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THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

**MOTIVATIONAL AND INFORMATION ASPECTS
OF THE REWARD SYSTEMS APPLIED TO
CHINESE STATE ENTERPRISES**

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IN CANDIDACY FOR THE DEGREE OF
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DEPARTMENT OF ACCOUNTING AND FINANCE

BY

GUOQI WANG

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ABSTRACT

This thesis analyses the motivational and information aspects of reward systems applied to Chinese state enterprises since 1949. It attempts to apply relevant concepts and analytical tools developed utilising the framework of agency and contracting theory in the analysis of the relationship between the State and enterprises in both planning and control.

The research is comprised of three parts. The first part critically reviews research in the area of managerial motivation in a centrally planned economy with particular reference to the New Soviet Incentive Model ("bonus literature"). It also presents systematically the relevant concepts and models of agency research. The second part describes and evaluates the reward systems applied to Chinese State enterprises during the period 1949-1989. The systems considered include the pre-reform system (1949-1978), the profit incentive systems (1979-1986), and the contract system (1987-1989). This description presents both documentary and empirical surveys concerning system design, operational models, and problems of application.

The third part sets up the analytical framework, models the Chinese systems, and analyses these models. Firstly, it attempts to establish the feasibility and suitability of using agency tools to analyse the State-firm relationship in central planning environments. It does this by comparing the bonus literature and agency research. Second, theoretical models are presented in a specific setting. A number of assumptions with regard to the elements of the theoretical models relevant to Chinese context are made. Models of various reward systems are then presented and analysed using an agency perspective and some suggestions for reform are made. The analysis also reveals some limitations of agency research and its power as an analytical tool in a Chinese context.

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CHAPTER 1

INTRODUCTION

1.1 Subject and Aims

1.1.1 Limitations of Existing Literature

Reforming the relationship between the State and state-owned enterprises has been a substantial part of the Chinese economic reforms which started in the late 1970s. The main motive behind this reform lies mainly in its incentive implications. The number of financial incentive schemes introduced so far is indicative of this motive. Providing enterprises with incentives and autonomy have been the core of the enterprise reform, as a lack of motivation and vitality on the part of enterprises was seen by Chinese authorities as the main cause for the low economic efficiency (CCP, 1984).

The Chinese economic reforms have been proceeded through a series of experiments. The reform programme has also attracted extensive attention from both Chinese and foreign observers. Much research has focused on assessment of the achievements and problems of the reform schemes. However, like the reforms themselves, there seems to be a lack of theoretical basis for the research in this area. Much attention has been paid to *ad hoc* treatments and exposure of empirical problems existing in the practice. While these treatments are necessary for understanding practical conditions and existing problems, they may be insufficient to provide assistance at the policy-making level. To gain an understanding of the more fundamental problems that emerged in the course of reform and to seek convincing explanations and successful solutions to the problems, it is worthwhile addressing the problems using appropriate theoretical frameworks and conducting certain theoretical analysis and modelling.

Economic analysis and modelling are an area in which few Chinese analysts

researchers seem to have explored. The Chinese research into economic reforms is quite extensive. However, few people have attempted to conduct serious analyses at the theoretical level. There are a number of reasons for this phenomenon. A lack of an appropriate theory or theories for the reforms is a main reason. Traditionally, the central planning practised in China during the pre-reform years was backed by Marxist economic theory and the Soviets developed a relatively mature framework for "socialist political economics". This economics has become largely obsolete in the reform years. And new theories are yet to be developed. One problem caused by this lack of theory is that the designs of reform schemes have to go through a trial-and-error process and what research can do in looking at these reforms is to expose problems of implementation and suggest amendments. Common sense and intuition play an important role in this kind of research. A lack of training in economic analysis on the part of Chinese analysts may also account for the limitations of existing Chinese literature. The majority of Chinese economists and accounting academics are less familiar with formal quantitative analysis and modelling than with verbal deduction and logical analysis.

Western research on Chinese economy, on the other hand, has been largely based on observations and/or surveys from either Chinese sources or from authors' own sources. This research is different from the Chinese counterpart in several ways. The most obvious one is that a large number of works are case studies and more specific in their research area. They also use certain analytical tools and concepts, which are not widely known and utilized in China. Western approaches enable researchers in the West to see issues and problems in the Chinese economy and reforms from different perspectives and therefore may lead to certain new results. However, a lack of comprehensive knowledge of Chinese economic system and its functioning may sometimes prove a barrier. Ideological and cultural differences between China and the West may increase difficulties in understanding and explaining certain Chinese phenomena. These difficulties and, maybe more fundamentally, the gap between Western theories and Chinese systems, substantially limit the scope and validity of applying Western economic theories and models in analysis of relevant Chinese systems. Recent attempts in this respect have however made some advances. For example, Granick (1990) uses a property-right version of principal-agent model

and analyzes Chinese state enterprises from this perspective (see Chapter 6 for a short review and criticisms). Byrd (1991) takes an abstract approach that seeks necessary and sufficient conditions for markets to work well, based on theoretical considerations and models and examines these conditions in the Chinese context.

In the area of managerial motivation, there exists a branch of Western literature that was developed in the context of Soviet reform schemes in 1960s and 1970s. This literature, referred to as the "bonus literature" in this thesis, examined the properties of the "New Soviet Incentive Model" (NSIM) built by some Western scholars based on the relevant practice in the former Soviet Union. Centring around this model, there have been a lot of discussion among Western writers concerning various theoretic aspects of central planning. The Western economists' interest in this area has also been greatly enhanced by the understanding that many of the problems which beset central planners in a centrally planned economy have their analogues in the central management of a large divisionalized Western firm. Among other concerns, the issue of managerial incentives embodied in information elicitation and effort inducement has been a main theme of this literature.

The bonus literature is highly relevant to the study of Chinese reform schemes since the Soviet incentive model and Chinese reform schemes are similar in that one of their aims is to address managerial motivation problems in a reformed central planning context.¹ However it is surprising to see that few researchers, either in China or in the West, have linked this literature to the study of Chinese reform schemes. This gap again reflects the weakness in modelling and quantitative analysis in the study of Chinese economic system. It may also mirror the neglect of motivational issues in the literature of Chinese economic analysis. One contribution of this study is to seek to examine the Chinese reward schemes in the light of the Soviet incentive model.

"Problems of motivation appear most prominently in centralized economies" (Holmstrom, 1982). It seems that these motivational problems were not fully

¹It is to be noted that the Soviet system was more manager individual oriented while the Chinese schemes are more firm oriented. This difference is basically due to different styles of management in the two countries.

recognized in China until recently. In dealing with aspects of the state-firm relationship, agency theory and other related Western theories such as contracting theory can be helpful. Agency theory has developed as a general analytical framework for incentive problems arising from information asymmetry between two contracted parties. This information asymmetry embodies a large set of situations in which one party is more knowledgeable than the other and therefore creating a number of incentive problems. Despite their limitations and relative immaturity of development, agency models enable many incentive problems within an organisation to be analyzed in a consistent economic framework. As our later analysis shows, agency research provides certain useful tools and concepts which can enhance our understanding and analysis of incentive problems in a centrally planned economy (CPE). There are already some attempts in the literature to utilize agency models in the analysis of the planner-manager relationship in a CPE. They represent a pioneer but primitive step in this area of research.

1.1.2 Key Questions to be Addressed

The main concern of this thesis is informational and motivational properties of the reward systems applied to Chinese state enterprises. The reward systems examined include both the pre-reform and reform systems. The reform systems analyzed in the later part of the thesis will be limited to two main schemes, ie., the profit retention scheme and the contract system. The selection of the schemes for study is oriented to those applied to large and medium-sized state enterprises. This selection will be justified later on in specific contexts.

The traditional Chinese industrial system, as its Soviet prototype, featured centralized decision-making and resource allocation and a decentralized information system. During the pre-reform period, the decision-making authority with regard to the major activities of state enterprises and resource allocation was held largely by the central planning authorities and local governmental authorities. The information system was however decentralized because of difficulties for planners in obtaining and retaining all necessary information concerning individual firms for decision-making. Under this system, the planner had to use certain devices to collect and motivate the

provision of relevant information from various sources, mainly from individual firms, in order to facilitate co-ordinating and planning activities across the whole economy. The reward system, among others, has been the main device used for this purpose. In designing a reward system, the planner has to take into account its effect on the reporting behaviour of firms, if rewards to firms are linked, in a way or another, to reports or information sent by firms. The ability to motivate firms to report truthfully is the main property we shall look for when considering information revelation in reward systems.

The necessity of linking the reported information from firms with rewards lies partly in the possibility for firms of sending biased messages in order to affect the planner's decision which in turn affects firms' effort choices. The assumption is that given that other conditions are equal, firms will prefer a lower level of effort to higher. This effort aversion on the part of the firm, combined with the planner's inability to perfectly observe the firm's action, gives rise to the problem of moral hazard or effort inducement. In designing a reward system, the planner has to take into consideration its power in motivating firms to exert desired level of effort and achieve what the planner wishes to be achieved. In particular, the simultaneous presence and interaction of moral hazard and information revelation create a class of incentive problems that the planner has to solve. It is one of our main purposes to assess how well the Chinese reward systems coped with these two problems.

Our other concern is to what extent Chinese reform systems have incentive advantages over traditional system. This question is more policy oriented and the answer to the question should bear much relevance to policy-making in China. However, this is a difficult question not only in itself but our analysis tends to focus on the economic aspect. Policy-making is necessarily a complicated process involving a number of factors and considerations. Our perspective may only reflect one or two of them.

Addressing these questions in a sensible way requires a thorough understanding of the "real" situation in China. By "real" we mean that the systems are not simply described as they appear on paper but also that cognizance is taken of actual implementations and practical problems. System description is an important part of this thesis. It will answer such questions as "was there any reward system

prior to the recent reform?" "how was and is the firm evaluated and rewarded?" This description basically relates to what has happened in China so far concerning the state-enterprise relationship and has therefore a primarily empirical bent.

Application of agency-related concepts and techniques, which originated in the West, to Chinese state-enterprise relationship must be justified for the results to be make any sense. This justification involves not only seeking to make sense of the general agency approach in the context of Chinese problems of industrial control but also identifying important assumptions underlying the agency approach and examining them in the Chinese context. This is a crucial issue that cannot be ignored, though it is difficult to address a number theoretical factors originated in the West in the Chinese environment.

1.2 Intended Contributions

The major difficulties involved in this research stem from two facts. One is on the empirical side. In the area of the Chinese systems of performance evaluation and incentive, few publications have so far tried to present systematically and critically all main systems used prior to the recent reforms and during the reform period, either in Chinese or in English. To gain a real picture of what has happened and is happening in this area, one has to not only study a number of official documents and existing literature but also read between lines to find hidden facts. An example of these hidden facts has been the extensive use of non-monetary rewards and penalties in China, especially in the pre-reform period. The lack of references to the pre-reform system in the literature increases these difficulties.

Another source of difficulties is the agency approach itself. Agency research has been active in the West in recent years, resulting in a rich literature. The research, however, has been much limited in its scope and depth. Basically, it is passing "the laboratory stage" but only limited empirical applications have so far appeared. Since there has been limited work to which we can refer in the area of applications and empirical analysis, our model-building attempts prove a challenging task which requires both creativeness and cautiousness. It requires creativeness because many of the models are built from scratch, it requires cautiousness because

the modelling process involves careful examinations of a number of assumptions which may have been taken as granted in literature. The issue of compatibility between agency framework and Chinese systems, for example, needs and will receive special attentions.

The major contributions of this thesis can be linked to the above-mentioned difficulties. The chapters of this thesis can be classified according to their emphasis. Some relate to what has happened and is happening in China and have a primarily empirical bent. These are basically system descriptions. A major contribution in this area is discovery of new facts that summarise and analyze critically Chinese literature and official documents which have not been published in English. This includes a presentation of Chinese relationship between the state authorities and enterprises, a detailed account of the changes in the area of enterprise autonomy since the beginning of the recent reforms, and descriptions of the Chinese systems of performance evaluation and reward applied to state enterprises. In particular, this thesis provides an up-to-date summary of the implementation of the contract system in China in recent years, covering details and cases of various practical aspects of the system and exposing features and problems based on a number of surveys. The process of collecting materials took a lot of time in looking for data in strange places, which we believe would have been no easier in China. Another contribution with regard to system descriptions is intended to be analytical. Discussion and criticisms outside the agency framework are raised following description of each system and relevant practice in the first half of the thesis. They represent more conventional views on the problems with the systems without the aid of agency and contracting analytical tools. Moreover, they serve to identify elements which are worthwhile considerations in the later part of the thesis.

The later part of this thesis relates to the theoretical and technical analysis and is intended to be more analytical. The major contributions of this part include setting up an agency framework for the analysis of the Chinese state-firm relationship, modelling the Chinese reward systems along agency lines, revealing motivational and information properties of the Chinese systems, and making policy recommendations derived from the analysis. The focus of the analysis is to examine the advantages and disadvantages of each Chinese system and to suggest ways of improvement if the

Chinese planner wishes to optimize the reward system applied to state enterprises.

In setting up the general analytical framework, we first make an explicit comparison between the bonus model and agency model, both of which are relevant to our analysis. It is indicated that although many elements of the two models are similar, limited research efforts have been made to bring them together and, in particular, to adopt the agency approach to incentive problems in centrally planned firms. Available research shows that this may be stimulating and bring insights into incentive problems addressed by the bonus literature.

In examining Chinese reward systems, some theoretical models are formulated and elaborated based on existing models in the literature. These models will be adapted and refined in a central planning setting with a planner and many firms (managers). The optimal solutions to the problems represented by the models will be characterized and they are meant to provide benchmark models against which the Chinese systems are analyzed.

This theoretical approach provides a new perspective in addressing the current problems in the Chinese economic reforms. In particular, it enables us to derive certain conclusions and suggestions which cannot be deduced from *ad hoc* treatments of implementation of the systems but only from the analysis of relatively "pure" theoretical models. These conclusions and suggestions may stand on their own in terms of their independence from specific cases and practical considerations.

Another contribution of this thesis is to show the limitations and the still immature nature of agency models. Much agency research has been so far confined to simplified and "standard" settings and models. Their present ability to tackle real-world problems leaves much room for innovation in this area. There are a lot of areas of which great potentials for further research are suggested. Examples of these areas are situations of simultaneous adverse selection and moral hazard with the risk-averse agents, multi-agent settings, and issues of incomplete, implicit contracting. Owing to the limitations of models and scope of this thesis, many questions have to remained unanswered. These questions however indicate that agency theory and the agency approach to Chinese reward systems are promising research areas awaiting further exploration.

1.3 Outline of the Thesis

The thesis is divided into ten chapters. This Chapter serves as a general introduction to the research. In the first part of this Chapter, we have indicated the subject of the research and discussed briefly limitations of current studies of Chinese reforms and state enterprises. Intended contributions of this study were also outlined. In the rest of this Chapter, we shall provide a background description of Chinese relationship between the state authorities and state enterprise. The description is based on the administrative aspect of the relationship and is intended to present a general picture of the relationship seen from this perspective. To aid the comprehension of the reform schemes, which are to be analyzed in the later part of this thesis, we shall also present a chronological account of the changes in the area of enterprise autonomy based on documentary and empirical surveys. Discussions will be raised at certain points in a general way.

The main chapters of the thesis (Chapters 2-10) can be divided into three parts. The first part consists of Chapters 2 and 3 and is a basic literature review. Chapter 2 critically reviews research in the area of managerial motivation in a centrally planned economy (CPE) with particular reference to the New Soviet Incentive Model (NSIM). This review of the bonus literature begins with a brief discussions of the major arguments raised in the Socialist Controversy, which is planned to provide some historic background to the topic of this thesis. It is indicated that information requirements of the central planner and the need to motivate individual managers to fulfil plans have been the main difficulties that the central planner in a CPE has to solve. A number of Western models of the firm in a CPE are presented together with short discussions. In particular, the information property of the NSIM, ie., its ability to provide the manager with incentives to report truthfully in the planning process, will be focused upon. Other relevant factors, such as managerial effort, uncertainty, and especially the ratchet effect, are also given consideration in the context of planner-manager interrelation.

Chapter 3 reviews the basic concepts and models in agency theory. The basic principal-agent model is examined primarily in the business environment where the two parties represent the owner(s) and the manager respectively. This setting allows

us to see the relevance of agency research to our planner-firm setting. The model is developed together with its underlying assumptions. Different combinations of risk preferences and information structures lead to several main settings in which the model results in different solutions. Incentive compatibility is a main consideration in presence of information asymmetry between the two parties. Criticisms and limitations of the basic agency model is also reviewed in the last major section of the chapter, though extensions of the model and some more advanced topics, primarily related to the issue of information, are left to later chapters (6 and 7).

Chapters 4 and 5 constitute the second part, which deals exclusively with system description. The switch from the first part to the second may seem to be abrupt but this arrangement of chapters is simply following the convention that literature review goes first. Chapter 4 gives a systematic presentation of Chinese systems of preformation evaluation and incentive applied to state enterprises. The main systems considered include the pre-reform system (1949-1978), the profit incentive schemes (1979-1986), and the contract system (1987-present). This description presents both documentary and empirical surveys concerning system design, operational models, and problems of implementation. The contract system is given special consideration in Chapter 5, which provides up-to-date details of the practice and problems of the system. Various aspects of implementation are considered with relevant regulations and survey data. Observations, discussions and criticisms are also given with regard to the system design and applications. The materials in Chapters 4 and 5 are presented in a general manner without entertaining an agency perspective. Moreover, they represent certain common views found in Chinese literature.

The third part consists of Chapters 6-10 and is the main section of the thesis. The principal task in this part is to set up an appropriate analytical framework for the Chinese systems, build theoretical models of the Chinese systems, and to analyze these models and draw conclusions. Chapter 6 attempts to establish the feasibility and suitability of using agency tools to analyze the state-firm relationship in the central planning environment. It does this by bringing together the two branches of literature reviewed in part one, ie., the bonus literature and agency research, and by making comparisons between them. Similarities and differences are identified, so are the

relative weakness of the bonus literature. It is argued that agency concepts and tools may be helpful to bonus research. This is further demonstrated by reviewing some agency research into the bonus problem existing in agency literature. The agency approach to incentive problems in centrally planned firms is thus rationalized. Chapter 6 also critically reviews a unique and interesting piece of work by Granick, who adopted an agency approach to Chinese state enterprises. While his approach strengthens the rationale of the agency perspective, his model of Chinese state-firm relationship is criticized from several points of views. Based on these criticisms, we define and justify our concept of the agency relationship applied to the Chinese planner-manager (firm) setting.

The main purpose of Chapter 7 is to set up some theoretical settings which are relevant to Chinese environments and establish appropriate benchmark models and solutions, against which practical Chinese systems are analyzed and compared. Based on existing models in the literature, we refine and elaborate a general resource allocation setting with a planner and many firms. The setting is also characterized by simultaneous adverse selection (information elicitation) and moral hazard (effort inducement). Standard agency models of the above setting are built and solutions to the models are characterized within the framework of Nash equilibrium. Chapter 7 also examines the Groves Mechanism, a much studied model in accounting literature and argues its relevance to the Chinese systems is remote because of its limitations. Finally, in the context of pure moral hazard and multiple-agents, the model of tournaments is refined by incorporating targets into the model in the centrally planning environment. The whole of Chapter 7 can be seen as providing extensions to Chapter 3 using specific settings. To avoid confusion and keep the "pureness" of the theoretical models, Chinese specifications are not explicitly referred to throughout the Chapter. Nevertheless, the relevance to China is kept in mind during the technical analysis of the theoretical models.

Chapter 8 deals exclusively with various elements of the agency model of Chinese reward systems and examines general assumptions underlying the analysis in Chapter 9. Utility functions and risk preferences of the planner and manager and the role of information from firms in planning process are the main topics. In particular, some fundamental assumptions underlying the agency approach are

carefully examined and analyzed in the Chinese context. Based on analysis of factual materials and available supporting works by Richman (1969) and Granick (1990), assumptions are made and clearly stated with regard to objectives of firm manager and of the planner, manager's attitude toward effort exertion, risk preferences of the planner and of the firm manager, and the characteristics of chinese plans and the firm's involvement in the budgeting process.

Chapter 9 continues the analysis of Chapter 8 and place the emphasis on model-building and analysis of models. Three Chinese reward systems are separately modeled and analyzed. They are the pre-reform system, profit-retention scheme, and the contract system. Different emphases are put on these three systems. In modelling the pre-reform system, three features of incentives are identified and modeled: a great reliance on non-material incentives and disincentives, different weights put upon a number of performance indicators, and the undefined nature of the system in terms of blurred and arbitrary coefficients in the model. It is assumed that information elicitation was a major concern of the system. While firms may have responded with less distorted information than in the case of badly-designed but explicit schemes or absence of incentive schemes at all, the undefined nature of the system and de-emphasis on financial incentives may have greatly undermined its incentive power. Compared with this system, the reform schemes are more clearly-defined and more explicit. Financial incentives become more important. Moreover, the importance of information revelation is reduced as that of central planning decreases. The moral hazard problem combined with rent-seeking behaviour by the firm in the dual-price environment is the main problem that the planner seeks to solve. The profit-retention scheme was one of the reform schemes that the planner used to motivate firms to generate more revenue for the State. Here, some of the practical problems with the scheme are analyzed and explained from the agency perspective. The planner's concern for "fairness" or equity between firms is shown to be an important counter factor to motivational considerations in designing the incentive scheme. This has effectively prevented the planner from using more powerful devices in terms of motivation such as relative performance evaluation or tournaments. The more recent contract system is modelled and analyzed following the profit-retention scheme. It is shown that several new features of the system can result in motivational

improvements over previous schemes. Problems of implementation are also analyzed.

Chapter 10 pulls together the main points made during the analysis of Chinese reward systems in the previous chapters and attempts to make certain policy-oriented recommendations. It also considers the possible trends of current Chinese reforms relating to state enterprises and briefly discusses the trends within the analytical framework of the thesis. Chapter 10 also summarizes the main contents of the thesis and highlights the main conclusions. It also points out the limitations of the analysis, in particular, the problems in applying standard agency models to the Chinese systems. Questions unanswered by this thesis are finally enumerated and directions for future research are enunciated.

1.4 The State Versus Enterprises in China: An Overview

In the remainder of this Chapter, we provide an introduction to general aspects of the relationship between the state authorities and state enterprises in China.

A background description of Chinese state enterprises will be first given, followed by a review of changes in the major aspects of the state-enterprise relationship since 1979. The focus will be placed on the decentralization efforts made by the Chinese government and their impacts on the state-enterprise relationship.

1.4.1 State Enterprises in China

State enterprises are the backbone of the Chinese economy. This has been the case especially since the "Socialist Transformation" in the mid-1950s, when the great majority of private and state-private joint-owned businesses were "transformed" into state-owned enterprises. The importance of the state ownership has been relatively reduced since the major economic reforms starting in 1979. However, state enterprises, especially those of large and medium-size², still constitute the most

²Chinese industrial enterprises are classified by size according to a set of uniform standards set by the state departments. The main standards used include production capacity and original value of productive fixed assets. There are currently three classifications (large, medium, and small) and six sub-classifications (RMRB, 18 Sept. 1992).

important part of the economy (see Fig. 1.1). For example, there were about 11,540 large and medium-sized state industrial enterprises in 1991³. This number accounted only for 2.5 percent of the total number of Chinese industrial enterprises. Nevertheless, the output value produced by these large and medium-sized enterprises accounted for 45.6 percent of the total output of all industrial enterprises in China, while the corresponding figure for the income contributed to the state budget was more than 60 percent (RMRB, 7 Oct. 1991).

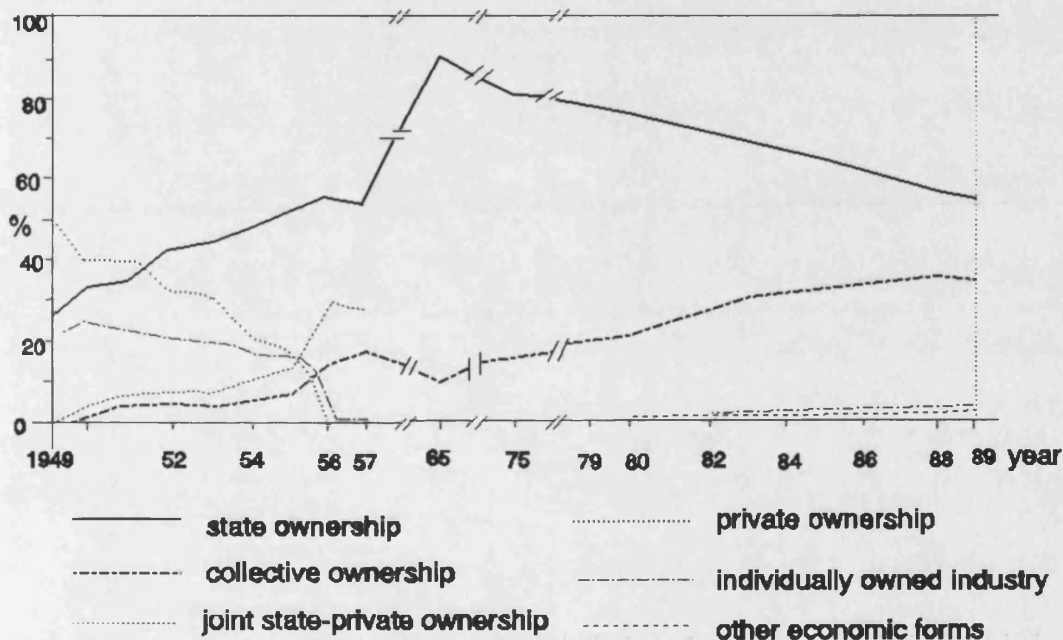


Fig. 1.1. Percentage Changes in the Industrial Output Value with Various Forms of Ownership, 1949-1989.

Source: Statistical Yearbook of China 1989.

Chinese state enterprises are officially defined as "owned by the whole people". Claiming to be the people's government, the state authorities own the enterprises on the behalf of the people. It was also taken for granted prior to the

³It was officially confirmed that by the end of 1991, there were 3,518 large industrial enterprises, of which 123 were classified as extra large enterprises. Most of them are owned by the state (RMRB, 18 Sept. 1992).

recent reforms that the governmental authorities should directly "manage" the enterprises⁴. As a result, state enterprises became basically "appendages" of various levels of government and departments and lacked autonomy in important decision-making areas. The separation of ownership (they are always owned by the state) and management (they can be managed by managers independently of the state interference) is a relatively new concept in the era of reforms.

Chinese state enterprises in the prereform period featured not only direct management by state agencies, but also a poly-functional characteristic: they are not only economic entities, but also social and political organizations. The economic nature of enterprises seems obvious but was largely undermined prior to the reforms in the sense that they were not granted great autonomy to pursue economic goals. For example, although they were encouraged to make profits, they are not necessarily profit-making firms. The economic nature is also greatly over-shadowed by other functions that have to be performed by enterprises. Social and administrative functions have been among the basic ones. Enterprises have for many years been extensions of state administrative organs. They have to provide the employees not only employment, but a number of social and welfare services such as housing and nurseries. Self-sufficiency facilities in large- and medium-sized enterprises is so extensive that such enterprises are commonly referred to as "small societies". Moreover, political functions have been important in Chinese state enterprises, where party activities are organized down to the grassroots levels. The political and ideological influences have also been enhanced due to their perceived role in moral incentives. A detailed discussion on the multiple-objective feature of Chinese state enterprises can be found in Chapter 4.⁵

⁴The term "state enterprise" can be understood as either "enterprise owned by the state" or "enterprise managed by the state". This distinction was not made clear until recently.

⁵The political characteristic of Chinese enterprises and the Party's involvement in nearly every aspect of enterprise activities are already treated by Western analysts in great detail. For a recent analysis, see Andrew G. Walder, Communist Neo-Traditionalism: Work and Authority in Chinese Industry, University of California Press, 1986.

Changes have been taking place in every aspect of the above outlined features of Chinese state enterprises in the course of the new economic reforms, but in an evolutionary way instead of a revolutionary way. In other words, many of the changes have been of detailed nature rather than of sweeping nature. For example, enterprises have been given a great degree of autonomy gradually during the 14-year reforms. They may no longer be treated as "appendages" of governmental departments. However they may have a long way to go to become independent economic entities which have full responsibility for their operations.⁶ Another example is that although the weights for the three aspects of Chinese state enterprises (economic, social, and political) have changed with greater stress on the economic aspect, the three-in-one feature of enterprises has never been removed.⁷

All of the features of Chinese state enterprises and the their changes in recent years will be presented in more detail in the Chapters 4 and 5, where the general statements made in this section will be justified and detailed. In the remaining part of this section, focus will be placed on the administrative relationship between the state agencies and state enterprises. As can be seen from the following description, the state-enterprise relationship in China has been very much complicated by different types of arrangements and changes in the arrangements over time. Gaining a clear picture of this administrative relationship is a basic for understanding other aspects of the state-enterprise relationship, some of which represent the main topic of this thesis.

⁶The ultimate aim for reforming the enterprise operational mechanism is officially described as "making enterprises independent and self constrained economic entities which have self initiative, assume sole responsibility for their profits or losses, and have ability to self-develop" (The State Council, Regulations for the Transformation of the Operational Mechanism of State Industrial Enterprises, RMRB(People's Daily), 24 July 1992).

⁷Immediately after June 1989, the tendency to put emphasis on the economic nature of state enterprises was criticized by some Chinese observers. For example, see Fan Ping, Implementing the Separation of the Party from Administration vs. Adhering to and Strengthening the Leadership of the Party, Beijing Ribao (Beijing Daily), 11 Oct. 1989.

1.4.2 Administrative State-Enterprise Relationship

The administrative relationship between the governmental authorities and state enterprises in China involves two types of interlinked control channels. The first consists of different levels of government units. Basically, two types of state enterprises can be distinguished by their controlling governance. Those invested in and managed by the central government provincial governments are referred to as "state enterprises", while others were invested in and controlled by governments at the provincial level as "local state enterprises".⁸ Due to historical changes in controlling responsibility of some enterprises, some are "jointly" supervised by different levels of governments, creating the so-called "multiheadedness" phenomenon.⁹

This multiheadedness phenomenon was made much more common by the second type of administrative arrangement in China: vertical industrial control. In general, an industrial ministry at the national level was responsible for related production in the same industry all over the country. All enterprises operating in the same industry are therefore subject to the industrial control or guidance by that ministry and its corresponding organs at local levels (an industrial bureau at the provincial level, for example). More confusing is that these industrial ministries are only responsible for organizing the production of specific lines of products. Other related functions, such as finance, supplying, labour and wages management, etc. are performed by other governmental agencies at various levels, on the basis of locality. As a result, an enterprise is virtually under both vertical industrial control and governmental functional control based on locality (see Fig 1.2). It is not unusual that a single enterprise is subject to supervision from several governmental authorities at the same level and even at different levels. However, for an enterprise, the government authorities at its place of location are more important, since most of its

⁸The Government Administration Council, The Provisions Concerning the Usages of Names of State Enterprises, Laws and Regulations of the Central PRC Government (1949-19, Beijing: Law Press, 1980).

⁹Granick (1990) gives a detailed account of the origin and historical evolution of the phenomenon, based on which he forms his multiple principal hypothesis.

economic activities, such as supplies of capital, materials, and labour, and product marketing, are organized by the local government agents rather than by the industrial ministry (Zhang, 1992, p.18).

It is rather difficult to describe precisely the actual jurisdiction of each government department when a specific enterprise is under consideration. The difficulties are mainly caused by the complicated and frequently changing criteria for division of responsibility among the departments involved.¹⁰ However, there is

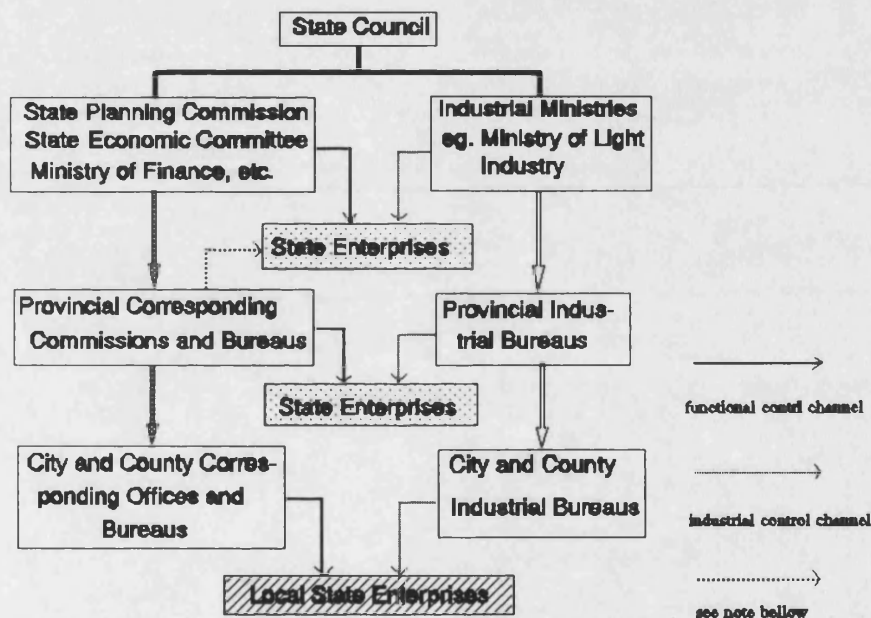


Fig. 1.2. Chinese Industrial Administration System, 1982

Note: Government authorities at the location of an enterprise, whether the enterprise is controlled directly by the authorities or under jurisdiction of a central Ministry, possess significant powers to influence that enterprise. For example, under the unified national state planning system, an enterprise which is under exclusive supervision of a central Ministry may have to, according to the state planning, obtain the material supplies from the local government under whose jurisdiction the enterprise is stationed.

¹⁰Several accounts of the confusing system in English are available. For example Donnithorne (1967) tried to describe the responsibilities for the eight Ministries involved in machine building; Zhang (1992) gives a detailed description of the situation in the Chinese bicycle industry; and Granick (1990) and Richman (1969) also give good presentations of the Chinese industrial control system based on case-studies and surveys.

one point which may be helpful to our analysis in the later part of the thesis. That is, no matter how many supervisory authorities an enterprise has, there exist one or two (sometimes more) superior authorities which have the power to make major decisions concerning the enterprise as well as to carry out performance evaluation and where applied, to award or penalize the enterprise. This(these) authority(ies) is referred to as "department(s) in charge (of the enterprise)" (qiye zhuguan bumen), or as "mother(s)-in-law" by enterprises. We shall use exchangeably the terms "the State", "the government", "the higher authorities", "the supervisory authorities (departments)", "the department in charge" in the context of state-enterprise relationship.

1.5 Enterprise Autonomy in the Reform Era

1.5.1 Status of State Enterprises Before Reforms

As previously indicated, during the period prior to reforms which began in the late 1970s, State-owned enterprises in China were organized nationwide in following ways: vertically, they belonged to the centralized ministries according to the products or services they produced or provided; regionally, most of them were administered by local governments except those controlled directly by the central authorities. Within such a pervasive administrative network, although State enterprises were given a status of "independent accounting entity", the autonomy, responsibility and benefits they had were far from matching with this status. Most strategy and policy functions exist in a Western firm were absent from Chinese enterprises. But "decentralization of production and operations decisions had been the practice before the reform" (Child, 1987, P.37). In most cases, enterprise management were expected to work out detailed production plans for their own factory, to decide on day-to-day operational matters, and were appraised by their performance in production plan fulfilment. In terms of the scope of power and responsibilities, an one-factory enterprise in China prior to reform might be compared to a plant of a large corporation in the West, and a large multi-factory corporation, to a tightly controlled division (Battat, 1986, P.32). In accounting terms, this hypothesis approximates to the cost centre judgement on the pre-reform Chinese enterprises (Skousen & Yang,

1988, P.202).

The Chinese State enterprises were basically seen as "appendages" of government departments during the pre-reform period (1949-1978). Although a certain degree of decentralization had existed prior to the major reform programme which started in 1978, this decentralization was limited to the level of industrial ministries and local administrations. Since the beginning of economic reform in late 1978, the Chinese reformers have made great efforts to reform the relationship between the State and enterprises. The next two sub-sections document the major efforts that have been made during the period 1978-1989 with regard to expanding enterprise autonomy. They are intended to serve as a main source of reference for the whole thesis.

1.5.2 Decentralization During the Period 1978-1983

Simplifying administration and decentralizing decision-making power have been the theme for reforms since 1978. The idea was clear, but to put it into practice seems to have been rather difficult and complex. The process was comprised of several stages and involved a series of experiments, which began in Sichuan Province in the late 1978.

In October 1978, six state enterprises in Sichuan Province were selected for the first experiment. The number was expanded to 100 by January 1979. These enterprises were authorized, for the first time among Chinese state enterprises, to assume new power in management and to share the financial benefits with the State. For instance, they could (1) produce beyond the state production planning targets and sell the above-target volume of products on the market; (2) retain a portion of their profits up to 5 percent of their payroll, provided that the state targets (output, quality, profit, and the provision of goods under contracts) were fulfilled; and (3) distribute a certain amount of retained profits as bonuses and decide how to distribute bonuses.

In April 1979, another experiment in enterprise management was launched and eight large industrial enterprises located in the three largest cities (Beijing, Shanghai and Tianjing) were selected to take part in this so-called "expanding the enterprise right for self-management" experiment. The number of enterprises involved reached 4,000 in July 1979. At the same time, a new system of income distribution was

instituted in 6,600 industrial pilot enterprises throughout China. Under this system, enterprises were entitled to a certain percentage of profit, which was directly linked to actual amount of realized profit, should the four state targets be fulfilled.

The above-mentioned experiments were claimed to be successful in light of the overall improved performance of the participating enterprises. According to official statistics, 84 of the 100 enterprises in the Sichuan experiment increased output by 14.9 percent, total profits by 33.5 percent, in 1979 over 1978. The performance of the pilot enterprises taking part in the 1979 experiment was reported to be higher than that prior to the experiment and the average performance of non-pilot enterprises.

Encouraged by this success, the Chinese leaders launched the third experiment in enlarging powers of enterprises in 1980. A few of enterprises taking part in this experiment were made responsible for their profits or losses. They were still obliged to fulfil the State plan targets imposed to them. But they possessed more autonomy in operations and could retain their after-tax profits. "In a way, they became profits centres" (Battat, 1986, P.39).

On the 2nd of September 1980, the State Council approved and transmitted "the Report Submitted by the State Economic Commission on Working Situation and Opinion Concerning the Future of Experimentation of Expanding Enterprise Autonomous Powers". According to this Report, state enterprises were to enjoy expanded powers in, *ad hoc*, production plan and pricing. Therefore, enterprises were given the power to make their own production plans under the guidance of State plans and in light of market needs and of their own production capacity. Where state plans were found to be infeasible, enterprises were entitled to adjust the plans, provided that they informed, or got approval from, the superior competent authorities. Moreover, enterprises might, under the guidance of State pricing policy, set prices for their products within limits.

In 1981, the economic responsibility system was implemented widely and rapidly across the country and brought about a new wave of expansion of enterprise autonomy. This system was intended to make enterprises bear full financial responsibility given the autonomy already granted to them. The enterprises under this system should ensure the fulfilment of the State plans as they did before, but they

were more committed to achieving financial results. On the other hand, somewhat conflicting with their financial responsibility but quite understandably at that time, they were warned not to concentrate on profit alone. In other words, profit could not be the guideline for production. By the end of 1981, 80 percent of all State enterprises were reported to have introduced this system.

A major change in the area of income distribution took place in April 1983, when the tax-for-profit scheme was announced. All enterprises (excluding some granted special approval of the State Council to practise other schemes such as the contract system) were then required to pay an income tax up to 55 percent of their realized profits. The remaining 45 percent of profits were to be divided between the State and enterprises in accordance with specific agreement by the both sides, which were very similar to the profit contract widely used at the present. Retained profits could be used by enterprises to establish development-related funds, such as new product trial run fund and production development fund, employees' welfare fund, and bonus fund.

The pre-1984 reforms in the industrial sector were actually a series of experiments, which could well be called a process of exploration through trial and error. The success of the reforms can thus hardly be judged overall. In 1985, a large-scale, authoritative survey on the pre-1985 reforms was conducted by the China Economic System Reform Research Institute (CESRRI). This survey covered a random sample of 429 enterprises in 27 cities, and the report of findings was presented to the Chinese State Council in October 1985.¹¹ The report, written by a group of pro-reform young researchers, concludes in a positive tone:

Since 1979, ... the reform of the economic structure designed to create a commodity market and deregulate and enliven the enterprises has made substantial progress. The reform of the systems of inter-enterprise distribution, planned resource transfer, and allocation and price control has gained noticeable results. Market mechanisms have begun to play an important role in the operation of the economic system (Chen & Wang, 1988, P.173).

¹¹The full version of the report was published in Chinese in 1986. An English version was published in 1987 under the title "Reform in China: Challenges and Choices" (Reynolds, 1987). A summary of the report was presented by Chan & Wang (1988).

These remarks do not seem exaggerated and sounded acceptable to Chinese observers, who witnessed the remarkable changes that reforms have brought about which had never appeared before. A number of Western observers, viewing the process in a critical way, take a more cautious attitude. Reynolds (1988), for instance, comments that reform in China has been very successful in agriculture, and "a dismal failure" in industry in terms of efficiency improvement.

Two main changes were brought about by reform efforts during this period. The first was a reduction in importance of central planning and an expansion of market's influence. According to the CESRRI Survey, in 1984, the planned supply of major raw materials in the sample enterprises accounted for 73.16 percent of materials consumption, output according to mandatory plans made up only 23.97 percent of the total output, and the planned allocation of products was 57.42 percent of total (Chen & Wang, 1988, P.174). Table 1.1 shows the survey results regarding proportions of planned supply, production, and allocation of products in industrial State enterprises.

TABLE 1.1

PROPORTIONS OF PLANNED SUPPLY, PRODUCTION, AND
DISTRIBUTION OF PRODUCTS IN INDUSTRIAL
ENTERPRISES OF DIFFERENT SIZES: 1984

Enterprises by size	Proportion of planned production (%)	Proportion of planned distribution of products(%)	Proportion of planned supply (%)
Large and Medium	28.38	67.97	84.47
Small	3.55	3.02	4.47

Source: Zhang & Zhang, "The Present Management Environment in China's Industrial Enterprises," in B. L. Reynolds (ed.) Reform in China: Challenges and Choices, New York: M.E. Sharpe, 1987, pp.47-58.

The second change is a transformation of the orientation of enterprises. A series of schemes seeking to reform the income distribution system have not only

entitled enterprises to retain more and more profits and therefore granted them more financial autonomy, but also motivated them to generate profit and gradually changed their objective from production-target-fulfilment to profit-seeking. For example, the CESRRI Survey revealed that "improvement of efficiency" or "increase in profit" topped the list of fourteen management objectives ranked by 359 enterprise directors, whereas "fulfilment of production quotas", the previous number one, came eleventh (Reynolds, 1987, P.4).

1.5.3 Enterprise Autonomy During 1984-1989

The pre-1984 industrial reforms were basically of an experimental nature without clearly defined objectives and a detailed blueprint. One momentous step towards expanding enterprise autonomy came on 10th May 1984 when the State Council issued "the Provisional Provisions on Further Expanding State Enterprise Autonomous Powers" (the "1984 Provisions", also widely known as the "Ten Articles"). Based on earlier developments, the 1984 Provisions confirmed ten autonomous powers for the enterprise. They were in the areas of production, sales of products, product pricing, selection of material supplied by the State, use of funds, disposal of assets, organisational arrangement, labour and personnel, wages and bonus, and associated production. The 1984 Provisions were supported in October 1984, when the most important document for Chinese industrial reform "the Resolution on the Economic System Reform" was adopted in the Third Plenary Session of the Twelfth Central Committee of the Communist Party of China. This Resolution laid down the basic principles for and the general direction of industrial reform, and, for the first time since 1949, defined in theory state enterprises as self-managing, independent economic entities responsible for their financial results.

During the period 1984-1987, the Chinese authorities issued totally 13 official documents that included 97 articles concerning the expansion of enterprise autonomy (Gao, 1987, p.30). In September 1985, for example, a directive was approved by the State council to boost the vitality of large- and medium-sized enterprises, arguing that enterprises should draw up their plans with reference to market conditions and change from production oriented operation to production and marketing oriented operation.

The State Enterprise Law ("SEL") adopted by the People's Congress in April

1988 reaffirmed the powers already granted to enterprises. Based on the idea of separating enterprise ownership from management powers, the Law stipulates further powers for enterprises, in addition to the above-mentioned powers in ten areas. The Law also approved the director (manager) responsibility system, placing in the hands of factory directors (managers) the sole power to make decisions concerning production, management and personnel (Yang, 1988).

By synthesizing the stipulations concerning enterprise autonomy in the documents mentioned above, we can deem that rights in the following areas have been, or more precisely, supposed to have been, vested in enterprises (relevant article(s) in the Enterprise Law is indicated).

1. Production. Enterprises can arrange on their own production, provided these fulfilment of the state plans and orders are guaranteed. They have the right to produce whatever is needed on the market or is in short supply, after fulfilling their shares of state plans. They are entitled to accept or refuse any production order or arrangement outside mandatory plans requested by any organization or government department (Arts. 22 & 23). Moreover, enterprises are entitled to request the adjustment of mandatory plans which are not accompanied by the planned supply of materials or by the planned sale of products.

2. Marketing. Enterprises are entitled to sell the products they produce unless otherwise specified by the State council. Enterprises charged with fulfilling mandatory plans are entitled to sell above-quota outputs or their share of products within planned production (Art. 24). The 1984 Provisions stipulates that, unless prohibited by the State, enterprises may sell products such as new products invented and produced by them, products which are not purchased by any State department, and overstocked products.

3. Purchase of materials. Enterprises are entitled to choose their own suppliers and purchase freely materials needed for their own production (Art. 25). Enterprises may conclude contracts and settle accounts directly with material suppliers.

4. Pricing. Enterprises have the right to price their own products, except those under State price control. The products produced under State mandatory plans which are to be "bought" by the State are subject to price control (Art.26).

Product prices may take one of three forms. The first form is prices set jointly

or exclusively by the State pricing departments at or above county level and by government departments in charge of enterprises. Enterprises have no choice but to accept such prices. The second is State-guided prices. Enterprises may only determine prices within this category under the guidance given by the above mentioned government departments, by taking into consideration the standard price, the range of fluctuation, profit level, and maximum and minimum price limits. The third form is market-regulated prices. Enterprises as producers have full autonomy in determining this type of price. In addition, enterprises may set the prices of quality products for which a price increase is permitted upon identification and affirmation by the department concerned and upon approval by the price control departments, provided that the increase is within the range permitted. They may also set, within the prescribed scope of authority, the bargain prices of worn-out or substandard goods. Finally, enterprises may decide, within the period prescribed by the State, the prices of new products for pilot sale.

5. Use of funds. Enterprises are entitled to allocate and use their retained capital for purposes of production development, employees's welfare and bonuses (Art.28).

6. Handling of assets. Enterprises have the right to lease or transfer for compensation (sell) unneeded or idle fixed assets in accordance with the provisions of the State Council. The income shall be used to upgrade or renew their own equipment (Art.29).

7. Wages and bonuses. Enterprises are entitled to decide on their own methods of reward distribution and wage schemes (Art.30). However, the central government has set forth unified standards for wages which differ in terms of region. There is also a national subsidy system which is changed from time to time. It is on the basis of these standards that enterprises may choose their own suitable types and levels of wages. Furthermore, enterprise directors are entitled to upgrade wages for staff and workers who have made a significant contribution, providing that the scale of such upgrading shall not exceed the rate set by the State. In addition, enterprises have the autonomy to distribute the bonus fund drawn from their profits in accordance with relevant regulations.

8. Hire and dismissal. Enterprises are entitled to hire and dismiss any staff member or worker in accordance with the provisions of the State Council (Art.31).

Several attempts have been made to ensure the realisation of this right. First, since the adoption of the director responsibility system, enterprise managers have been authorised with powers to appoint and remove enterprise managerial personnel. Secondly, more and more workers have been employed on a contractual basis. Enterprises have relative freedom to recruit, employ, and dismiss workers in accordance with relevant regulations.¹² Thirdly, on July 31, 1987, the State Council promulgated Regulations Concerning Labour Disputes Settlement, which provide for procedures for dealing with disputes arising from sanctions and the dismissal of workers.

9. Organizational structuring and personnel. Enterprises have the right to decide on organizational structure and the personnel establishment (Art.32). The 1984 Provisions contain clearer stipulations: enterprises are entitled to, within the limits on the setup and the fixed number of staff members approved by government departments in charge, decide on their organisational structure and staff allocation, in accordance with the features of their production and the actual needs. Relevant government departments may make proposals to enterprises on their organisational structure and staffing according to the needs of their professional works. But no government department is allowed to make compulsory provisions as to establishment and staffing within enterprises.

10. Foreign business. Enterprises are entitled to negotiate and sign contracts with foreign businessmen, to withdraw and spend their shares of foreign exchange, in accordance with the rules of the State Council (Art. 27). In the past, foreign trade was carried out exclusively by special State-owned trading companies. Since the mid-1980s, some ordinary State enterprises have been authorised to carry out direct foreign trade.

11. Inter-enterprise operation. Enterprises have the right to form associations with

¹²In July 1986, the State Council promulgated four sets of Provisional Regulations, concerning respectively Implementing Labour Contract System, Recruiting Workers, Dismissing Workers Violating Disciplines, Insurance for Unemployed Workers. For an discussion and translation of these regulations, see H.K. Joseph, "Labour Law in the Workers' State: the Chinese Experience", Journal of Chinese Law, Vol.2 1988, pp.201-63.

other enterprises or public institutions, to invest and to own shares in other enterprises, in accordance with the rules of the State Council (Art.34).

In addition, enterprises are entitled to issue debentures in accordance with stipulations of the State Council. In March 1987, the State Council promulgated Provisional Regulations Concerning the Administration of Enterprise Debentures. Until 1992, the issue of debentures has been a privilege for State enterprises, since other enterprises including collective enterprises, with the exception of foreign investment enterprises, are prohibited from issuing debentures. The People's Bank of China is the government authority in charge of issuing of enterprise debentures. It has the power to approve the issuance of debentures, providing that the amount does not exceed the limit jointly controlled by the People's Bank of China, and State planning and financial departments. If enterprises intend to issue debentures for the purpose of investment in fixed assets, such investment items must be investigated and approved by relevant government authorities. Such requirements are set to control the random expansion of investment in fixed assets, and to ensure that priority for the issuance of debentures must be given to investment on key construction items covered by the State plan.

12. Refusal of outside solicitation. Enterprises have the right to refuse the solicitation for manpower, materials or money made by any organizations or government offices (Art.33).

1.5.4 Enterprise Autonomy: Practical Problems

The institutional efforts made by the Chinese central authority towards decentralization and enterprise autonomy, especially since 1984, can be said praiseworthy. These efforts have demonstrated the willingness of the central authority to create a sound economic environment in which enterprises can function in the way similar to that in a market economy, while the State retains macro-control. Despite this, a number of surveys have revealed that the real situation in enterprise autonomy seems to be a different story.

Studies into Chinese enterprise autonomy show that a great diversity exists concerning the extent of freedom different enterprises (Zhang & Zhang, 1987; Warner, 1987; Fujimoto, 1987). The degree of autonomy varies with a number of

factors. Except size we have discussed earlier, the factors include the importance of products produced by the enterprise, the subordinate relationship with the higher authorities, and its hierarchical position (see Fig.1.2).

Besides this unevenness of decentralization, the most prevailing complaint from enterprises has been that many rights the central authorities have granted to enterprises did not actually reach the enterprises owing to the interference from government administrations at various levels. Many efforts by central authorities to enlarge enterprise autonomy have been ruined by resistance of local government administrations and of intermediate industrial administrations. It was reported that some administrative bureaux had successfully retained their power by forming "administrative companies" and establishing "operational companies" (Jin, 1988). These "companies" are still government bureaux *per se* with different names. They claim the powers granted to enterprises and leave enterprises powerless (Jiang, 1986). The Economic Daily of October 14, 1986 reported the outcome of a survey it had conducted among 300 factory managers in the electronics industry concerning their difficulties. A large percentage of the respondents confirmed that they found it difficult to carry out their duties, which the paper attributed in large part to the failure to realize enterprise self-management rights (Quoted in Fujimoto, 1987). The situation of the electronics industry in Shanghai could perhaps provide as a typical example. The Shanghai Municipal Communications and Measuring Equipment Bureau exercise tight control over the industry through its six industrial "corporations" --dealing respectively with radio and television, computers, vacuum tubes, electronics parts, semi-conductors, and electronic measuring equipment, all 130 enterprises or factories are subordinated to these six "corporations" which function as intermediate administrative bodies under the guidance of the municipal industrial bureau (Fujimoto, 1987). Within such a bureaucratic network, it is hard to imagine that individual enterprises can easily act at their own discretion.

The outcome of a survey of some large-and medium-sized enterprises in Beijing in 1986 discovered a similar situation, in which the "concern" of the administrative corporation, meant that the autonomy of enterprise in the financial and personnel areas exist only in name (Fujimoto, 1987). In the personnel area, some

factory directors were simply notified by their superior "corporations" of their decision to eliminate the right even to appoint medium-ranked staff. To dismiss staff or workers, directors had to seek "approval" from these "corporations". In the financial area, the right to decide the rate of profit reserves and the growth of overall wages was held by senior officials of the "corporations". The tradition of amassing a certain amount of funds from the subordinate enterprises put the "corporations" in the habit of soliciting funds from enterprises. It has been reported that enterprise autonomy in other spheres, such as planning, marketing, supplies and pricing has also often been shared by these "corporations". In some cases, for instance, the production quota in mandatory plans for products in short supply is raised at each administrative level while products in excessive supply are left to enterprise to sell on its own (Jiang, 1986; Fujimoto, 1987).

In 1990, the All-China Trade Union Association conducted a survey to examine the actual implementation of the State Enterprise Law. In the published results (ACTUA, 1990), enterprise rights were classified into eight large groups.¹³ Although the classification seems to be chaotic, and to contradict SEL provisions, it is still possible to understand current practice by analysing several interesting figures in the Survey results.

Of all surveyed enterprises, the percentages for the successful "basic implementation" of enterprise rights were: 76 percent of enterprises for both the right to use retained funds and the right to manage property; 70.3 percent of enterprises for production autonomy; 63 percent of enterprises for personnel arrangement and distribution of wages and bonus; 61 percent of enterprises for management autonomy; and 9 percent of enterprises for the right to refuse random appropriation. None of the surveyed enterprises was found to be able to enjoy the right to share foreign exchange revenue, to participate in economic associations, and to invest in other enterprises.

It is evident that enterprise autonomy granted by the central authorities has been constricted by government administrations at various levels and by new-established "corporations" of an administrative nature, which resort to all kinds of

¹³Ibid, p.24. In particular, it is unknown why the eleven kinds of enterprise rights as provided in the SEL were simply consolidated into eight.

measures in attempt to retain their previous powers and control as higher authorities of enterprises. As a result, many areas in which enterprise management should have considerable degree of freedom are still under the control of these authorities, especially the areas of personnel, financial affairs and pricing. A lack of sound external conditions, such as a full-fledged capital market, labour market and social security system, is also likely to restrict the enterprise autonomy to a certain extent. The right to dismiss workers, for example, can not exercised without misgivings due to the lack of a labour market and a social security system.

1.5.5 Recent Developments

The Chinese authorities are aware of the ineffective implementation of enterprise autonomy. In an attempt to revitalize large and medium-sized state enterprises, in May 1991 the State Council issued a circular¹⁴ calling for new measures to be implemented. Thus, state enterprises will be subject to less compulsory plans and may enjoy more autonomy in selling their products; some state enterprises may be authorised to carry out direct foreign trade. In particular, in order to reduce the burden on enterprises, government departments and other units have been told to stop illegal appropriation from enterprises. The new policy has been followed by many regional efforts to grant further autonomy to state enterprises.¹⁵

Since early 1992, state enterprises have been granted full autonomy in deciding on the wages for their workers and staff. In order to break "iron salaries", "iron bowls" (for workers and staff), and "iron chairs" (for cadres), government departments have been ordered to abolish all their previous rulings regarding the income distribution of enterprises under their jurisdiction. Enterprises will be allowed to, within the wage scale set by government authorities for urban workers,

¹⁴For the text in Chinese, see RMRB (People's Daily), May 30, 1991.

¹⁵For a report, see "Pilot Reforms to Revitalize State Enterprises", in BBC SWB, Oct.31, 1991, FE/1217, B2/4. According to this report, for example, the Shanghai Municipal Government has granted a number of state enterprises independent decision-making powers over many internal issues such as production planning, marketing, accounting, capital construction, technological upgrading, tax payment, employment, distribution and export.

autonomously set their salaries based on the success of their operation as well as the performance of individual workers.¹⁶

In the wake of a series of speeches made in early 1992 by Deng Xiaoping, China's paramount leader, on the need for bolder economic reforms and more rapid economic development, state enterprise reform has been proceeded with at a faster speed than was expected even in late 1991. This drive to reform seems much stronger than in 1988 when the SEL was adopted. At that time, a much more cautious approach was taken.

The most significant achievement in this on-going campaign has been the promulgation by the State Council on 23 July 1992 of "the Regulations for the Transformation of the Management Mechanism of State Industrial Enterprises" (hereinafter the "Regulations").¹⁷ Comprising a total of fifty-four articles, these Regulations cover, *inter alia*, the management rights and responsibilities of enterprises, the relationship between enterprises and government departments, and the legal liabilities of enterprises and relevant government departments.

The Regulations consolidate the management rights of State enterprises in fourteen areas.¹⁸ Compared to relevant SEL provisions, the Regulations not only reiterate the management rights conferred by the SEL, but also add a new right -- the right of investment in other enterprises. State enterprises can, in accordance with the law and the provisions of the State Council, invest in other enterprises, or even set up enterprises abroad, by using their retained funds, materials, land use rights, industrial property and non-patent technologies. The authorization of this right

¹⁶For a report, see "China Gives Enterprises Autonomy Over Wages", China Daily, Apr.14, 1992, p.1.

¹⁷For the text of these Regulations in Chinese, see RMRB (People's Daily), 25 July 1992. For the English text of the Regulations, see BBC SWB, Jul.29, 1992, FE/1445 C1/1-11.

¹⁸Arts.8-21. These rights include: decision-making concerning production, pricing for products and labour, the sale of products, purchase of products, import and export, investment, use of retained funds, disposal of assets, inter-enterprise economic cooperation and take-over, labour administration, personnel management, distribution of wages and bonuses, internal organisational structuring, and refusal of outside solicitation.

represents a new development towards a greater degree of enterprise autonomy as enterprises are allowed to make use of State-owned assets and earn profits.

The most notable feature of the Regulations is that the management rights enjoyed by enterprises are stipulated in great detail. Such detailed treatment is aimed at reducing the possibility that government departments abuse their authority and intervene in enterprise management. This can be seen in every provision regarding the powers of enterprises. For example, the SEL merely contains a brief provision about the right to dispose of assets and therefore did not clarify the scope of the assets that can be disposed by enterprises. The Regulations contain detailed provisions. Thus, in accordance with the needs of production and management, State enterprises may make their own decisions to lease, mortgage, or assign for value their ordinary fixed assets. State enterprises may also lease, or upon the approval from appropriate government departments, mortgage or assign for value their key equipment, whole sets of equipment or important construction works. Thus, the Regulations attempt to not only clarify the coverage of the assets which can be disposed of by enterprises, but also in fact expand this right by allowing enterprises to mortgage fixed assets which they do not own in the first place.

The Regulations also attempt to define both the authority and responsibilities of relevant government departments. Like the SEL, the Regulations attempt to define the role of government departments in accordance with the principle of separating government administration from enterprise management. On one hand, government departments continue to bear important responsibility for the administration of the economy and state enterprises; on the other hand, they are required to exercise macro control and provide services to the autonomous management of state enterprises.

Finally, in order to prevent enterprises from abusing their management rights, the Regulations have moved towards imposing more severe liability on enterprises and their directors. For example, while enterprises which suffer losses because of policy reasons or State plans may be immune from punishment, enterprises which make losses due to poor management have to face many liabilities. Such liabilities can be imposed on enterprise directors, other enterprise leaders, and even workers.

Since early 1992, in an attempt to revive the ailing State sector of the economy, the Chinese authorities have been committed to developing a "socialist

market economy".¹⁹ State enterprises are to be "pushed" to the market place and forced to compete with enterprises of non-state ownership types. If this move is to succeed, state enterprises will experience many significant changes.

One of our aims in this study is to assess the changes in the area of enterprise autonomy from an agency perspective. It is hoped that this analysis can generate insights into the problems of fundamental nature with the state-enterprise relationship in China. Before we describe the Chinese reward systems in detail and analyze them in a properly established framework, we shall first review Western studies into the motivational problem in a centrally planned economy in the next chapter. These studies, known as "the bonus literature", provide some useful concepts and models of the managerial motivation problem existing in the planning environment.

¹⁹Although the call for forcing enterprises to the market was made even in 1991, the nature and role of this movement was not clearly defined. In particular, it was debated within China whether a market economy was socialist or capitalist in nature. In early 1992, Deng Xiaoping initiated a new era of economic reform in which the market economy is described as compatible with either socialist or capitalist economies.

CHAPTER 2
MANAGERIAL INCENTIVES IN A CENTRALLY
PLANNED ECONOMY

2.1 Introduction

This Chapter and the next review Western literature relevant to our analysis of Chinese reward systems. In this Chapter, we focus on the theoretical discussion in the West on managerial incentive problems in a centrally planned economy (CPE). This literature, prevalently based on observations on past Soviet practice, builds a number of models to analyze managerial incentive problems existing in centrally planned economies, especially since the Soviet and East European reforms of the 1960s and 1970s. As can be seen later on, this research highlights some important points and provides a modelling framework which is both relevant and helpful to our analysis. The relevance stems primarily from the fact that the Chinese economy, at least that of the pre-reform period, belongs to the class of centrally planned or socialist economies.¹

Western research on socialist economics can be said to be initiated by the well-known Socialist Controversy (or "Socialist Calculation Debate") starting with von Mises' challenge to central planning in 1920s. One of the arguments raised in the debate has been that the central planner in a socialist economy would be faced with information and motivational problems in carrying out economic calculation and resource allocation (von Mises, 1936). The problems were said to be created principally by the lack of a price system, which is regarded as "the way in which the

¹A centrally planned economy (CPE) can be roughly defined as an economy in which the state owns the means of production and makes major economic decisions by means of central planning. However, there is no generally agreed definition of a CPE, since the term "centralization" can be understood in various terms, such as of information possession and of decision-making authority (Bennett, 1989, p.1).

incentive to act on information accompanies the information that is transmitted" (Friedman, 1984), which simply means that prices in a market economy can automatically serve as the carrier of both information that firms need and incentives for responding to the information. Despite the market versus central planning debate, central planning was extensively practised in the former Soviet Union, most other Eastern European countries, and is still practised in a modified and limited fashion, in the People's Republic of China. As a result, there has been a renewed interest among Western economists in analysing various theoretic aspects of the practices, creating an extensive literature and models of the managerial behaviour in a CPE. The Western economists' interest in the topic has also been greatly enhanced by the understanding that many of the problems which beset the central planner in a CPE have their analogues in the central management of a large divisionalized Western company (Hurwitz, 1968; Loeb and Magat, 1978a). Among other concerns, the issue of managerial incentives embodied in the problems of information elicitation and effort inducement has been a main theme of the literature.

The review below begins with a brief review of the major arguments relevant to our concerns that were raised in the Socialist Controversy. This review is a quite terse abstract of arguments and statements without explanations and analysis. The purpose is to provide some historical background of the topic of this thesis. From section three on, various models and concepts of the Soviet firm will be presented, followed by the discussion of aspects of new models since the 1960s Soviet economic reforms, particularly the New Soviet Incentive Model(NSIM). In the latter context, the behaviour of the firm will be considered first in static terms with certainty. Issue of effort, uncertainty, and of the dynamic (multi-period) problem are added in the later part of the Chapter. During the review, much attention will be paid to the methodological and technical aspect of the literature while the question regarding appropriateness and correctness of conclusions is largely deemphasized (some aspects of the NSIM will be considered later in the agency context in Chapters 6, 7 and 9). Moreover, the relevance of the literature (referred to as the "bonus literature" in the later chapters) to the Chinese analysis will not be directly addressed in this Chapter and will be left, as will criticisms of the literature, to Chapters 6 and 7.

2.2 Markets versus Central Planning

This section is a short review of the historical development of the theory of central planning. It serves as an introduction to the origin of the theme of this thesis: information, incentives, and central planning. As the scope of the debate on markets versus central planning is wide, we do not intend to focus on detailed and balanced discussion. Moreover, many arguments and statements in this section are presented without explanations and justifications. However, because of their relevance to our analysis, they will be considered in detail later on in other contexts.

Using plans in place of markets as the major mechanism of resource allocation was first suggested around the turn of this century by Pareto (1897) and others. The Socialist Controversy since 1920s was induced largely by argumentation on the possibility of using a planning device to allocate resources rationally in a centrally planned economy. More specifically, the planning device in question was the simultaneous equations approach formulated by Barone (1908). In this approach, a set of simultaneous equations, equivalents of supply and demand functions for planned goods, were formulated and to be solved by the planner. In theory, resources can be allocated in this way as rationally as by the use of a price system. Except for the obvious computational difficulty,² the main problems involved in the simultaneous equations approach were argued to be non-revelation of information and the need to provide incentives (Hayek, 1935, 1945), both of which lie at the heart of this thesis.

2.2.1 The Beauty and Imperfectness of Markets

Critics of central planning tend to emphasize the "beauty" of a price system and certain theoretical merits of a market economy. For example, Friedman (1984) identifies three functions of prices, ie. transmitting information, providing incentives, and distributing income. First, through prices, buyers are informed of the relative

²In a later article, Lange (1967) argues that, with the emergence of computers, centralized calculation becomes both feasible and necessary. By comparing the market and computer, he believes that a computer has "the undoubted advantage of much greater speed, ... does not produce fluctuations in real economic processes and the convergence of its iteration is assured by its very condition".

scarcity of resources consumed in production and sellers know the demands of consumers. Second, prices carry incentive "for people to adopt the least costly methods of production and to use available resources for most highly valued uses"(Friedman, 1984). Third, income is distributed through a price system which links incentive with rewards. In addition to this linkage, "the real beauty" of a price system, according to Friedman, is its ability to link incentive with information, that is, prices carry both information and incentive. Moreover, in its perfect form, prices equal marginal cost at minimum average cost, and all markets can then be cleared through prices in a natural and automatic fashion. So, in the utopia of a perfect market economy, Pareto-optimal resource allocations can be achieved along with a high level of economic efficiency.

In the real world, a "perfect" market economy as described above may not have existed. Market failure, for example, disrupts the absolute economic efficiency offered by perfect markets by upsetting the relationships among demand, price, and supply; monopolistic elements such as monopoly, monopolistic competition and oligopoly mean that prices not necessarily equal marginal cost, and therefore generate allocative inefficiency (Cowling and Mueller, 1978). Moreover, behavioral theories and more recently organizational and agency theories suggest that managerial slack or discretion means some possibly important deviations from profit-maximizing behaviour at the firm level (Tirole, 1988). The use of market mechanism as a solution to informational and motivational problems at the firm level may also be criticized from the transaction-cost point of view. As market transactions are not free and are associated with transaction costs, market functions may be greatly limited within the firm because of the nature of the firm. Coase (1937) points out that the purpose of forming the firm is to avoid market transactions and associated costs and to replace the market by an entrepreneur who co-ordinates production. He states that "the distinguishing mark of the firm is the suppression of the price mechanism" (p.389). Williamson (1975) makes a similar point and argues that organizations benefit by absorbing externalities and use of "in-house" specialists and internal labour markets. Recent research has suggested that within firms agency problems are pervasive and

agency costs occur because of information asymmetry.³ The existence of agency problems in Western firms prompts alternative mechanism and organizational designs. It also highlights a limitation of a price system in dealing with intrafirm allocation problems, which embody a number of "in-house" information and incentive issues.

2.2.2 Market Socialism

Advocates of central planning attempt to replace a price and free market system with central plans (including rules, instructions, and directives from the centre) as information carriers and coordination devices. In theory, when the central planner is perfectly informed about conditions and performance at the enterprise level, perfect plans and directives can be structured and they can achieve Pareto optimality as can a perfect market system. Here, the functions performed by a free market can be perfectly performed by a set of government rules and controls (Tinbergen, 1964). Moreover, perfectly designed plans can rule out possibility of market failure at the macro level and complete information gives no rise to agency problems at the enterprise level, which result from incompleteness and asymmetric distribution of information.

This utopian model of perfect central planning is as improbable as the utopia of perfect markets. Clearly, costless, complete information in the model is the most important but an unrealistic assumption. It is also open to question whether the planner can actually motivate enterprises to carry out the directives from the centre to the letter and fulfil the plan targets to the degree desired by the planner. In view of the apparent information and motivational problem in the above model, there have been proposals which try to defend central planning by modifying the model, prevalently with introduction of elements of price and market mechanisms into the planning system. The so-called socialist market economy, or market socialism,

³Broadly speaking, an agency relationship exists when one individual's payoffs depend on the action of another. The individual taking the action is called the agent and the other the principal. When the principal cannot perfectly and costlessly monitor the agent's action, the agency problem arises and the problems of inducement and enforcement come to the fore (Pratt and Zeckhauser, 1984). A more detailed discussion of agency relationship can be found in chapter 3 of this thesis.

represents the mainstream of revised model of central planning.⁴ In principle, market socialism is a combination of market mechanism and socialist ideology, as it is featured by public ownership, limited inequality in income distribution with the use of markets and prices to allocate resources and goods (Bornstein, 1979). Recent debate over market and planning has been largely focused on the pros and cons of market socialism.

The first blueprints for market socialism originated in response to the argument of some prominent economists in the 1920s that rational economic calculation and thus efficient allocation of resources were in principle impossible in a socialist economy. The view was that economic calculation is only possible using money prices, which are inseparable from the market established on basis of private ownership of the means of production (von Mises, 1936). Moreover, it was argued that "artificial" markets in socialism cannot successfully replace the true markets of capitalism in pricing producer goods so as to use them most effectively. Oskar Lange (1936, 1937) and Abba P. Lerner (1934, 1937), on the other hand, refuted the above conclusions and developed their own models of market socialism. In Lange's model, the prices of consumer goods and services are determined by market forces, while a Central Planning Board attempts by trial and error to fix prices for producer goods which equate supply and demand. In Lerner's model, prices of both consumer goods and producer goods are determined by the interplay of the supply and demand in the markets. Given these "parametric" prices, enterprise managers make production decisions according to two broad rules. First, they must combine factors of production so as to minimize the average cost of production for any output. Second, they must set output at the level where marginal cost equals the price. In combination, these two rules secure the most economical production of the optimum

⁴It is interesting to note that all economic reforms in centrally planned economies in the real world involve introduction of more market elements. This has certainly been the case in China. Recent Chinese reform efforts have been officially directed to developing a socialist market economy in China (Jiang, 1992). According to official reasoning, markets should not be exclusively linked with capitalism and can be adapted anywhere regardless of political system. The proposed model of Chinese socialist market economy bears a strong resemblance to the Lerner Model reviewed below.

output.

The Lange-Lerner Model as described above and other similar proposals (see, for example, Le Grand and Estrin, 1989) met with many criticisms from various perspectives. Hayek (1940), for example, doubts that the "parametric" prices set by the Central Planning Board can in fact be market-clearing prices which equalize supply and demand. He points out that problems of managerial responsibility, initiative, risk-bearing, and incentives are simply ignored in the market socialist blueprints, which leave it open to question whether the proposals appear practicable and superior to a market economy and even to authoritarian socialism.

A number of critics point to the theoretical contradictions existing in the logic of market socialism. Roberts (1971) argues that the models of Lange-type are only effort at market simulation, and they are not relevant to theory of socialist planning itself. He further points out (a) the Lange model is rooted in market organization of the economy, as demonstrated by Lange's use of the marginal rule, which is in contradiction to the hierarchic requirements of central planning; and (b) the Lange model is almost a model of publicly owned firms operating according to the market principles that it was the purpose of socialism to abolish. Friedman (1984) recently adds to the critique of the Lange-Lerner model from the stand point of property rights and using examples of socialist countries. He believes that the functioning of competitive private enterprise cannot be duplicated in an economy where property rights are held by the State. In such a society, problems arise in the areas of managerial behaviour, incentive, responsibility, and of performance monitoring.

The problems arise out of asserted incompatibility of socialist doctrine with market (de Jasay, 1990). Two aspects of the incompatibility are identified. First, "genuine market exchanges presuppose among other things a plurality of principals owning goods to be exchanged, and having dissimilar preferences or expectations." (ibid.) When the State is the sole owner of the assets to be exchanged, it can best organise exchanges between its right hand and its left hand. Moreover, from the perspective of the theory of property rights, it is suggested that managers of publicly owned enterprises "neither would nor could successfully simulate capitalist responses and reproduce the market processes and the resource transfers they induce". Second, markets derive their efficiency from the fact that there are winners and losers, risk-

takers and bankruptcies, entrepreneurs and uncertainty. The socialist end-state egalitarian ethic seeks to avoid losses and losers and therefore certainly dilutes the motivational implications of market forces and destroy the alleged efficiency of using markets.

It seems that the theme of the counter-Lange arguments has been impossibility of using market-based mechanisms efficiently, at least as efficiently as in a pure market economy, in a socialist economy where public ownership and central planning are dominant. While the problem remains unsolved and the controversy still goes on, one of the major problems with the predominant argument seems to be that it prevalently and implicitly compares the practical deficiencies of the existing models of central planning in selected countries with a quasi-perfect market (Nove, 1984), but not with the real-world market systems. When public ownership and central planning are criticized, the real-world imperfections of existing market systems such as externalities, monopoly, unemployment and inflation, and market failures seem to have been evaded or ignored. Another problem with the prevailing arguments against market socialism has been that critics base their arguments on certain preconception about socialism or central planning that might have nothing to do with the real-world practice. The incompatibility of market and socialist doctrine is one of the principal statements that need reexamination if the concept of socialism is revised.⁵ As will be seen later, problems of managerial motivation and information asymmetry equally exist in modern capitalist divisionalized firms, where the manager is not necessarily the owner. To a certain extent, motivational and information problems may have a remote connection to the type of ownership where ownership and management are separated. Rather, the separation of ownership and management, which is common to both capitalist firms and reformed socialist firms, is the main cause of the problems.

Market socialism of Lange-type does not exist in the real world, as Buck

⁵Currently in China, the incompatibility of market and socialism is being challenged with the official effort to develop a socialist market economy. The view is that socialism is compatible with market (RMRB, 15 February 1992). This compatibility is, of course, achievable with the revised version of socialism, or in Chinese term, the socialism with Chinese characteristics.

(1982) indicated. In a purely theoretical terms, neither more centralized systems as practised in former Soviet Union and pre-reform China nor more decentralized system as previously practised in former Yugoslavia can provide empirical ground for the Lange model. The Yugoslav model, however, has conventionally been treated as an example of market socialism, while models of former Soviet Union and of pre-reform China are treated as examples of centralized planning and control or are labelled in the Western literature as command economies or centrally planned socialism. In the latter case, a rigid central planning and control system was adopted, with the central planner being in charge of major economic decisions. Through the State Planning Commission and the industrial ministries, the State determined for each enterprise what it would produce, undertook to provide it with the necessary materials and took its output all at state prices. An immediate question one would ask is how the central planner sorted out the information and motivational problem at the enterprise level. There has existed in the West a rich literature which attempts to model and analyze, with available Western approaches and analytical techniques, enterprise behaviour under this centralized economic system especially in the former Soviet context. In the following sections, selected analyses relevant to our interest are critically presented.

2.3 A Classical Model of the Pre-reform Soviet Firm

This section is the starting point for presenting the Western models of the centrally planned firm. In this section, we introduce some early work in this sphere, largely on the Soviet firm prior to the Soviet reform in 1960s. The basic assumptions underlying this analysis are first listed and followed by a short discussion on managerial objectives in the Soviet firm. A simple model of the firm is then presented.

2.3.1 General Assumptions

Since Ames' work on the Soviet firm was published in 1965,⁶ his analytical

⁶Ames, E., Soviet Economic Processes, Homewood, Ill.: Irwin, 1965. Ames' model was regarded as the first model of the Soviet firm (Gindin, 1970).

methodology and modelling approach have been followed by a number of writers in this area. In these studies, some common basic assumptions regarding to the Soviet firm and environment of modelling have been made explicitly or implicitly. They include:

1. Each firm is run by a single manager who is assumed to behave in a self-interested fashion (Bennett, 1989, p.66; Buck, 1982, p.49). This, of course, does not mean that firms may not be exhorted by the centre to operate in some common interest, but self-interested behaviour is generally assumed (Buck, 1982).

2. Individual managers are assumed to aim to maximize their utility or expected utility over some specified period (Bennett, 1989). The utility function normally contains individual income (normally bonus income where salary income is fixed) as a positive argument; effort may also be included as a negative argument.

3. There exists information asymmetry between the central planner and managers (Freixas, Guesnerie & Tirole, 1985). The manager is assumed to possess more complete information as to production potential, the specificity of the production process and technology in his firm and he has discretion as to what information to pass on to the centre.⁷

4. The central planner can influence managerial behaviour by choosing the form of bonus function and the values of its parameters. "It is assumed that the aims of the planner are to obtain from each firm input-output information which is as accurate as possible (to facilitate the co-ordination of production activity in the aggregate) and to encourage as high a level of productive performance as possible" (Bennett, 1989, pp.66-67).

5. The manager's effort is observed by the planner through performance indicators, and his bonus income is made dependent on these indicators in the bonus function. A performance indicator should have the property that the manager is

⁷ For the sake of convenience of presentation and distinction, we shall use "he" to refer to "the manager" and "she" to "the planner" throughout this thesis. "The planner" may be taken as a group of people who perform functions of central planning and control on behalf of the state or whole society.

motivated to maximize the performance evaluator(s) and to send accurate information regarding to his performance (Loeb & Magat, 1978).

Based on these general assumptions, a number of models have been developed in attempt to describe objectives and behaviour of the Soviet firm. Among them, Ames (1965) and Portes (1969) represent early attempts in the area of modelling socialist firm. Before we consider these models, a brief review of the Western analysis and description of the Soviet management control system may be helpful, because the models to be reviewed have been primarily developed based on the understanding of management objectives and behaviour.

2.3.2 Managerial Objectives

The Soviet management control system prior to the 1965 reform was documented and analyzed in Nove (1958), Ames (1965), and Portes (1969), among others. Nove's following description of Soviet performance evaluation and incentive system seems to be representative. In the two-tier institutional structure, the planner seeks to stimulate plant managers to achieve efficiency. This can be done by rewarding "desirable" behaviour, either in cash or in increased esteem, improved chances of promotion, the issue of Orders of Lenin, or other forms of incentive. These rewards, in their turn, must be associated with some definable achievements. Moreover, the manager must know in advance what he must do to qualify for rewards. Therefore it becomes necessary to define so called "success indicators" (in Russian, *pokazateli*) under various desired heads, such as volume of output, reduction in costs, labour productivity, and so on (Nove, 1958, p.2).

From this description, one may note the multi-criterion and multi-incentive characteristic of the Soviet system. In the area of performance evaluation, the manager was required to meet numerous targets, in both production and financial terms, determined by the centre (Horwitz, 1968). But writers normally pick up some of them and ignore others in the model-building process, not only for the sake of simplification, but more significantly some indicators are considered dominant the major variables in the manager's utility function. Among them, production volume was regarded as the number one objective for the Soviet firm (ibid; Buck, 1982;

Portes, 1969). Buck (1982) attributes this dominant position of output in a CPE to the fact that fixed prices cannot achieve the matching of supply and demand for all products and the central planner has to use instead *ex ante* "materials balancing" calculations to achieve equilibrium. In these circumstances, firms are expected to ensure the fulfilment of production targets assigned to them which are supposed to have been coordinated, and the planner will be reluctant to tolerate underfulfilment of planned output and she may therefore be prepared to pay incentives on all target and above-target production. This assertion seems to be consistent with Portes' observations that gross value of output has been pre-eminent among the indices, "in all Eastern European countries at almost all times" (Portes, 1969, p.198). On these grounds, the output was regarded as the most important indicator in early model-building efforts (eg. Portes, 1969).

Profit is another important indicator. Nove (1958) observes that firms were encouraged to make profits in the Soviet Union, and derive material advantages from so doing. For example, the "enterprise fund", which was the main source for funds for housing and amenities, for the payments of bonuses, and for reinvestment, was created using the profit, particularly the above-target profit, made by the firm. But profit in the Soviet economy was of arbitrary and distorted nature due to "the absence of any objective criterion for price-fixing, and the lack of any logical relationship between prices, profits and the desired assortment of production" (Nove, 1958). A reward related to profits therefore failed to reflect real efficiency. As a result, profit did not serve as the dominant "success indicator" to which the operations of Soviet enterprises could be geared (*ibid.*). Profit has been considered, however, by some model-builders as a complementary objective (Ames, 1965) or simply a constraint (Portes, 1969), because of its presumed importance.⁸

In most models, the incentive for the manager is assumed exclusively to be monetary income (bonus), while other potential rewards, mainly non-monetary

⁸According to Bennett (1989), combinations of the following success indicators are commonly modelled: profit, profitability (the ratio of profit to some measure of the size of the operations) and sales or output. Other indicators are also used, especially for modelling firms after reform, for example, a combination of output, profit, profit-cost ratio, and profit per worker is used in Liu (1982).

incentives, are ignored. The reason for this simplification was not stated, but presumably was due to difficulties in quantifying these non-monetary factors and the comparatively less significant roles played by these factors in affecting manager's behaviour. In the circumstances where the manager is motivated primarily by higher income, the simplicity of this single motivation assumption should not distort greatly the validity of the conclusions.⁹

2.3.3 Ames' Model of the Soviet Firm

A classical model of the Soviet firm was developed by Ames (1965) in the simplified single-motivation context. He assumes that incentives are paid to the manager so that the manager's utility function (U) depends upon the weight (α) given to output (x) and the weight ($1-\alpha$) to profit (π). Let $C(x)$ denote cost and p price of the output, then $\pi = px - C(x)$. The manager is assumed to choose x to

$$\begin{aligned} &\text{maximize} && U = \alpha x + (1-\alpha)\pi \quad (0 \leq \alpha \leq 1) \\ &\text{subject to} && \pi \geq 0 \end{aligned} \quad (2-1)$$

By substituting $\pi = px - C(x)$ into (2-1), we have

$$\begin{aligned} U &= \alpha x + (1-\alpha)(px - C) \\ &= \alpha x + (1-\alpha)px - (1-\alpha)C \end{aligned}$$

For maximum U :

$$\frac{dU}{dx} = 0 = \alpha + (1-\alpha)p - \frac{(1-\alpha)dC}{dx}$$

where dC/dx is marginal cost (MC). Then we have

$$MC = p + \alpha/(1-\alpha) \quad (2-2)$$

⁹In certain circumstances where monetary incentives are very limited or subordinate, non-monetary incentives may become major motivations for the manager. The conclusions drawn on the basis of the single motivation assumption should be reexamined in this case. For a detailed discussion in Chinese context, see Chapters 8-10.

This relationship is illustrated in Fig. 2.1, where AC is average cost. Fig.2.1 shows that if $\alpha = 0$ the firm becomes a profit maximizer, producing x_0 . The firm does this by equalizing marginal cost (MC) to the price (p). If $\alpha = 1$ the firm will seek to maximize output subject to a zero-profit constraint, producing x_2 . At that level of output, average cost (AC) equals the price (p). x_1 represents the Ames' equilibrium where $0 < \alpha < 1$, and x_3 the optimal output when p is set at p_0 , the lowest level of average cost.

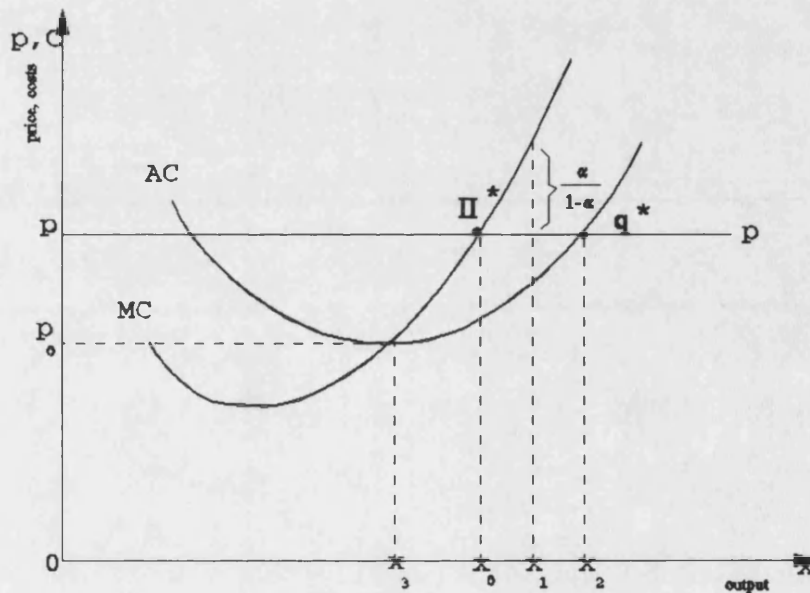


Fig. 2.1 Ames' Model of the Soviet Firm

Ames' model represents a simplified case in which the central planner tries to motivate the firm to maximize output (subject to a profit constraint) by controlling α . By adjusting the value of α , the planner can also provide some compensation against frequently misleading nature of the rigid price system. If the planner believes, for instance, that the price system undervalues the output of a firm relative to its inputs, formulation (2-1) gives her a means, by setting a positive α , of making correction (Bennett, 1989). Ames' model correctly considers the somewhat conflicting roles and relative importance of trade-off nature of output and profit in the Soviet economy. The model, however, "sacrifices inclusion of key aspects of the Soviet

firm" (Gindin, 1970). One of the aspects omitted in the model is the potential interdependence of plan targets and performance levels in succeeding periods and interaction between the planner and the firm. This problem, often referred as the dynamic incentive problem or "the ratchet", seems to be a universally essential part of the incentive issue in a socialist economy. It has been considered by a number of writers, whose views are to be reviewed in a later section. In the following section, we look at potential interaction between the planner and the manager in terms of the plan tautness.

2.4 Managerial Effort and the Tautness of Plans

It was indicated in the previous section that the fulfilment of central plans may play an important role in determining managerial bonuses in a centrally planned firm. As to the use of plans, it is assumed that the planner may use plans to stimulate managerial effort; she would also like each firm to at least fulfil its plan targets so as to facilitate the planner's co-ordination of activity throughout the economy (Bennett, 1989, p.73). The tautness of plans, which is relevant to both of the points, becomes an important element in optimal planning system and in a management incentive system in which plan fulfilment has an important weight.

The term "tautness" is used to describe the relative difficulty of plan targets that imposed on the firm. A plan is regarded as more taut if the target level is raised and therefore becomes more difficult to achieve. A more taut (or less slack) plan requires more effort to achieve. It can thus be expected to induce more managerial effort. However, if disutility of managerial effort is allowed, a taut plan may appear too difficult to achieve, resulting in underfulfilment of plan. This underfulfilment is undesirable if the planner wishes to use plans as a coordination device. The degree of tautness is thus an important concept if plans are used both to stimulate managerial effort and to coordinate the economic activities across firms.

2.4.1 Optimum Tautness of Plans

The earliest treatment of the topic of tautness is believed to be given by Hunter (1961), who expresses tautness as a relationship between planned increases

and achieved increases in output. He regards a production plan as taut if it puts the target in a zone which can only be reached with a great deal of effort and as slack if the target can be so easily fulfilled that overfulfillment is assured. The concept of optimum tautness depends on both effort and possibility of fulfilment. It is assumed that higher plan targets can inspire greater effort, resulting in higher levels of performance. But targets which are too high may defeat their own ends and eventually bring about a reduction in output. "Consequently, there exists some optimum target which elicits maximum output, a target which stretches production possibilities tautly but not too tautly. This is the target of optimum tautness" (Keren, 1972).

Hunter's (1961) concepts are illustrated in Fig. 2.2 by the curve *H*. Target increases (\hat{q}) are plotted along the x-axis and actual increases (q) along the y-axis. The 45° line shows the exact fulfilment of planned targets: planned production equals

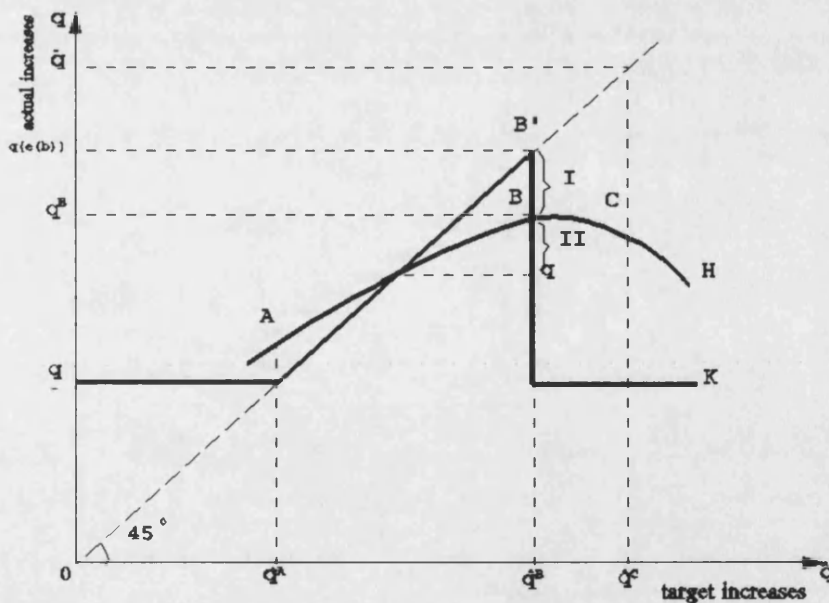


Fig. 2.2 Optimum Tautness of Plans

actual output ($q = \hat{q}$). Points above the line represent overfulfilled plans, those below it underfulfilled plans. When the plan is slack (eg. $\hat{q} = \hat{q}^A$) and requires little or no effort to fulfil, overfulfillment is very likely. Bennett (1989) assumes this might be due to altruism, pride or a concern for career prospects. By assumption, as the plan

becomes taut (but not too taut), q will increase due to the stimulating effects of a taut plan: more effort is extracted and "hidden reserves" uncovered, provided that the manager's gains from making greater effort outweigh the presumed losses. If targets are set too high, however, say at \hat{q}^c , the manager will feel discouraged and dysfunctional forces becomes dominant. As shown in Fig. 2.2, optimum plan targets should be increased up to \hat{q}^b , at which "losses from overtautness exactly match the estimated gains from ambitions target increases" ($I=II$) (Hunter, 1961). The point B therefore represents the optimum tautness point, where although there exist dysfunctional forces, their negative influence can be offset by the level of the gains that justify them.

A similar analysis is conducted by Keren (1972), who models a Soviet bonus system used prior to the 1964 reforms. The manager is assumed to choose effort e to maximize his utility function $U(Y,e)$ where Y is total income and

$$Y = \begin{cases} y + B & q \geq \hat{q} \\ y & q < \hat{q} \end{cases}, \quad (2-3)$$

where y is the basic income, B is the bonus.¹⁰ It is also assumed that all elements on which production depends are constant except the level of effort (e):

$$q = q(e) \quad (2-4)$$

where $q' > 0$ and $q'' < 0$.

As shown by the broken line K in Fig. 2.2, Keren's analysis indicates that when the target is not above the minimum quantity ($\hat{q} \leq \hat{q}^*$), the manager will produce output q with the minimum exertion ($q(0) = q > 0$). When the target is raised above the minimum, but still in the feasible range ($q < \hat{q} \leq \bar{q} < \infty$), the manager's choice depends on his judgement as to whether the value of the gains, B ,

¹⁰Keren (1972) indicates the function examined here is a simplified one, while a function like $Y = y + B + a(q-\hat{q})$, for $q > \hat{q}$, seems more exact. But this involves complex "ratchet effect", which is to be examined in a later section.

is not outweighed by disutility of the effort required for it, i.e. $U(B, e(\hat{q})) > U(0,0)$, where $e(\hat{q})$ denotes the effort required for fulfilling the target \hat{q} . If the value of the gains is greater, the target will be fulfilled, because the bonus can justify additional effort. This situation can continue until the target reaches \hat{q}^B . Targets above that level will lead the manager to believe either that the bonus is not worth his effort or that he can only waste efforts without any hope of obtaining extra income, the output will then return to its minimum, q . The target level \hat{q}^B therefore indicates the optimum tautness of plan.

The most notable difference between the Hunter and Keren curves in Fig. 2.2 is that the H curve and its maxima do not coincide with the 45° line, while the K angular line and its maxima do coincide with the line. An implication of the shape of the H curve is that the relationship between disutility of effort and earning of bonus is not linear. There is no reason, therefore, why the H curve maxima should lie on the 45° line: it may lie on either side (Bennett, 1989, p.74). The coincidence of the K curve with the 45° line between \hat{q}^A and \hat{q}^B only occurs when B can be earned with certainty provided the corresponding effort is exerted. When uncertainty is considered, i.e., when q function appears in form of $q = q(e + \theta)$, when θ is a random variable representing uncertainty to the manager, the maxima is reached where the expected disutility of the marginal increment of effort equals the expected utility which would accrue from it. The maxima on this curve may lie on either side of the 45° line.

The above models provide a framework within which one aspect of managerial behaviour can be explained: the trade-off between disutility of effort and earning of bonuses. As will be seen in Chapter 3, this analysis is very similar to the agency model, in which the agent makes action decisions by evaluating utility of gains against disutility of effort. The above models also provide a formal, though very simplified, presentation of the characterization of the optimum tautness. They are, however, of limited use for practical purposes. One difficulty would be, as Keren himself points out, that the information requirements for setting an optimum target can hardly be met:

In order to fix the optimum target the planner must have an intimate knowledge of production possibilities and the tastes and beliefs of the

manager, and perhaps also of other key employees in each enterprise. If, in addition, knowledge of production possibilities depends on information received from the managerial staff, the optimum target becomes very difficult to approach. They can consequently never be sure that they have reached the optimum and may often be tempted to overshoot (Keren, 1972. P.482).

2.4.2 The Information Revelation Problem

The possibility of the planner's being misinformed by the manager is further analyzed by Bennett (1989), who uses the "classical" Soviet bonus system before the 1965 reforms as an illustration. His bonus scheme is expressed as

$$B = \begin{cases} c + d(q - \hat{q}) & \text{if } q \geq \hat{q} \quad (d \geq 0) \\ 0 & \text{if } q < \hat{q} \end{cases}, \quad (2-5)$$

where c and d are constant (in Keren's model, $d=0$). With a single-period time horizon, the manager may wish to maximize q in order to maximize $(q - \hat{q})$, because additional bonuses can only be earned by overfulfillment. However, if the time horizon is extended to allow the plan to reflect interaction between the planner and the manager, (2-5) gives the manager an incentive to understate production possibilities, in order to get a lower target in the future. This problem, known as the ratchet principle, will be further examined in section 6 of this Chapter.

To overcome the understatement problem involved in (2-5), one option is to design a scheme in which high output itself, in addition to target fulfilment, is rewarded. Leeman (1970) designs a model which incorporates this idea. The model is written as

$$B = \begin{cases} aq - b(q - \hat{q})^k & \text{if } q \leq \hat{q} \\ a[q - 2(q - \hat{q})] - b(q - \hat{q})^k & \text{if } q > \hat{q} \end{cases}, \quad (2-6)$$

where a , b and k are positive and constants. The first term on the right hand rewards the manager for size of output, and the second penalizes him for deviations from the plan. (2-6) can, as Leeman claims, produce desirable results if the planner and the

manager have similar risk preferences. If they are all risk-takers, a taut plan may be adopted and the manager has no reason to understate production capacity, for example. If they diverge in risk preference, the problem will remain. In this case, Leeman (1970) amends (2-6) to

$$B = \begin{cases} aq^j - b(q-\hat{q})^k & \text{if } q \leq \hat{q} \\ a[q - 2(q-\hat{q})]^j - b(q-\hat{q})^k & \text{if } q > \hat{q} \end{cases}, \quad (2-7)$$

where $j > 1$. Under this scheme, the reward per unit of output rises with volume and compensates the manager for the risk that he will be penalized for underfulfilment, provided that j is well specified. The manager is thus less inclined to conceal his capacity and to try for a slack plan.

In a comment on Leeman, Ellman (1973) analyzes the Soviet reform scheme announced in 1965. He observes that an important feature of the reform was the transition from incentives for plan fulfilment and overfulfillment to incentives for adopting a taut plan. The scheme was formulated as

$$B = c\hat{q} - kd(\hat{q} - q) \quad (c, d, k > 0) \quad (2-8)$$

$$\text{and } 0 < k < 1 \quad \text{if } q > \hat{q} \quad (2-8a)$$

$$k > 1 \quad \text{if } q < \hat{q} \quad (2-8b)$$

The first term of (2-8) provides an incentive to adopt a high plan. The second term together with (2-8a) ensures that an increase in the plan provides a greater bonus than overfulfillment of the plan by the same amount, and therefore provides an incentive to adopt a taut plan. Even with this theoretically sound scheme, as Ellman observes, Soviet firms still adopted slack plans. This is said to be due to a number of factors such as the uncertainty and disutility of effort, which were not considered in both the Leeman and Ellman schemes. The ineffectiveness had led to a new bonus scheme, known as the New Soviet Incentive Model in the West, in 1970s.

2.5 The New Soviet Incentive Model

2.5.1 The Basic Model

The New Soviet Incentive System launched in 1971 was another attempt to counter the built-in tendency for the manager to underreport his firm's potential in seeking low assignments. The most interesting innovation in the new system is the idea of making the bonus depend on both performance of fulfilling the target and the target level itself. Weitzman (1976) gives the first Western theoretical analysis of the new Soviet model. The basic ideas of the model are presented as follows.

The planning process is composed of three stages. In the first stage, the planner, based on her own best knowledge, assign to the firm a tentative target \bar{q} and a tentative bonus \bar{B} associated with \bar{q} . A set of bonus coefficients α , β and δ are also stated. In the second stage, the manager chooses a plan target \hat{q} , which is communicated to the planner, with a corresponding planned bonus in mind:

$$\hat{B} = \bar{B} + \beta(\hat{q} - \bar{q}). \quad (2-9)$$

The actual amount of bonus can only be determined in the third stage, when the actual performance q is available. The bonus is in the following form:

$$B = \begin{cases} \hat{B} + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \\ \hat{B} - \delta(\hat{q} - q) & \text{if } q < \hat{q} \end{cases}, \quad (2-10)$$

combining (2-9) and (2-10) we have

$$B = \begin{cases} \bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \\ \bar{B} + \beta(\hat{q} - \bar{q}) - \delta(\hat{q} - q) & \text{if } q < \hat{q} \end{cases}, \quad (2-11)$$

where the constants α , β and δ must be so set that

$$0 < \alpha < \beta < \delta \quad (2-12)$$

in order to produce desirable incentive effects.

Fig.2.3 illustrates the model. The bonus line, kinked at $q = \hat{q}$, has a slope α

when $q > \hat{q}$ and a slope δ when $q < \hat{q}$. Suppose the initial target is set at \bar{q} with the bonus of \bar{B} , and the firm chooses target \hat{q} , at which exact fulfilment will yield a bonus \hat{B} . The firm does so by weighting the gains from setting a higher target than the proposed target against the possible penalties if the new target is not fulfilled. If at the end q_1 is reached, fulfilment will win the firm a bonus $\alpha(q_1 - \hat{q})$ in addition to \hat{B} ; if q_2 is turned out, \hat{B} will be subject to a reduction $\delta(\hat{q} - q_2)$ for underfulfilment.

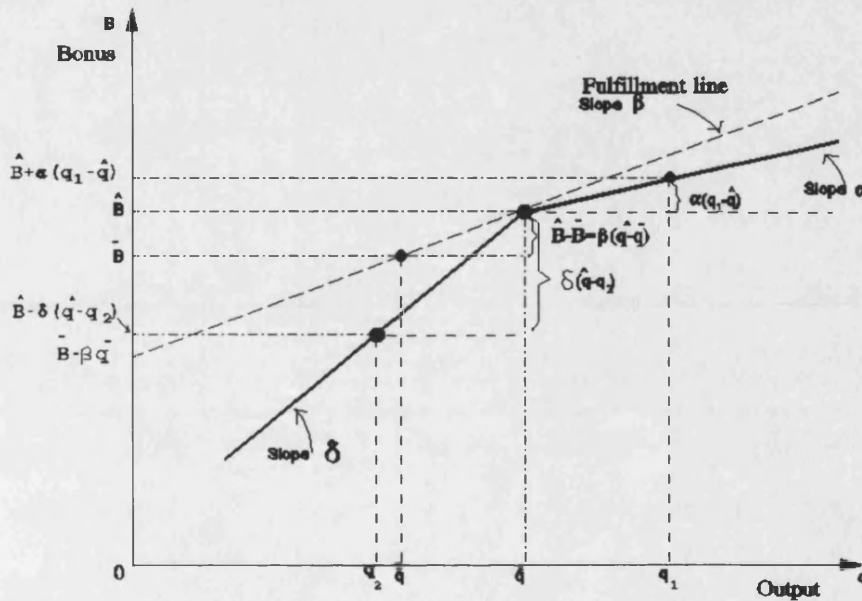


Fig. 2.3 The New Soviet Incentive Model

According to the model, for given values of \bar{q} , \bar{B} , α , β , and δ , the manager is assumed to choose \hat{q} and q to maximize B . Weitzman (1976) shows that in the case of perfect certainty for the firm, i.e., if the manager knows for sure how much q can be produced, he will always get the maximum bonus by setting \hat{q} equal to that value. This indicates that the model gives the manager an incentive to be truthful in revealing the production capacity.

If uncertainty in production performance is considered, the manager is assumed to choose \hat{q} to maximize the expected bonus $E(B)$:

$$\begin{aligned}
 E(B) = & \int_{-\infty}^{\hat{q}} [\bar{B} + \beta(\hat{q} - \bar{q}) + \delta(q - \hat{q})] f(q) dq \\
 & + \int_{\hat{q}}^{\infty} [\bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q})] f(q) dq,
 \end{aligned}
 \tag{2-13}$$

where $f(q)$ is the probability density function of q . The first-order condition of (2-13) can be calculated as:

$$P(q \geq \bar{q}) = \int_{\bar{q}}^{\infty} f(q) dq = \frac{\delta - \beta}{\delta - \alpha}, \quad (2-14)$$

which shows that the optimal self-selected target is such that the probability of plan fulfilment is the ratio of the difference in the coefficients $(\delta - \beta)/(\delta - \alpha)$. This property allows the planner to obtain required information from the manager by manipulating the coefficients and their relations. If, for example, the planner would like to know the median level of q , for which there is equal chance of underfulfilment and of overfulfilment, the coefficients can be set as such that $(\delta - \beta)/(\delta - \alpha) = 1/2$. Similarly, the planner can induce relatively slack plan target by raising α , lowering β , or raising δ . A relatively taut plan target can be stimulated by the planner's doing the opposite.

2.5.2 Criticisms and Extensions

2.5.2.1 The NSIM in the context of resource allocation.

The above analysis demonstrates a desirable property of the NSIM. That is, it can elicit production information from the firm under certain circumstances. This conclusion was drawn in a simplified situation where the information from the firm is used by the planner in such a way that it will not affect the firm's measured performance. If, however, this is not true, some studies have shown that the information property of the NSIM will disappear (Loeb and Magat, 1978a; 1978b; Conn, 1979). In such a case, it is shown that a firm can reap individual benefits by not sending a truthful forecast, to the overall detriment of the economy. Given that all other firms hold to their strategies of sending truthful forecasts, any individual firm can benefit from sending a biased forecast.

Consider an economy consisting of n firms and a central planner. The planner is to allocate total amount of capital available in the economy K to the firms and \bar{K}_i represents the firm i 's allocated capital from the planner. It is obvious that the resource allocation is constrained by

$$\sum_{i=1}^n \bar{K}_i \leq K. \quad (2-15)$$

When the firm's effort level is not considered as a decision variable (it will be considered later), each firm produces an output q_i according to a production function $q_i(k_i, \theta_i)$, where θ denotes a stochastic variable for which the density function is known to the firm in advance but not to the planner. Assume that the planner's problem is to allocate capital to maximize the sum of expected outputs, basing her calculations on the expected production functions reported by the firms ($q_i^*(\bullet)$). That is, the planner chooses $\bar{K}_1, \bar{K}_2, \dots, \bar{K}_n$ such that $\bar{K}_1, \bar{K}_2, \dots, \bar{K}_n$

$$\text{maximize} \quad \sum_{i=1}^n q_i^*(\bar{K}_i) \quad (2-16)$$

$$\text{subject to} \quad \sum_{i=1}^n \bar{K}_i \leq K$$

$$\text{and} \quad \bar{K}_i \geq 0 \quad (i=1, 2, \dots, n)$$

In this context, we rewrite the NSIM presented by (2-10) as:

$$B_j = \begin{cases} \hat{B}_j + \alpha_j [q_j - q_j^*(\bar{K}_j)] & \text{if } q_j \geq q_j^* \\ \hat{B}_j + \delta_j [q_j^*(\bar{K}_j) - q_j] & \text{if } q_j < q_j^* \end{cases}, \quad (2-17)$$

where \hat{B}_j , α_j and δ_j are parameters set by the planner and $0 < \alpha_j < \delta_j$. In this formulation, the presence of $q_j^*(\bar{K}_j)$ indicates the contingency of the target on the capital allocation. Under this scheme, the manager may be induced to send biased forecast. Bennett (1989) uses Fig. 2.4 to illustrate the possibility that the manager is better off reporting falsely. Suppose the firm's output can be raised by using more capital but constant effort and productivity. When the manager reports truthfully, the functions $q_j(\bullet)$ and $q_j^*(\bullet)$ are the same: $q_j = q_j^*$. The output target $q_j(\bar{K}_j)$ is set with allocated \bar{K}_j and the bonus function I would apply with the bonus being B_j^t .

If, however, the manager reports a biased function $q_j^*(\bullet)$ in which the marginal

productivity of capital is overstated, the planner may allocate an higher amount of

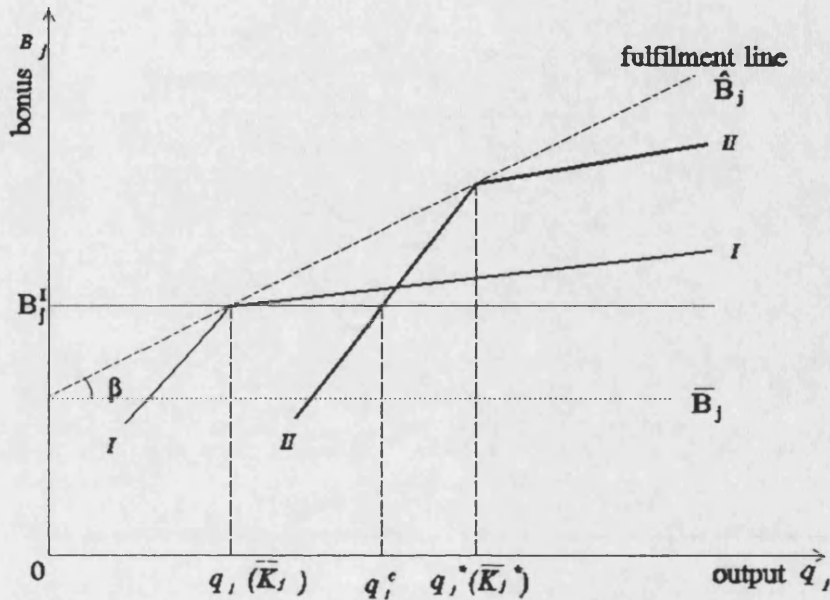


Fig. 2.4 Resource Allocation in the NSIM

capital \bar{K}_j^* to firm j , where $\bar{K}_j^* > \bar{K}_j$. Output target $q_j^*(\bar{K}_j^*)$ will be higher than $q_j(\bar{K}_j)$ and the bonus function II will apply. The actual output q_j may be below the target q_j^* provided other elements are unchanged but should be higher than $q_j(\bar{K}_j)$ because of a larger capital input, that is, $q_j(\bar{K}_j) < q_j < q_j^*(\bar{K}_j^*)$. There exist possibilities that the manager gets a higher bonus with this q_j . Particularly, if $q_j > q_j^c$, then $B_j > B_j^I$, and the bonus for the manager is greater than that resulted from truth-telling B_j^I . The manager gains by simply deviating from the "truth".

Conn (1979) makes a similar statement, saying that, with resource allocation decisions, it is impossible for an elicitation scheme (like Weitzman's) to be an optimal incentive structure. But his statement is made in the context that elicitation schemes can be used to obtain more reliable information, but at a cost of inefficient resource allocation. In Conn's analysis, an elicitation scheme cannot be an optimal incentive structure if it rewards the manager on the basis of only his own output, as far as optimal resource allocation is concerned. When the rewards for the manager are made

contingent on his self-imposed targets and simultaneously resource allocation depend on, to a certain degree, these self-imposed targets, the accuracy of self-imposed targets as forecasts might be reduced, the allocation of resources even worsen.

In analysing the limitations of Weitzman's model, Conn (1979) further points out that a crucial assumption underlying the model is that the manager is an expected-reward maximizer. This assumption may appear less realistic when such factors as (1) risk aversion, (2) disutility of effort, and (3) direct utility from output size or input utilization are considered. He observes, for example, that Soviet managers by and large keep the initial, centrally proposed target \bar{q} as their self-selected target \hat{q} . Several reasons are suggested for this phenomenon. The manager might be loath to lower their target owing to career considerations. Risks and the effort involved may also prevent him or her from raising the target. Finally, the planner might already have tried to preempt anticipated target increases so as to restrain managerial rewards.

2.5.2.2 Variable effort and the NSIM.

In the basic model of new Soviet incentive, managerial effort was assumed to be constant, the manager's objective being to maximize bonus by selecting a target and trying to fulfil it. It was indicated that if effort has no disutility and no uncertainty affect production, the manager will select as a target the maximum possible performance level and try to fulfil it (assuming the manager has a one-period time horizon). If we consider the variability of effort, or assume that effort has disutility, the incentive problem embodied in the NSIM becomes a typical agency problem, which will be considered in details in Chapter 3.

Consideration of variable effort in the context of NSIM is included initially in Weitzman (1976) and later on in Snowberger (1977), Miller and Thornton (1978), and Bonin and Marcus (1979). The variability of effort induces the manager to weigh the disutility of each possible increment of effort against the associated gain from bonus. By the assumption, neither the manager's effort nor his utility function can be observed or inferred by the planner. The planner can, however, induce the manager to behave desirably by appropriately altering the parameters of the model, just as in

the case of constant effort, provided that she knows how effort affects output and how the changes in parameters influence the manager's choice of targets. In this literature it is assumed that effort $e (\geq 0)$ has a disutility $Z(e)$ to the manager, and $Z \geq 0$, $Z' > 0$ and $Z'' > 0$. In the case of certainty, the manager is expected to choose the plan \hat{q} and effort e to maximize $(B - Z(e))$. \hat{q} will then be set at the level of q that will be achieved, which is same as in the Weitzman model, while the choice of e fulfils the first-order condition

$$Z'(e) = \beta u'(e), \quad (2-17)$$

where $u(e)$ is the utility function of bonus gain from e , and $u'(e) > 0$ and $u''(e) < 0$, (2-17) indicates that optimal level of e is where, given that exact fulfilment will occur, its marginal disutility will equal the marginal bonus gain (Bennett, 1989, p.83).

In the case of uncertainty, a stochastic variable θ , which affects performance additively, is added to the performance function:

$$q = u(e) + \theta, \quad (2-18)$$

where θ has the maximum and minimum possible values $\bar{\theta}$ and $\underline{\theta}$ but its value is not known to the manager until he selects \hat{q} . Thus, the manager first of all has to choose \hat{q} based on the expected value of q . Then he observes θ . The choice of optimal e will depend on both the observed value of θ and \hat{q} already chosen, in accordance with the principle of equating the marginal disutility of effort and the bonus gain from marginal increase in effort. If the observed θ indicates that the expected value of q differs from the target \hat{q} , the manager may alter the level of effort during the time he tries to fulfil the target.

Three possibilities are explored in Miller & Thornton (1978) and illustrated in Fig. 2.5. The function $G(e) + \theta$ describes the output level achievable with various levels of effort with an observed θ . The function $G(e) + \bar{\theta}$, for example, describes the output for various levels of effort when $\theta = \bar{\theta}$, the upper limit of θ . If the target chosen by the manager is \hat{q} , then $ABCD$ in the figure indicates the locus of points that

the manager will choose according to the following rules. (1) $\theta \leq \theta_s$. In this case, the observed θ is so low that extending enough effort to reach the target would not maximize the net bonus. The manager would then choose as the level of effort e_δ , where $Z'(e_\delta) = \delta u'(e_\delta)$, and the target would be underfulfilled. The effort-output

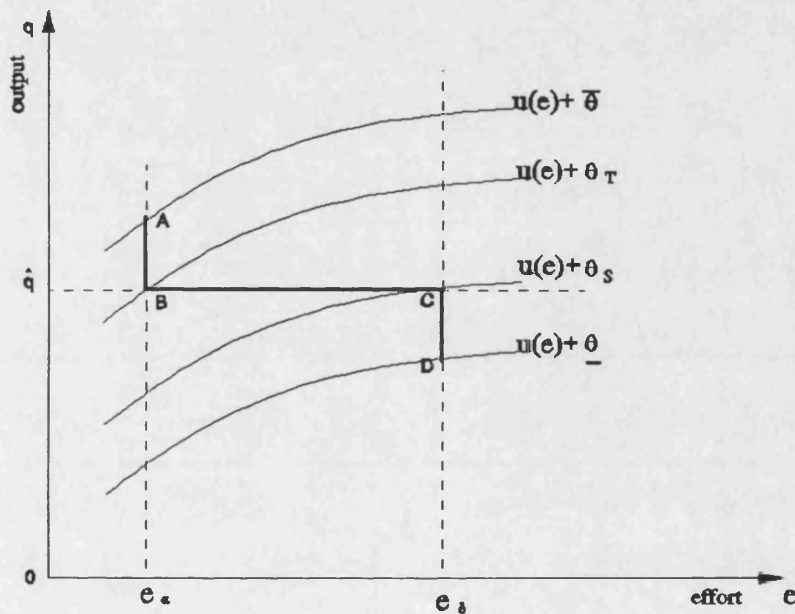


Fig. 2.5 Miller-Thornton Model of Effort and Uncertainty

function would lie below the function $u(e) + \theta_s$, and output would fall short of \hat{q} by the range (C-D). (2) In the case of $\theta \geq \theta_T$, the observed θ may be so high that maximizing the bonus would result in a level of effort which would cause output to exceed the target. e_α would be chosen, where $Z'(e_\alpha) = \alpha u'(e_\alpha)$, and output would exceed the target \hat{q} by the range (A-B) when $\theta > \theta_T$. (3) If $\theta_T > \theta > \theta_s$, the level of output would equal the target at a level of effort different from either e_δ or e_α . The level of effort which maximizes the bonus is such that the target will be fulfilled and $\alpha u'(e_\alpha) \leq Z'(e) \leq \delta u'(e_\delta)$. The optimal level of e can be determined by $u^{-1}(\hat{q} - \theta)$. Such is the way the manager selects optimal e on the basis of chosen \hat{q} and observed θ .

In the presence of uncertainty and disutility of effort, the manager's problem can be formulated as to select the target and afterward the level of effort to maximize

the expected bonus net of the disutility of the optimum level of effort. That is,

$$\underset{\hat{q}}{\text{maximize}} E[B - Z], \quad (2-19)$$

$$\text{subject to } e^* = e^*(\hat{q}, \theta). \quad (2-20)$$

Under the NSIM and in the cases previously discussed, the expected net bonus is

$$\begin{aligned} E(B) &= \int_{\underline{\theta}}^{\theta_s} [\bar{B} + \beta(\hat{q} - \bar{q}) + \delta(q - \hat{q}) - Z(e_\delta)] f(\theta) d\theta \\ &+ \int_{\theta_s}^{\theta_r} [\bar{B} + \beta(\hat{q} - \bar{q}) - Z(G^{-1}(\hat{q} - \theta))] f(\theta) d\theta \\ &+ \int_{\theta_r}^{\bar{\theta}} [\bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q}) - Z(e_\alpha)] f(\theta) d\theta \end{aligned} \quad (2-21)$$

Differentiating (2-21) with respect to \hat{q} and setting the equation equal to zero yields:

$$\begin{aligned} \beta &= \int_{\underline{\theta}}^{\theta_s} \delta f(\theta) d\theta + \int_{\theta_s}^{\theta_r} [Z'(G^{-1}(\hat{q} - \theta)) (\partial(G^{-1}(\hat{q} - \theta)) / \partial \hat{q})] f(\theta) d\theta \\ &+ \int_{\theta_r}^{\bar{\theta}} \alpha f(\theta) d\theta, \end{aligned} \quad (2-22)$$

which is equivalent to

$$\beta = E[Z'(G^{-1}(\hat{q} - \theta)) (\partial(G^{-1}(\hat{q} - \theta)) / \partial \hat{q})]. \quad (2-23)$$

The value of β in (2-23) is the expected marginal disutility of the effort required to fulfil the target \hat{q} . The manager can select the appropriate target by balancing the expected marginal disutility and the marginal benefit of increasing the target. After observing θ , he can select the optimum effort e^* according to the rules described in the previous paragraph. Having solved the problem, Miller and Thornton conclude that incorporating effort into the analysis does not alter Weitzman's conclusion that the new Soviet incentive scheme encourages the manager to reveal accurately what he expects to achieve.

As will be seen, this analysis is very much alike the principal-agent model, in

which the agent (the manager) makes his effort decision using the same marginal rule. The agency model goes further to explore the interaction between effort and uncertainty by considering risk preferences of the both individuals. The revelation problem in the context of resource allocation and uncertainty is another complicated topic that requires further investigation. Both of these topics will be addressed later on in the agency context. In the last major section of this Chapter, we shall briefly look at the NSIM in a multi-period context and introduce the much discussed concept in this context, the ratchet principle.

2.6 The Ratchet Principle and Dynamic Incentive Issue

The previous sections deal basically with the static incentive problems, in which the manager is assumed to have a one-period time horizon. The possibility of interaction between the planner and the manager, the relationship between the target in a given period and the firm's previous levels of performance are ignored. The use of current performance as a partial basis for setting future targets is observed to be an almost universal feature of economic planning (Weitzman, 1980). The term "ratchet principle" was first coined by Berliner (1957) to describe the practice by the planner, when a best-ever level of performance has been achieved by the firm in period t , of raising the $t+1$ target at least as high as this level. "Planning from the achieved level" (PFAL) is an analogous term. The operation of the ratchet creates a dynamic incentive problem for the planner and managers. "In such situations, agents face a dynamic trade off between present rewards from better current performance and future losses from the assignment of higher targets" (ibid.). Since this sort of problem characterizes the planning process in a CPE, where the relationship between the planner and the firm is typically repeated over periods, the incentive implications should not be overlooked. This section concentrates on this problem and reviews relevant literature which offers analyses of and solutions to the problem especially in the CPE context.

The rationale of the ratchet principle stems from the framework of asymmetric information within which central planning of production is usually performed. The

firm in general has more information about its productive potentials than the planner. The planner therefore has to rely on some rule of thumb, using the firm's previous, actual performance as a major source of information on the firm. The tendency of adjusting upward targets for the future induces the firm to restrict current performance to some extent to try and avoid relatively taut future targets (Bennett, 1989). The ratchet effect is analysed by a number of writers, including Gindin (1970), Yunker (1973), Murrell (1979), Weitzman (1980), Snowberger (1977, 1979), Liu (1982), Holmstrom (1982), Keren *et al.* (1983), and Freixas *et al.* (1985).

Gindin (1970) develops a formal model to analyse the interdependence of the outputs of different time periods. In his model, the manager is assumed to choose optimal output level to maximize his utility:

$$U = f(B, \hat{q}_{t+1}, \hat{q}_t), \quad (2-23)$$

where B is the lump-sum bonus for achieving the current target \hat{q}_t plus the bonus for overfulfilment $b(q_t - \hat{q}_t)$ ($b > 0$). The new target \hat{q}_{t+1} is assumed to be set somewhere between the current target and the actual output (q_t):

$$\hat{q}_{t+1} = \hat{q}_t + r(q_t - \hat{q}_t) \quad (0 \leq r \leq 1). \quad (2-24)$$

This indicates that, if period t performance equals the target, the new target for period $t+1$ will be unchanged but that, for every unit that performance exceeds (or fall short of) the current target, the new target will be raised (or lowered) by r units, r therefore signals the strength of the ratchet. Current performance (q_t) represents a source of utility through the current bonus as well as one of disutility since it can make future bonuses more difficult to achieve.

The above relationships are shown in Fig. 2.6. In Fig. 2.6, the future target function is shown as a linear mark-up (r) on $(q_t - \hat{q}_t)$. The U indifference curves represent the utility function, which combines the utility of higher bonuses and disutility of higher new targets. The lower the curve, the higher the utility associated with the curve ($U_3 > U_2 > U_1$). The trade-offs between the utility of increased bonus and disutility of raised new target occurs in the region $(q_t > \hat{q}_t)$ (shadowed in Fig. 2.6). In this region, the bonus rises at a constant rate b , but the disutility from the new

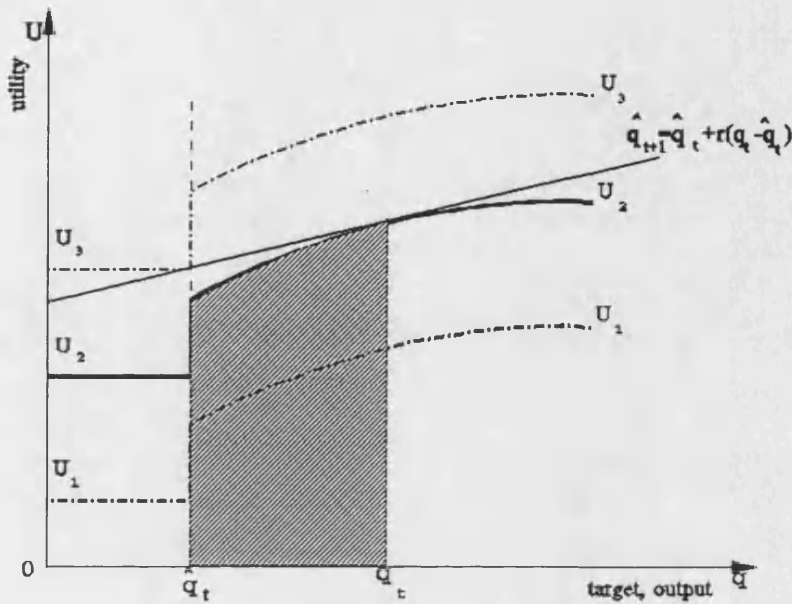


Fig. 2.6 The Ratchet Principle

targets rises at an increasing rate (Weitzman (1980) reveals this rate, see below). In the case shown in Fig. 2.6, the firm would choose output (q_t) as the level which attains the lowest indifference curve (U_2), given the future target line; i.e. tangency to U_2 represents an optimum and equilibrium output for the firm. If, however, there were no such interdependence between the current performance and future targets, the firm would produce as much as it can to achieve maximum bonus provided these were no other limits or considerations.

Weitzman (1980) adds a parameter μ to (2-24) and assumes that r and μ are independently distributed random variables whose realized values are not known to the firm even in the future period. It is assumed that the firm chooses q_t to maximize

$$U = B_t - Z_t(q_t, \epsilon_t), \tag{2-25}$$

where Z_t is net disutility mainly from the current performance q_t , ϵ_t is a stochastic parameter characterizing cost or technological conditions of the firm in the period t , and it is known at time t but uncertain before. Within a multiperiod framework, the period discount rate used by the manager is denoted i . The factor $1/(1+i)$ therefore transforms the next period's gains into this period's. Weitzman's conclusion shows

that the optimal output level in period t, q_t^* occurs where

$$Z'_t(q_t^*, e_t) = \frac{b}{1+r/i}, \quad (2-26)$$

which indicates that optimal output level for the firm is reached where the realized marginal disutility equals the marginal bonus gain adjusted by the term $(1+r/i)$. Note that as either $r \rightarrow 0$ or $i \rightarrow \infty$, the right hand of (2-26), which Weitzman calls "ratchet price", $p^r \rightarrow b$, the ratchet effect is diminishing.

Keren et al (1983) use a different formulation of the ratchet and bonus function and reach different conclusions. In their analysis, the ratchet is modelled as

$$\hat{q}_{t+1} = \hat{q}_t + hq_t \quad (0 \leq h \leq 1). \quad (2-27)$$

This formulation excludes the possibility of reducing the target over time, which is implied in Gindin's and Weitzman's models. The bonus function used in Keren et al's analysis is written as

$$B = \begin{cases} b(q_t - \hat{q}_t) + \bar{B} & \text{if } q_t \geq \hat{q}_t \\ b(q_t - \hat{q}_t) & \text{if } q_t < \hat{q}_t \end{cases} \quad (2-28)$$

The manager is assumed to select the optimum level of output in each period to maximize the present value of the expected bonuses. In the two-period setting used as an illustration by Keren et al, the future targets beyond the period $(t+1)$ are irrelevant to the manager. The manager will therefore always choose to operate at capacity during the terminal period $(t+1)$ to achieve maximum bonus, regardless of how q_t has affected q_{t+1} and how it will affect q_{t+2} . In the period t , however, the manager faces the trade off between a higher B_t and the future costs of a lower expected B_{t+1} . He is assumed to maximize $B_t + E(B_{t+1})/(1+i)$. The analysis shows that three output levels in period t might be optimum, depending on the circumstances, if the manager is either very lucky or very unlucky in that the firm capacity during the period is very large or so small that normal optimal output level q_t^* is unattainable, he will choose to operate at full capacity maximizing the present

value of B_t and expected bonus B_{t+1} . Otherwise, operating at less than capacity as q_t^* , at which the marginal net benefit of higher current output equals the marginal cost, or the target becomes the optimum. This implies two important points. First, the ratchet does not always have an adverse effect by causing the manager to select an output level less than capacity. Second, the manager is always willing to achieve a feasible target in order to earn the basic bonus. These conclusions appear different from Weitzman's. Bennett (1989) considers three factors which might explain the disparity: Weitzman's exclusion of capacity constraints and his inclusion of the disutility of effort and of an infinite time horizon. If these factors are considered, the differences in the two analyses become less significant.

The ratchet in the context of the New Soviet Incentive Model was analyzed initially by Snowberger (1977). In his formulation, the parameters α , β , δ and \bar{B} are assumed to be relatively constant over time and the ratchet principle is applied to the planner's adjustments of tentative target \bar{q} :

$$\bar{q}_{t+1} = \bar{q}_t + r(q_t - \bar{q}_t) \quad (0 \leq r \leq 1), \quad (2-29)$$

where r is assumed constant and known to the manager. In a two-period case, the manager wishes to select \hat{q}_1 and q_1 so as to maximize the utility function

$$U = U(B_1, \bar{q}_2) \quad (U_{B_1} > 0, U_{\bar{q}_2} < 0, U_{B_1 B_1} < 0, U_{\bar{q}_2 \bar{q}_2} < 0), \quad (2-30)$$

where \bar{q}_2 is assumed to affect the utility level negatively, because the higher \bar{q}_2 is, the more difficult it is for the firm to overfulfil it to be rewarded more than underfulfilment. It can be seen that a higher value of \bar{q}_2 is equivalent to a lump-sum reduction in period 2 bonus B_2 . According to (2-29), the present choice of \hat{q}_1 does not affect \bar{q}_2 , the manager, for the similar reasons as in the static environment, will set $\hat{q}_1 = q_1$. So the problem reduces to selecting the optimal q_1 to reach maximization of (2-30). It is calculated that

$$-\frac{U_{q_2}(B_1, \bar{q}_2)}{U_{B_1}(B_1, \bar{q}_2)} = \frac{\beta}{r}, \quad (2-31)$$

which indicates that the firm will raise q_t to the point where the marginal gain in U via the current bonus is just offset by the marginal loss of U resulting from the reduction in future bonuses because of increased \bar{q}_2 . Because $\partial q_t / \partial r < 0$, if $(q_t - \bar{q}_t) > 0$, the greater r is, the lower q_t the firm will choose.

The Miller and Thornton (1978) analysis also shows that under the new Soviet incentive system, the ratchet discourages the manager from operating his firm at full capacity. It also further complicates the selection of the values of the parameters of the incentive system. Basing on simple assumptions, they indicate, however, that if the perceived strength of the ratchet is not very strong, the ratchet does not affect accuracy of signalling what the manager expects to produce by the targets selected by the manager. Holmstrom (1982) argues that the ratchet could play a positive role if the planner allow appropriate adjustments in parameter values. Bennett (1989) demonstrates this idea by rewriting the tentative bonus function for period $(t+1)$ as

$$\bar{B}_{t+1} = \bar{B}_t + \beta(\bar{q}_{t+1} - \bar{q}_t) . \quad (2-32)$$

This function makes the intercept of the period $(t+1)$ fulfilment line refer to Fig. 2.3 unchanged at $\bar{B}_t - \bar{q}_t$. The bonus earned in period $(t+1)$ would not be affected by the tentative target \bar{q}_{t+1} set via the ratchet mechanism. The informational properties of the new incentive model would not be affected but potential adverse effect of the ratchet on q_t could be avoided. Bennett (1989) also mentions that after the 1971 reform, it was intended that the tentative targets for an entire five-year plan period would be set in advance. This could reduce the ratchet to the minimum during the five year period, albeit the ratchet could nonetheless operate at the beginnings of each five year period, when the tentative targets are determined.

2.7 Summary

Problems of information and incentives seem to exist, but to different extent, in every economy. In a centrally planned economy, while certain market deficiencies can be avoided, information transmission and incentive provision may create problems for the planner in using planning as a device of resource allocation on a large scale,

especially when the economy is huge. Recognition of these problems initiated the Socialist controversy in the early part of this century. It seems beyond argument that the difficulties involved in planning would be greatly increased if a price and market mechanism were totally replaced by the planner's activities. In modified models of central planning, Large and Lerner proposed that certain element of a market mechanism be retained in a centrally planned economy. Those elements are expected to reduce information and calculation demands set on the planner. Critics of the model, point out that the functioning of a price system can not be duplicated in a socialist economy where property rights are held by the state and the end-state equalitarian ethic is dominant. In particular, problems of managerial incentives, initiative, and risk-sharing, which are supposed to be resolved "automatically" by the price mechanism in a market economy¹¹, may become sources of inefficiency in a centrally planned economy.

Centrally planned economies in the real world, headed by the former Soviet Union, were shaped differently from the idea of Large-Lerner market socialism. Market prices were largely replaced by the government's commands and directives. The resulting informational and motivational concerns prompted a large literature in the West which studied the mechanism design problem and enterprise behaviour in a centrally planned economy, especially in the former Soviet Union.

Early efforts to model the Soviet firm focused on discussion of the objective(s) of the manager and of the planner (centre). Modelling the firm's objective seems a natural starting point for the literature, as the objective(s) of a centrally controlled firm is not as obvious as that of a Western firm. Moreover, only when the objective function of the firm is identified can further analysis of other aspects of managerial behaviour proceed. Earlier analyses assumed that objectives of the centre were the same as or very similar to that of the firm. In those models, the centre can set the firm to maximize its objectives without worrying about incentive problems. Different objectives, asymmetric information, and therefore incentives did not enter the analyses.

¹¹This Neoclassical triumph has been challenged by some recent research especially in organization studies. See the "Introduction" of the following chapter.

The 1965 Soviet reforms marked the recognition of independent interests of the firm and of the importance of incentives. More elaborate models of the firm's objective function based on the reform scheme appeared in the literature. Management's bonus function or reward function became the centre of analyses. The incentive problem is examined in the context of interaction between the planner and the manager. More important factors, such as managerial effort, information asymmetry, and ratchet effect, entered analyses, and provided a number of insights into the functioning of the Soviet planning and incentive system. One of the issues examined extensively in the literature has been tautness of central plans and optimum plan targets, which highlights the problem of information inducing in planning process.

The Weitzman's (1976) analysis of the New Soviet Incentive Model launched in 1971 suggests some new topics for the bonus literature. Particularly interesting is the information property of the new scheme, in which the bonus for the manager increases with both performance and the target level that was initially chosen by the manager himself. This property of the new scheme was believed to be able to provide the manager the incentives to report truthfully in the planning process. The contingency of bonus on the final output also prompted the manager to exert the right level of effort to fulfil targets. The manipulation of the values of the parameters in the bonus function allowed the planner to stimulate desirable information and effort from the manager. However, it is argued that the above favourable properties of the new system were due to some simplifying assumptions which did not conform to the reality observed in the Soviet Union. In particular, it is argued that if the information from the firm is used for the purpose of resource allocation and if the managerial effort is assumed variable and to generate disutility to the manager, the new scheme may induce the firm to send biased forecasts by the self-selected targets.

The New Soviet Incentive Model was also examined in an uncertain environment and extended to multi-period dynamic situations, where the ratchet principle was believed to be applying. The ratchet effect reflects the existence of information asymmetry between the manager and the centre and the planner's tendency to rely on the firm's past performance as a source of information. The effect of the ratchet on the manager's choice of effort level was analyzed by a number of

writers using the discounting technique. With regard to the effect on the manager's information strategy, several authors argued that the ratchet does not necessarily have an adverse effect on accuracy of the manager's signalling in the planning process. Some of these arguments in the context of Chinese reward systems, will be examined in the agency framework later in this thesis.

CHAPTER 3

AGENCY THEORY: A LITERATURE REVIEW

3.1 Introduction

The Western analysis of a centrally planned economy, which was briefly reviewed in Chapter 2, has been in terms of interaction between the central planner and her subordinates, firm managers. In this literature, both sides are assumed to have their own utility functions, which they seek to maximize. In designing a planning framework, a principal consideration of the centre has been to provide the managers with incentives to choose an action course so that they act in accordance with the centre's interests. The expected responses and reactions from the managers are considered by the centre in designing an incentive scheme. Information and effort issues are also given consideration in the literature.

An alternative approach to the managerial motivation problem in a centrally controlled economy is to regard the relationship between the planner and the manager as a non-cooperative game.¹ This allows the use of formal game-theoretic models in treatment of motivational problems that arise from information asymmetry. Along this line, agency research has so far generated some helpful results. In agency, the principal hires an agent who is intended to provide effort to generate pay-off or/and information to facilitate the principal's decision-making. In the case of effort provision, if the effort level supplied by the agent can be perfectly observed by the principal, then the agent can be appropriately motivated by an effort-based compensation contract. However, when perfect observation is not possible due to the nature of effort itself or/and the environment in which the agent operates, the

¹In a non-cooperative game, one, or both, of the following conditions hold: (1) there exists information asymmetry between the players, or (2) the players do not co-operate nor attempt to reach, or cannot enforce, agreements (Atkinson, 1987). Information asymmetry prevails in our setting, hence the non-cooperative game.

principal has to rely on some surrogate, such as output, other than the agent's actual effort level as the basis for contracting. The use of an imperfect substitute for actual action indicators creates incentives for the agent to shirk and may result in a welfare loss for the both parties. This motivational problem resulting from imperfect observation is normally referred to as the problem of moral hazard.² The problem of moral hazard may also arise when the agent gains private information on the moves of Nature, which are not observed by the principal, before he chooses the level of effort (but after the contract is accepted). In this case, as output signals are distorted by the moves of Nature, the principal cannot judge the agent's effort level perfectly by looking at the output. In the cases where the agent's private information is gained before a contract is agreed upon, the problem becomes that of adverse selection. In adverse selection models, information is not only asymmetric but also incomplete, as Nature moves first without awareness of the principal and before the principal offers a contract.³

One area of agency research which has yielded many insights into the structure

²The use of the terms "moral hazard" and "adverse selection" in the agency literature is far from consistent and sometimes is a source of confusion. Rasmusen (1989) classifies asymmetric information models into five categories: a) moral hazard with hidden actions, b) moral hazard with hidden information, c) adverse selection, d) signalling, and e) screening. Basically, these five categories can be grouped into two: moral hazard (including a) and b)) and adverse selection (including c),d), and e)), since according to Rasmusen, signalling and screening are special cases of adverse selection (p.134). Moral hazard models differ from adverse selection in that in moral hazard information is complete while in adverse selection information is incomplete. Here by incomplete information we mean that at the time when the players in a game choose their strategies for playing the game, they have different private information about this preferences and abilities (Myerson, 1985). They can also be distinguished by the terms *ex post* (post-contract) information asymmetry and *ex ante* (pre-contract) information asymmetry. This thesis only considers broad classes of moral hazard and adverse selection. More detailed discussion on information issues can be found in section 3.5 of this chapter.

³As noted in Footnote 2, the definitions of these terms are not well established in the literature. In particular, what is referred to as moral hazard with hidden information here is called adverse selection by a number of writers (see, for example, Baiman, 1982). For this reason, we would like to try to avoid the use of these two terms in later chapters. If they are used, except in quotations and explained otherwise, their definitions are as referred to Footnote 2 of this chapter.

and nature of organizations has been concerned with the design of an incentive system or contract in a business setting. In the archetypal principal-agent model, the principal is the owner(s) of a business or higher management of a hierarchical organization and the agent is the business manager or lower management in a hierarchy. The structure of the game consists of the principal's design of managerial reward system, and information system, the subordinate managerial production decision, and performance appraisal and payment to the manager.

This game structure leads us to a tentative idea that the agency models may facilitate the analysis of incentive problems in a centrally planned economy, which can be basically described as a hierarchy. In this Chapter, a brief discussion of the agency model highlights the theme of and basic tools used in the agency research and provides a basic language we shall use in the later part of the thesis. The basic principal-agent model will be first presented, followed by a discussion of the first-order approach. Information considerations will be the main concern in the third section. Finally, some criticisms and extensions of the basic model will be considered.

3.2 The Basic Principal-Agent Model

Generally speaking, agency theory deals with situations in which one party (known as the principal) hires another party (known as the agent) to act on behalf of the principal and in return for some kind of payment.⁴ A typical example of this type of contractual relationships most studied in economic literature has been a manager running a firm on behalf of its shareholders. In a standard setting, some general assumptions are made. These include: (1) All relevant parties are assumed to be motivated solely by self-interest. That is, each individual's choices are endogenously

⁴Baiman (1990) identifies three branches of agency literature: the principal-agent literature, the transaction cost economic literature, and the Rochester literature. Strong and Walker (1987) divide the agency literature into two distinct lines: the principal-agent literature and the positive agency literature. In this thesis, however, the principal-agent model is used throughout. Agency theory is taken as the synonym of the term.

derived and are based only on his or her own self-interest. This implies that potential conflict of interest exists between individuals. But self-interest motivation forces each individual to make choices or act in the manner that equilibrium must be reached under a properly designed structure (Baiman, 1982). Since it is in the interest of both parties to reach equilibrium that maximizes their utilities at the Pareto Optimum. (2) Each individual is assumed to be economically rational. He or she chooses his or her actions optimally (in his or her own self-interest) based upon his or her own information and the chosen employment contracts (ibid.). (3) The information that the two individuals have is asymmetrical. Typically, it is assumed that the agent knows his type and production environment while the principal does not share all or part of the agent's information. Moreover, the principal is normally assumed to be unable to observe the action taken by the agent. (4) The agent is delegated a certain degree of decision-making autonomy; that is, there are certain decision variables over which the agent exercises choice which influences the welfare of both the principal and the agent (Strong & Walker, 1987). (5) Both individuals operate in an uncertain environment and risk sharing is assumed to be desirable for both. The action which is optimal for the agent will depend on the extent of risk sharing between the principal and the agent (Grossman & Hart, 1983). Typically, only second-best solutions are available.

In a simple one-to-one case, the principal denoted P is to design a payment structure under which P makes a payment w to the agent denoted A according to a specified contract. A must choose some action a from a given set of action $\{A\}$. P 's purpose is to design a payment scheme which can induce A to choose the optimal action \hat{a} to generate maximum utility for P , which is determined by the outcome from A 's action and the payment to A . A 's utility is derived from the payment w and the effort (e) associated with the action a which generates disutility for him. The main concern in the principal-agent literature is to characterize the optimal forms of such contracts under various assumptions about both individuals' risk preferences, effort execution, and the information they possess or can obtain.

3.2.1 Utility Functions

The utility is the objective that an individual in the principal-agent relationship

seeks to maximize and can roughly be defined as the net welfare for the principal or the agent. The agent's utility function is the expectation of his utility, which depends both on the payment from the principal (w) and on the action he chooses. More generally, the level of effort he exerts (e) is taken as representative of the action he chooses. Thus, the agent's utility function can be written as $U_A(w, e)$. In the world of uncertainty, the outcome y depends not only on the level of the agent's effort (e) but also on the realization of a random variable θ , which belongs to a set of states of the world $\{\theta\}$ given by the closed unit interval $[0, 1]$. We can then present y as $y(e, \theta)$. At this point, it should be pointed out that the substantive assumption prevailing the principal-agent literature is that both P and A have identical probability beliefs concerning the state of the world, represented by the probability density function $f(\theta)$, though there might exist information asymmetry between the two individuals as to the likely occurrence of states of the world and to the definition of the states themselves (Rees, 1985). In the primitive principal-agent framework, it is assumed that the principal can observe only the outcome (y) and make the payment to the agent contingent on it ($w(y(e, \theta))$). The utility for the principal is typically represented by the outcome generated by the agent net of the payment made to the agent. The principal's utility function can thus be written as

$$EU_P[y(e, \theta) - w(y(e, \theta))]. \quad (3-1)$$

The utility for the agent can be expressed as the pay from the principal net of disutility of the effort made to obtain the pay. The agent's utility function is

$$EU_A(w(y(e, \theta)), e), \quad (3-2)$$

$$\text{or } EU_A(w(y(e, \theta)) - Z(e)),$$

where $Z(e)$ is the disutility of effort.

3.2.2 The Basic Model

The basic principal-agent model involves a single agent hired by a single principal in a single period. Given the above notation, the principal's problem can be expressed as follows:

$$\text{maximize } E U_P [y(e, \theta) - w(y(e, \theta))], \quad (3-3)$$

$$\text{subject to } E U_A (w(y(e^*, \theta)), e^*) \geq \bar{U}_A, \quad (3-4)$$

$$\text{and } e^* \in \underset{e}{\operatorname{argmax}} E U_A (w(y(e, \theta)), e). \quad (3-5)$$

The preceding formulation represents the principal's problem of choosing a Pareto optimal employment contract.⁵ The principal's problem is to choose the employment contract which is to induce the level of effort e^* from the agent that maximizes the principal's expected utility (3-1) subject to two constraints directly relevant to the agent. Expression (3-4) requires the expected utility of the agent (the left hand side of (3-4), or (3-2) to be at least as great as the expected utility the agent could get from working for some other people than the principal, the reservation utility \bar{U}_A . \bar{U}_A represents the agent's opportunity cost of participating in the contract by foregoing the expected utility which can be generated from selling his services in the labour market. To ensure that the agent will agree to participate, the principal should restrict her payment schedules to those that will generate the agent the expected utility which is no smaller than the agent's reservation utility. Otherwise, the agent would rather seek alternative employment. This restriction is commonly termed "individual rationality", "limited liability" or the "participation" constraint (Tirole, 1988).

The other constraint expressed by (3-5) is generally termed the "incentive compatibility" constraint (ibid.) or "the agent's action self-selection constraint" (Baiman, 1982). The two terms have different interpretations, however. In terms of "incentive compatibility", Expression (3-5) represents a rule of which the principal must take account when she determines the level of e she intends to induce from the agent. The rule requires that the principal's desired e^* to be an element of the argmax of the expected utility of the agent under the payment structure $w(\cdot)$ and the effort level e . Any desirable level of effort e^* should meet the condition that it is a utility-

⁵In the agency context, a Pareto optional contract is one that maximizes one party's (say the principal's) expected utility subject to the constraint that the other party's (say the agent's) specified level of expected utility is not lowered.

maximizing choice for the agent. Specifically, (3-5) requires higher level of e generate greater (at least, equal) utility for the agent:

$$E U_A (w(y(e^*, \theta)), e^*) \geq E U_A (w(y(e', \theta)), e') \text{ for } e^* \geq e'. \quad (3-6)$$

In this way, (3-5) provides the agent with incentives to adopt the level of e desired by the principal (Strong & Walker, 1987).

The term "the agent's action self-selection constraint" puts more emphasis on the side of the agent. Given the principal's choice of the payment schedule, the agent will only choose the level of effort that maximizes his own expected utility. His choice is made based on his beliefs, which are the same as those of the principal at the time of contracting. Because the principal is assumed to know the agent's beliefs and preferences, he can solve the agent's choice problem expressed by (3-5) and take it into account when she tries to solve her own problem. Thus the solution to Expression (3-5) is an argument in the principal's objective function. Baiman (1982) points out that, if, at optimality, i.e. the principal could directly observe the level of e actually exerted by the agent, Expression (3-5) would not be a binding constraint and therefore could be ignored. In this case, a first-best optimum risk-sharing contract would be possible. This possibility will be further considered in the following subsection.

3.2.3 The First-best Solution and Perfect Information

An extreme case with the above principal-agent model is where full, perfect information is available to both the principal and the agent. When the information issue is considered in the agency context, one point may be worth mentioning here. Generally, it is assumed in the basic agency model that both the principal and the agent possess the same beliefs and information *before* they enter the contract (Grossman and Hart, 1983). Specifically, the principal is assumed to know the agent's utility function $U_A (w, e)$, the possible action set $\{A\}$, and the production function $y(e, \theta)$. In other words, there does not exist *ex ante* information asymmetry between the principal and the agent. The incentive problem extensively examined in the agency

literature arises from *ex post* information asymmetry⁶ resulted from imperfect monitoring and reporting systems and imperfect observability.⁷

In a simplified situation where complete monitoring is possible and perfect information on the agent's action is available, a first-best solution can be achieved by establishing a "forcing contract" based on the agent's effort level (Holmstrom, 1979; Namazi 1985). In this case, because the principal can observe a or e , she can establish a payment schedule which depends on a or e alone and he chooses this payment schedule and a level of e for the agent in such a way as to maximize her own expected utility, subject only to the agent's participation constraint expressed as (3-4).

The first-best solution to the principal-agent problem can be described as follows: the principal chooses an optimal level of e , e^* , which will maximize her expected utility $EU_p[y(e, \theta) - w(e)]$. The following contract will then be offered to the agent: if the agent chooses e^* as the course of action, which is fully observable by the principal, he will be paid a constant $w^*(e^*)$; otherwise, he can only get a very low pay w or even get penalized by the principal's enforcing the contract.

Rees (1985) analyzes the first-best situation with respect to optimal risk

⁶By *ex post* is meant post-contract, pre-payoff type of information. Strong & Walker (1987) distinguish eight types of information according to its timing and its distribution between the principal and the agent. In terms of timing, four types are identified: pre-contract; pre-effort; post-effort, pre-payoff; and post-payoff -- *ex post* information (for details see section 3.4.1 of this chapter). Clearly, the term *ex post* in our context covers both pre-effort and post-effort, pre-payoff types, but not the *ex post* of the Strong-Walker type.

⁷According to Grossman and Hart (1983), this distinguishes the principal-agent study from the literature on incentive compatibility, which deals with incentive problems arising mainly from *ex ante* information asymmetry. The basic principal-agent research has primarily concentrated on the problem of moral hazard with hidden action (see Note 2 of this chapter). More recent research has widened the sphere substantially to include problems that arise from *ex ante* (pre-effort but post-contract and pre-contract) information asymmetry. The so-called incentive compatibility literature is a such extension and therefore can be said to belong to the class of agency in a broad sense. The literature on the Soviet incentive system reviewed in chapter 2 can be said to basically belong to this branch of literature, because incentive problems involved in the target-setting process have been its main concern. Chapter 6 will address this issue in more details.

sharing. In the world of uncertainty, there is a balance that needs to be struck between providing incentives and insulating people from risk. To provide incentives, it is desirable to hold the agent responsible for his performance, implying that his income should depend on the measured performance. This also means that his current and future incomes are subject to fluctuations resulted from randomness out of the agent's control. Many people are normally assumed to be risk averse, that is, they would prefer getting a certain income to getting a random income (though the expected value of the latter may be higher than the former). A risk-neutral person does not care about the randomness in his or her income. An important consideration in designing a payment scheme when there exist risk factors is the risk preferences of relevant parties. In the optimal situation, the principal is assumed to be able to observe a or e , and therefore θ . Suppose the payment to the agent is made contingent on θ alone, it is found that the constant payment $w^*(\theta)$ is characterized by the following condition

$$-U'_p(y-w^*) + \lambda U'_A = 0 \quad \forall \theta \in [0, 1], \quad (3-7)$$

where λ is a conventional Lagrange multiplier and independent of θ . Because the principal's non-satiation in income implies that $\lambda (=U'_p/U'_A) > 0$, the participation constraint must be satisfied as an equality -- the agent receives only his reservation utility \bar{U}_A . By differentiating the condition (3-7) with respect to θ and substituting for λ using the Pratt-Arrow index of absolute risk aversion

$$r_P \equiv \frac{-U''_p}{U'_p}, \quad r_A \equiv \frac{-U''_A}{U'_A},^8$$

the following expression is obtained:⁹

⁸Differentiated with respect to w in the case of r_A for the agent.

⁹For details of description, see Rees (1985), pp.8-10. For purpose of consistency in this chapter, different notation is used here.

$$\frac{dw^*}{d\theta} = \frac{r_P}{r_P+r_A} \frac{\partial y}{\partial \theta}. \quad (3-8)$$

In the case that both the individuals have constant absolute risk-aversion, $r_P / (r_P+r_A)$ becomes a constant, say, α . A linear payment schedule in the form of $y=\alpha x+\beta$ can then be structured as

$$w^*(\theta) = \alpha y(e, \theta) + \beta \quad \alpha = \frac{r_A}{r_P+r_A}, \quad (3-9)$$

where α and β are constants.

From (3-9), various payment solutions can be obtained with respect to various risk preferences on both sides. For example, if the principal is risk-neutral, ie. $r_P=0$, we have

$$w^*(\theta) = \beta, \quad (3-10)$$

implying that the principal bears all the risk as the agent receives a secured payment.

The converse occurs if the agent is risk-neutral ($r_A=0$) and the principal risk-averse.

The payment schedule takes the form

$$w^*(\theta) = y(e, \theta) - \gamma. \quad (3-11)$$

In this case, the agent makes a fixed payment γ to the principal and becomes the residual income retainer. With both risk-neutral, any arrangements in the form of (3-8) is an equilibrium.

3.2.4 The First-best Solution and Imperfect Observability

It was indicated earlier that when perfect observation of e or θ is possible, the first-best solution is attainable. If, however, there exists imperfectly observable e or θ , is the first-best still possible? This situation is analyzed in Shavell (1978) and Holmstrom (1979). It is also well presented in Rees (1985). Suppose that the principal can only observe a random variable $\hat{e} = e + \epsilon$, where ϵ has zero mean and probability

$\phi(\epsilon) > 0$ on the interval $[\epsilon_0, \epsilon_1]$ and zero elsewhere. The presence of ϵ indicates the imperfection in the principal's observation of e . Suppose that ϵ is independent of θ , the state of the world. Rees (1985) shows that in this case, if the principal knows the function $\phi(\epsilon)$ and ϵ is uniformly distributed over $[\epsilon_0, \epsilon_1]$, the first-best solution is still achievable for the principal by adopting a forcing contract. In this case, the following arrangements may be made to "force" the agent to take action that is desirable for the principal:¹⁰

$$w(e + \epsilon) = \begin{cases} w^* & \text{if } \hat{e} \in e^* + \epsilon \\ w_0 & \text{if } \hat{e} < e^* + \epsilon \end{cases}, \quad (3-12)$$

where w_0 is a sufficiently low w to threaten the agent (Fig. 3.1). In Fig. 3.1, e^* represents the level of effort desired by the principal. If the principal observes a \hat{e} which falls into the range $[e^* + \epsilon_0, e^* + \epsilon_1]$, she will reward the agent with w^* ;

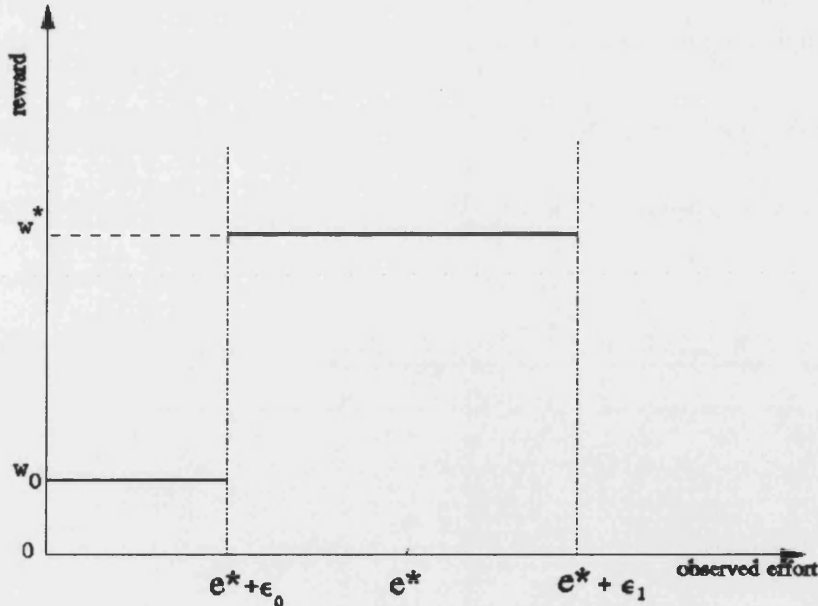


Fig. 3.1 Payment Schedule with a Imperfectly Observable e

otherwise, w_0 will be paid to the agent. Although the observation of e is not perfect,

¹⁰Here it is assumed that the principal is risk-neutral and the agent risk-averse.

the relationship of e with ϵ and the characteristics of ϵ make it possible for the principal to detect the action course of the agent relatively precisely. It therefore approximates to the situation in which e can be perfectly observed. In a general sense, observation of a random e which is independent of θ is less likely than that of a variable y which depends on both e and θ . This latter situation has strong incentive implications and has received much wider attention in the literature, and to be reviewed in the next section.

The above discussion is based on the assumption that the agent is risk-averse. In other words, a necessary and sufficient condition for $w(e, \epsilon)$ to be Pareto-optimal is the existence of risk aversion on the part of the agent (Harris and Raviv, 1976, 1979; Namazi, 1985). If, however, it is assumed that the agent is risk-neutral, it is proved that any contract which makes w contingent only on y can Pareto-optimally dominate one in which w depends on e , θ and y (Harris & Raviv, 1979; Shavell, 1979). Under this situation, any additional information concerning the effort of the agent to y has no significance ¹¹(Namazi, 1985). Intuitively, because the agent is risk-neutral, the first-best risk-sharing rule requires that the principal receives a fixed payment γ and the agent retains the residual income $y(e, \theta) - \gamma$ (see (3-10)). Given this payment schedule, the agent will choose e to solve

$$\max_e EU_A(y(e, \theta) - \gamma, e), \quad (3-13)$$

which implies that the agent is in fact trying to maximize the expected net return (the outcome minus the cost of effort). His choice of e does not differ from the principal's payment schedule. The principal does not care about the agent's choice of e and therefore does not have to bother herself about incentives. The first-best can always be achieved in spite of imperfection in observing e .

¹¹Details of the proof of the proposition are presented in Shavell (1979), Appendix, pp.68-69.

3.3 The First-Order Approach

The standard setting for the principal-agent problem has been that the principal can observe only the outcome y and has no information about e and θ , and, of course, that the agent is risk-averse. The general description of the principal's problem is presented in the basic model described by (3-3), (3-4) and (3-5). The ability to observe only y and the agent's risk-aversion imply that the principal must take account of the effect of her choice of $w(y)$ on the agent's choice of a or e , i.e. the incentive compatibility constraint (3-5) is binding.

The presence of (3-5) in the principal's problem makes it difficult to reach any solution to the original problem. This is especially the case when there are infinitely many possible outcomes reflecting infinitely many possible actions or effort levels. Pioneered by Mirrlees (1974) and Holmstrom (1979), an approach called "first-order approach" has been developed to be used to solve this problem.

3.3.1 A Simplification of the Model

The first-order approach was developed by making some further assumptions concerning the agent's utility function. It is assumed, first of all, that the utility function is separable in income and effort:

$$U_A(w,e) = u(w) - Z(e),$$

where $u(w)$ is utility generated by income w and $Z(e)$ is disutility of effort to the agent. It is further assumed that the function u is strictly increasing, continuously differentiable, and concave and therefore $u' > 0$, $u'' < 0$, which implies that the agent is risk-averse. It is also assumed that the basic random variable y has a cumulative distribution function $F(y,e)$ on $[\underline{y}, \bar{y}]$, parameterized by the agent's effort. The density function of $F(y,e)$ is given as $f(y,e) > 0$, which is assumed to be differentiable in effort (e). For any given e , $F_e(y,e) < 0$ for some y -values, so that an increase in e will shift the distribution of y ($\in [\underline{y}, \bar{y}]$) to the right (Fig.3.2). In Fig.3.2, it is assumed that the supports of function $F(y,e)$ do not change with e , implying that the upper and lower limits of outcome are fixed. Changes in e can only shift the distribution of

outcome y . $F(y, e_2)$ describes the distribution of y when the effort level is e_2 . When e_2 is increased to e_1 , $F(y, e_2)$ is changed to $F(y, e_1)$, and the probability of yielding a higher outcome is then increased:

$$e_1 > e_2 \Rightarrow F(y, e_1) < F(y, e_2).$$

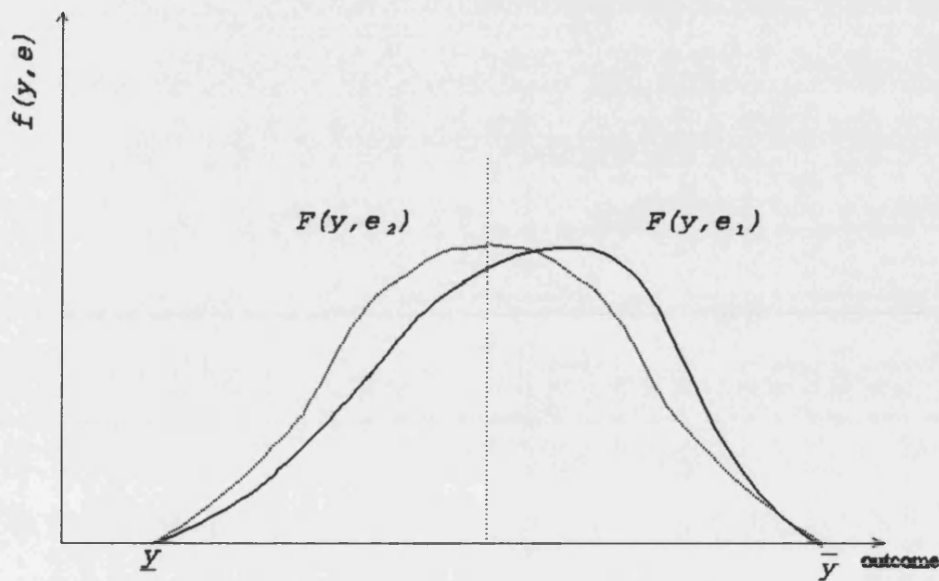


Fig.3.2 Shift of the Distribution of y

Given these assumptions, the agent's effort choice problem can be addressed as choosing e so as to

$$\max_e \left(\int u(w(y)) f(y, e) dy - Z(e) \right). \quad (3-14)$$

By differentiating (3-14) with respect to e and setting the result equal to zero we get the following first-order condition:

$$\int u(w(y)) f_e(y, e) dy - Z'(e) = 0. \quad (3-15)$$

When there exist conditions (to be considered) that ensure (3-15) yields an optimum

solution to the agent's choice problem, the principal's problem model can be significantly simplified by replacing (3-5) with (3-15), making the model more technically manageable. In this way, the original basic model can be recast as

$$\underset{w(y), e}{\text{maximize}} \quad \int U_p(y - w(y)) f(y, e) dy, \quad (3-16)$$

$$\text{subject to} \quad \int u(w(y)) f(y, e) dy - Z(e) \geq \bar{U}_A, \quad (3-17)$$

$$\int u(w(y)) f_e(y, e) dy = Z'(e). \quad (3-18)$$

Further analysis of the simplified model can lead to some useful derivations.

3.3.2 Analysis of the Simplified Model

By introducing multipliers λ for (3-17) and μ for (3-18), we can rewrite the simplified model presented by (3-16), (3-17) and (3-18) as follows:

$$\begin{aligned} \underset{w(y), e}{\text{maximize}} \quad L = & \int [U_p(y - w(y)) f(y, e), \\ & + \lambda((u(w(y)) - Z(e) - \bar{U}_A) f(y, e), \\ & + \mu(u(w(y)) f_e(y, e) - Z'(e) f(y, e))] dy. \end{aligned} \quad (3-19)$$

Differentiating (3-19) with respect to e and w yields the following characterization of the optimal scheme (Holmstrom, 1979):

$$[-U_p(y - w(y)) + \lambda \mu'(w(y))] f(y, e) + \mu u'(w(y)) f_e(y, e) = 0,$$

$$\text{or} \quad \frac{U_p(y - w(y))}{u'(w(y))} = \lambda + \mu \frac{f_e(y, e)}{f(y, e)}, \quad (3-20)$$

$$\begin{aligned} \text{and} \quad & \int U_p(y - w(y)) f_e(y, e) dy, \\ & + \mu \left\{ \int u(w(y)) f_{ee}(y, e) dy - Z''(e) \right\} = 0. \end{aligned} \quad (3-21)$$

Recall that the condition for the first-best solution when (3-18) is not a binding constraint was

$$-U_p'(y-w) + \lambda U_A' = 0 \quad \text{for all } e. \quad (3-7)$$

In the case where the principal is risk-neutral and agent risk-averse, i.e. U_p' is a constant, (3-7) implies that U_A' and therefore w , the payment to the agent should be constant. The difference between (3-7) and (3-20) is the presence of the second term on the right-hand side of (3-20), which indicates that $\mu > 0$ ¹² and the incentive condition represents a binding constraint on the principal. The presence of the μ term shows that risk-sharing is no longer Pareto-optimal and the first-best solution is no longer attainable: the principal has to take account of the incentive effects on the agent, i.e. the effect of the choice of w , given y , on the agent's choice of e and hence the effect on the probability of getting y (Rees, 1985). In contrast to perfect risk-sharing, in cases where (3-20) holds, a greater burden of risk has to be imposed upon the agent than would be optimal because otherwise he has an inadequate incentive to supply effort if he is fully insured against the payoff (Strong & Walker, 1987). On the other hand, providing the agent with incentives generates an incentive cost to the principal of contracting under imperfect information. Holmstrom (1979) shows that when $\mu > 0$, the second-best solution is strictly worse for both the principal and the agent than the first-best, implying that there are positive gains to observing the agent's action and using imperfect monitoring and information when perfect observation and information are not available.

In interpreting the implications of (3-20), Tirole (1988) uses a two-level of effort case, where low and high levels are notated as e_L and e_H respectively. The principal's intention of inducing the high level of effort from the agent leads to the following expression for the incentive compatibility constraint:

$$\int u(w(y)) f_H(y) dy - Z(e_H),$$

¹²Holmstrom (1979) proves that with $Z'(e) > 0$ and $F_e(y, e) \leq 0$, $\mu > 0$: the principal would like to see the agent increase his effort when the first-best is not available.

$$\geq \int u(w(y)) f_L(y) dy - Z(e_L), \quad (3-22)$$

where $f_H(y)$ and $f_L(y)$ denote the distribution densities for e_H and e_L respectively. In this case, (3-20) becomes

$$\frac{U'_P(y-w(y))}{u'(w(y))} = \lambda + \mu \left(1 - \frac{f_L(y)}{f_H(y)} \right) \quad \lambda, \mu > 0. \quad (3-23)$$

To simplify the interpretation, we assume that the principal is risk-neutral rather than risk-averse as symbolized by the presence of $U'_P(y-w(y))$ in (3-23).¹³ Under this assumption, we rewrite (3-23) as

$$\frac{1}{u'(w(y))} = \lambda + \mu \left(1 - \frac{f_L(y)}{f_H(y)} \right) \quad \lambda, \mu > 0. \quad (3-24)$$

Some observations can be readily made on (3-24). Since u' is decreasing, $1/u'$ is increasing.¹⁴ The term $f_L(y)/f_H(y)$, normally called the likelihood ratio, reflects how strong the outcome (y) signals that the true distribution from which the sample was drawn is f_L rather than f_H . Under the monotone likelihood ratio condition (to be considered), a higher likelihood ratio signals a more likely e_L than e_H . Specifically, the agent's income (w) varies in opposite direction to that of the likelihood ratio. When $f_L(y)/f_H(y) < 1$, outcome y is more likely if the agent exerts effort e_H than if he chooses the level e_L , and (3-24) shows that he should be paid more to be encouraged to choose e_H ; And he would be "penalized" at outcomes such that $f_L(y)/f_H(y) > 1$, which are more likely when he chooses e_L than when e_H is chosen. The essential idea embodied in (3-24) can be summarized as:

At the optimum, you reward the agent if the outcome is relatively more likely if he took the desired action, and you penalize him if the outcome is relatively

¹³This assumption would not affect the main theme of the discussion of the first-order approach, see Hart and Holmstrom (1987), p.83, Footnote 2.

¹⁴By definition, u is an additive income element of the agent's utility function and is strictly increasing, strictly concave, and twice continuously differentiable (Rogerson, 1985). Hence u' is strictly convex, and hence $1/u'$ is strictly increasing.

less likely, relative to the actions that bind in the relative incentive constraints (Kreps, 1990, pp.592-593).

3.3.3 The Validity of the First-order Approach

The first-order approach to principal-agent problems involves relaxing the incentive compatibility constraint so that the agent chooses an action at which his own utility is at a stationary point. The approach can, under certain assumptions, lead to some useful implications, which are not attainable using the "standard" principal-agent model due to technical difficulties. The method has, however, been claimed to be "generally invalid" since its emergence in the middle of 1970s. This claim led researchers to examine the conditions that validate the first-order approach. One of the pioneers in the area, James Mirrlees (1975, 1976), identifies two conditions that are sufficient for the first-order approach to be valid. Grossman and Hart (1983), Rogerson (1985) and others also made further analysis of these conditions subsequently.

3.3.3.1 Non-uniqueness of the solution.

Mirrlees (1975) points out that the solution to the simplified model is not always the same as the original programme. The problem with the first-order approach is that it does not guarantee the uniqueness of a solution: there may be multiple solutions to the agent's problem of maximizing his expected utility subject to a given payment schedule. The first-order conditions derived by the procedure mentioned in the last section are not therefore, even necessary conditions for the optimality of the risk-sharing contract.

Fig. 3.3, which has been used by a number of authors in the field, illustrates the problem of non-uniqueness of the first-order solution. The horizontal axis m represents the payment schedules for the agent ranked in order of the principal's preference from the left to right, and the vertical axis e or a the agent's effort level or action. The Z-shaped curve $e(m)$ reflects the agent's choice of effort level for a given payment schedule. The points on the curve can therefore satisfy the agent's first-order condition. However, only these points lying on the dotted portion of the

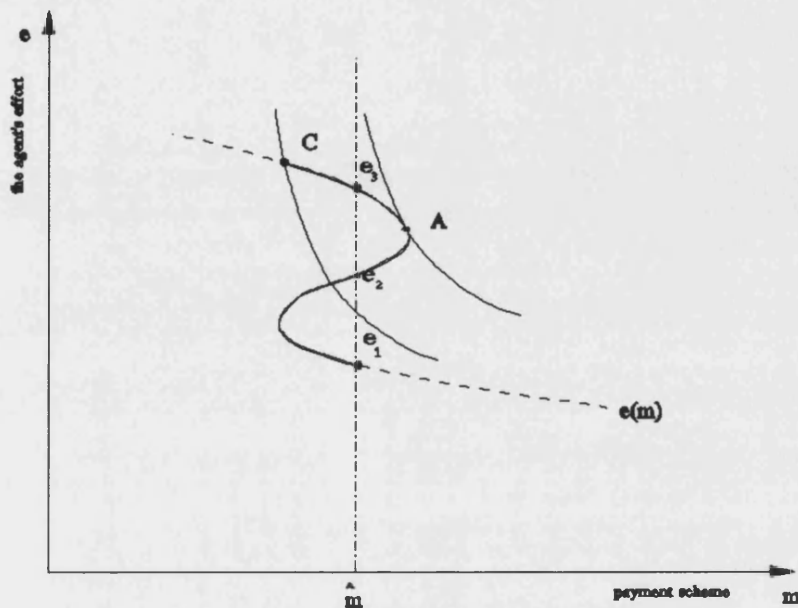


Fig. 3.3 Non-uniqueness of e for Given m

curve represent global maxima for the agent. For example, given the payment schedule \hat{m} , the agent's optimal level of effort is at e_1 , not e_2 or e_3 , because he always prefers less effort to more. The principal's indifference curves are drawn in terms of m and e . The first-order solution for the principal is characterized by the point A , which yields the principal the highest utility of all the points which satisfy the agent's first-order condition. The true feasible set for the principal lie on the dotted portion of the curve and C is hence the true optimum, at which the agent is induced to choose the highest level of effort out of the those he can actually be induced to choose. However, C does not satisfy the first-order conditions, the necessary conditions for the first-order approach to reach optimal solutions. This existence of the non-uniqueness problem makes the first-order approach generally invalid.

3.3.3.2 Monotone likelihood ratio condition (MLRC).

To make the first-order approach valid, two conditions have to be satisfied. The first is the monotone likelihood ratio condition (MLRC), which specifies the signal property of the likelihood ratio ($f_L(y)/f_H(y)$ in the two-level-of-effort case, or f_e/f in general cases). It specifies that for any two effort levels e_L and e_H such that

$e_H > e_L$, and for any two outcomes y_1 and y_2 such that $y_1 < y_2$, the relative likelihood of yielding the better outcome with the higher effort level relative to that of the better outcome with the lower effort level is at least as large as this relative likelihood ratio for the lower outcome (Kreps, 1990, p.595). Symbolically,

$$\frac{f_H(y_2)}{f_L(y_2)} \geq \frac{f_H(y_1)}{f_L(y_1)},$$

where each $f(y)$ element specifies the probability of an outcome (y_1 or y_2) conditional on an effort level (L or H). Simply, MLRC indicates that if a high outcome is observed, then the chances are greater that high effort has been exerted than are the possibilities that high effort has yielded a low outcome. Without this specification, it is possible for the higher output to signal lower effort level despite dominance. This possibility would lead to situation where the agent is paid less in the high outcome state or *vice versa*. The property of monotonicity can, however, guarantee that higher outcome is indeed a correct signal of higher effort, and therefore the agent's compensation increases with observed outcomes. Similarly, lower outcome would signal lower level of effort from the agent, who should accordingly be paid less.

Under certain circumstances, however, MLRC does not guarantee monotonicity. Grossman and Hart (1983) show that if there exists the possibility that the agent may be indifferent between several levels of effort at an optimum, monotonicity may be jeopardized even if MLRC is satisfied. In these cases, an additional condition is needed to ensure that only binding relative incentive constraints for the optimal effort level e^* are constraints corresponding to levels of effort lower than e^* (Kreps, 1990).

3.3.3.3 Convexity of the distribution function condition (CDFC).

The second property that the probability functions are assumed to possess is the convexity of the distribution function condition (CDFC). This condition requires that $F_{ee} \geq 0$ for every outcome y and every possible value of e . In the two-level-of-effort case, this condition can be presented as

$$F(y, \alpha e_1 + (1-\alpha)e_2) \leq \alpha F(y, e_1) + (1-\alpha)F(y, e_2) \quad \alpha \in [0, 1],$$

which implies that the agent always has a level of effort available which can yield a distribution that is stochastically superior to that he could achieve by randomizing between effort e_1 with probability α and effort e_2 with probability $1-\alpha$. It can be seen that according to CDFC, F_e should decrease at a decreasing rate as e increases. The CDFC is therefore interpreted as a kind of stochastic diminishing returns to scale (Rogerson, 1985; Strong & Walker, 1987).

What the first-order solution and the two sufficient conditions imply is, conclusively, that the second-best optimal incentive schedule for the principal should be such that payments to the agent are non-decreasing functions of the outcome level. MLRC and CDFC restrict the cases in which the first-order approach works to those where the family of distributions controlled by the agent is one-dimensional in distribution space (Hart & Holmstrom, 1987), but they do not alter the general solution of the first-order approach represented by (3-24). This solution provides a useful guideline for designing payment schedules where outcome-based incentives are provided. In the following section, we turn to the information issue, a fundamental factor characterizing the principal-agent problem.

3.4 Information in the Principal-Agent Problem: An Introduction

The role of information was previously mentioned in discussing the basic principal-agent model. Two points were made there. First, when perfect information on the agent's action is available, the first-best solution can be achieved by establishing a "forcing contract" based on the agent's effort level. In this case, the agent's payment can be made directly contingent on the observation of his effort level and a fee schedule can be constructed in such way that it can induce desirable effort level from the agent. In the real world, however, full information about the agent's effort is either impossible or prohibitively costly to obtain. Second, where only imperfect information about the agent's action is available to the principal, the solution to the principal-agent problem and the value of information vary with the risk

attitudes of the both parties and the nature of information. If the agent is risk-neutral and the principal is risk-averse, efficient risk sharing can be achieved by the agent assuming all the risks and paying the principal a fixed rate, and a contract based on the output alone is sufficient for the solution to be Pareto-optimal. Further information about the agent's effort is therefore of no significance and does not improve the contract's solution. In the cases where the agent is risk-averse, if observation of a random variable is independent of the state of world, the principal can then detect any shirking by the agent with positive probability. This situation is "eventually equivalent to observing the agent's action directly, because a first-best solution can be approximated arbitrarily close in this case" (Holmstrom, 1979).

The role of information in these first-best settings seems straight-forward. That is, information on the agent's action is the direct base on which the principal establishes the agent's effort level and pays the agent. The same may not apply to the second-best settings. In this section, we review research on information issues in more general situations where information is not independent of the state of nature. The effects of private information are also discussed. Since the issue of information and communication will be further explored in later chapters, where research results will be presented in different contexts, review in this section serves as a short introduction instead of a full, intensive review.

3.4.1 Types of Information

For the sake of simplicity, only two types of information were distinguished earlier in this Chapter: pre-contract vs. post-contract information. Further classification is necessary for our purpose in this section. Strong & Walker (1987) classify information in the agency context into eight types, distinguished according to its timing and distribution:

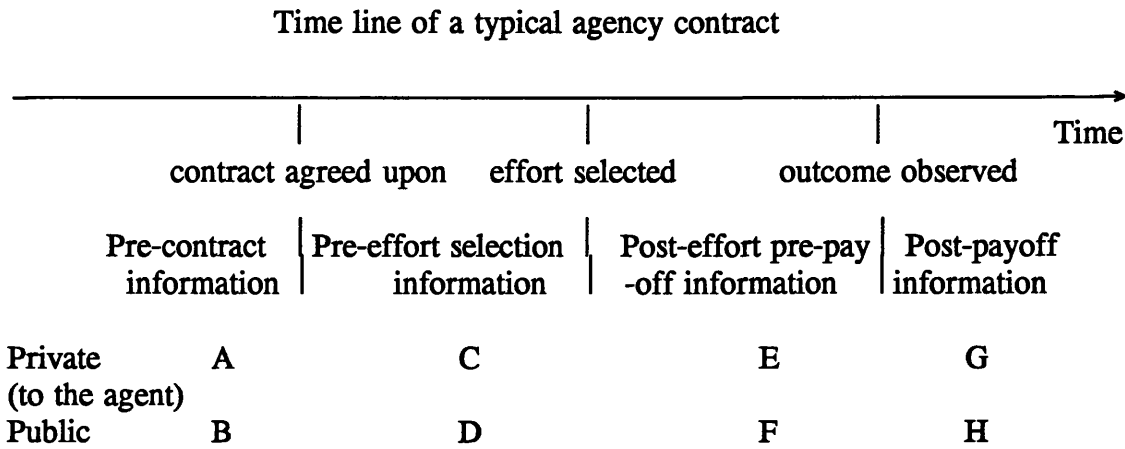


Fig. 3.4 Types of Information

Of these eight types of information, C, D and H have been received great attention in the principal-agent literature. As the role of information has been examined in this literature in terms of its potential effects on a Pareto improvement after the contract is agreed upon, this restriction may seem to be self-evident.

3.4.2 Public Post-payoff Information (H)

Much of the agency literature focuses on analysis of the post-payoff information available to both the agent and the principal. Chapter 7 of Bromwich (1992) provides a detailed and broad discussion of the utility of public information. In this sub-section, we focus on the concept of informativeness, which is useful in judging whether public information has value. In the first-best setting, it is found (see 3.2.3 and 3.2.4) that direct observation of the agent's effort level or information about this level which is independent of the state of world can increase the principal's expected utility and yield a strict Pareto improvement. This type of information is therefore of value to the principal.¹⁵

¹⁵The cost of observation is ignored here. Moreover, not all indirect information has positive value. Additional incomplete information may provide an inaccurate signal concerning the agent's effort level. Whether additional information is of value depends on whether it is costless and contains signals which cannot be inferred from existing information (Namazi, 1985).

In general, however, information about outcome or/and the agent effort level is not independent of the state of nature. Holmstrom (1979) characterizes conditions under which the information can be of value to the principal. By introducing an additional signal to payoff (y) , x , which is observed simultaneously by both parties, Holmstrom rewrites the optimal sharing rule (3-20) as

$$\frac{U'_p(y - w(y, x))}{u'(w(y, x))} = \lambda + \mu \frac{f_e(y, x, e)}{f(y, x, e)}, \quad (3-25)$$

where $f(y, x, e)$ denotes density function of the distribution $F(y, x, e)$, the joint distribution of y and x given \hat{e} . An important distinction between (3-25) and (3-20) is that in (3-25) $f_e(y, x, e)/f(y, x, e)$ may change with x . The value of x therefore becomes a determinant of the agent's payment. In particular, if for one value of y , x conveys less information about \hat{e} via y , the deviation from optimal risk sharing will be smaller, and *vice versa*. In the extreme case where $f_e(y, x, e) \rightarrow 0$, i.e. nothing about the agent's effort can be inferred from the outcome, optimal risk sharing rule should stand because that indicates that outcome is beyond the agent's control and he should not be held responsible for such outcome.

Holmstrom (1979) proves that additional information x will be of value¹⁶ if and only if it is *false* that

$$\frac{f_e(y, x, e)}{f(y, x, e)} = \bar{h}(y, e), \quad (3-26)$$

for almost every (y, x) . Equivalently, differentiating (3-26) with respect to e yields

$$f(y, x; e) = g(y, x) h(y, e), \text{ for almost every } (y, x). \quad (3-27)$$

The concept of a sufficient statistic suggests that if (3-27) holds, y is a sufficient statistic for (y, x) with respect to \hat{e} , which indicates that x conveys nothing new about

¹⁶Holmstrom defines that a signal x is of value if both the principal and the agent can be made strictly better off with a contract of the form $w(y, x)$ than they are with a contract of the form $w(y)$.

\hat{e} and is therefore of no value to the principal. On the other hand, when (3-27) or (3-26) is false, x is considered informative about \hat{e} because it contains some information about \hat{e} in addition to that revealed by y . This informativeness is sufficient for x to be valuable.¹⁷ It is Holmstrom's conclusion that "essentially any imperfect information about actions or states of nature can be used to improve contracts", "regardless of how noisy it is". The point is that

Additional information is of value because it allows a more accurate judgement of the performance of the agent; or viewed differently, it provides the same incentives for effort with less loss of risk-sharing benefits (Holmstrom, 1979. p.89).

This argument provides support for observed practice. One case is the one where the agent is directly monitored or supervised. In this case x is independent of y . From (3-27) it follows that

$$f(y, x; e) = g(x, e) - h(y, e);$$

$$\text{and } \frac{f_e(y, x; e)}{f(y, x; e)} = \frac{h_e(y, e)}{h(y, e)} + \frac{g_e(x, e)}{g(x, e)}.$$

x is not informative if and only if g is independent from \hat{e} . Otherwise, x is informative and thus valuable. Another case of informativeness is in the multi-agent setting, where information about other agents' performance can be used in evaluating an agent. This practice of relative performance evaluation will be further considered in Chapter 7.

3.4.3 Private Pre-effort Selection Information

Private pre-effort selection information exists when certain signals are observable only by the agent after a contract has been agreed upon and before the agent makes his effort selection. There are two strategies available to the agent in face of this type of information: either he may report the private information to the principal through a communication mechanism or keep the information private. The latter situation may seem simpler in that the agent's payment schedule will be based

¹⁷For an illustration of this statement, see Strong & Walker (1987), pp.181-182.

on those variables only jointly observable by the both parties and the agent's private information may only affect the agent's choice of effort level. In the case of communication, however, in addition to effort selection, the agent is faced with some revelation strategies (such as truth-telling and non-truth-telling strategies); his payment schedule may be based upon jointly observable variables as well as his communication strategy (Baiman and Evans, 1983). This point will be discussed fully in Chapter 7.

The value of private pre-effort selection information may be seen from its potential effects on the agent's decision-making, and in the case of communication on the principal's decision-making as well. Private information is valuable when it conveys a message that changes the prior probability of the action to be selected by the agent and directly changes the agent's production decisions¹⁸ (Namazi, 1985). In the present context, the notion of the value of information can perhaps be simply interpreted in terms of possibility for private information of bringing about Pareto-improvement. Next, we shall examine briefly the situations in which the agent's private information is and is not communicated to the principal respectively. The revelation problem will be dealt with in more detail in Chapter 7.

3.4.3.1 Private pre-effort information without communication.

Whether private pre-effort selection information can bring about a Pareto-improvement has been a controversial issue in the principal-agent literature. As Strong & Walker (1987) illustrate, it is possible to construct examples in which the principal's welfare is reduced, and examples in which the principal's welfare improves, both when the agent only has access to private information. The two possible effects associated with the agent's access to private information prior to effort selection are clearly demonstrated in Christensen (1981, 1982) and Strong and Walker (1987). The possibility that private information leads to a deterioration in the principal's welfare originates from the possibility that the agent may use his private

¹⁸The valuation of information is a more complicated issue than it is stated here when a monetary value is introduced. For our purpose, the following definition may be sufficient: The value of information is defined as the net expected utility obtained from using an information for a decision relative to the expected utility of the decision employing the null information system (Bromwich, 1992).

information to "shirk" without the principal's awareness. In situations where a forcing contract is applicable, the first best solution can be achieved in the absence of private information. In this situation, because the agent is no better informed than the principal in the world of uncertainty, he will be reluctant to risk adopting certain level of effort which may lead to lower level of payoff (than the optimum) and lead to a penalty for him as well. If he can observe some signal privately, however, he may no longer run any risk of getting penalized if he adopts this level of effort when a certain signal is observed. He is then able to shirk without being detected by the principal. This possibility of shirking can result in reduction in principal's expected payoff (For an example, see Strong and Walker, 1987, pp.182-183).

The introduction of the same private information may alternatively have a potential advantage. In designing the reward function, the principal can construct a contract that can induce desirable level of effort whichever signal the agent receives. This can be achieved by constructing different marginal productivities of effort associating with different possible signals. There are potential benefits therefore arising "from the possibility of the agent adjusting her effort level in line with the marginal productivity of effort signalled by the private information" (Strong & Walker, 1987, p.185). Baiman and Evans (1983) show that if the agent has access to a private information system, "the principal and the agent can always find an informative private pre-decision information system for the agent which produces a weak Pareto improvement over the case in which the agent has no private pre-information". Penno (1984) also show that if the agent is allowed to install a private information system, he would be able to increase production by exerting effort beyond the no-information case. Strict Pareto improvement can therefore be achieved in these cases.

3.4.3.2 Communication and the revelation principle.

If the possibility of communication between the agent and the principal is considered, the effects of private pre-effort information become more complicated. Research so far has not established whether the private pre-effort information should be communicated. Furthermore, when an *ex post* information system has been

installed, it is open to question whether such communication is strictly valuable. Some analyses based on the revelation principle, however, have identified certain conditions for communication to be strictly of value (see, for example, Christensen, 1979, 1981, 1982; Baiman and Evans, 1983; Dye, 1983; Penno, 1984).

In situations where the agent's reporting of his private information to the principal is allowed, the agent may be induced either to misreport or to tell the truth. The revelation principle shows that, under certain conditions, any equilibrium in which the agent is induced to misreport can be achieved by alternative that induces the agent to tell the truth (Kreps, 1990, Chapter 18). This alternative solution not only provides the agent with sufficient incentives to tell the truth, but also yields the same levels of utility to the principal and the agent. The revelation principle provides possibilities of designing reward functions which can motivate the agent' to report truthfully when such reporting is needed by the principal. It also allows the analyst to safely confine attention to the class of all possible solutions in which the agent is motivated to tell the truth.

To demonstrate the basic idea of the revelation principle, we now formulate a simplistic model involving only one agent.¹⁹ The revelation problem with more than one agent will be considered in Chapter 7. Suppose that the agent can access private information about production θ before he chooses the action but after entering the contract with the principal. If the principal decides that it is worthwhile to induce the agent to report the true value of θ , she may wish to consider the following formulation of the incentive problem:

$$\text{maximize } E[y(\cdot) - w(\cdot)], \quad (3-28)$$

$$\text{subject to } E[w(\cdot) - Z(\cdot)] \geq \bar{U}_A, \quad (3-29)$$

$$\hat{e} \in \underset{e}{\operatorname{argmax}} E[w(\cdot) - Z(\cdot)], \quad (3-30)$$

¹⁹The formulation of the model is not complete in that a number of technical assumptions and conditions are omitted and elements in the model are in their simplified form. A full formulation of the model with one agent is included in Baiman and Evans (1983). Chapter 7 of this thesis includes a formulation of the revelation problem with more than one agent.

$$\text{and } E[w(\cdot) - Z(\cdot) | \theta, m] \geq E[w(\cdot) - Z(\cdot) | \theta, \bar{m}]. \quad (3-31)$$

Expressions (3-28), (3-29) and (3-30) are similar to (3-3), (3-4) and (3-5) respectively except that the agent's utility function takes an explicit additive, separable form. The main difference is the addition of (3-31), where m is $m(\theta)$, the message sent by the agent to the principal. Constraint (3-31) states that the agent should not be worse off if he reports the true value of θ rather than other biased values of θ , given the pre-defined compensation schedule. This effectively restricts the program to those compensation schedules for which the agent's optimal message strategy is truth-telling. The choice of the effort level after communicating the θ value is more complicated than indicated in (3-30). The agent has to take into account the message he chooses to send when choosing the effort level.

The revelation principle assures that any expected utility level achievable by a non-truth-inducing reward scheme is also achievable by a truth-inducing scheme. However, it does not mean that inducing the truth-telling behaviour of the agent is costless. The presence of (3-31) indicates that the principal has to restrict her use of the information communicated. This restriction represents the cost of information revelation. The trade-off is between this cost and the benefit that can be obtained from having the agent report truthfully. The revelation principle assures that the loss of efficiency from restricting the reward scheme to be truth-telling is equal to the loss of efficiency from letting the agent misrepresent his information (Baiman and Evans, 1983). An extreme example is that the principal could choose a reward system which ignores the agent's message so that the agent has no incentive to lie.

The revelation principle enables the principal to induce truth-telling reporting from the agent if she chooses to do so. When the revelation principle holds, "all parties should be indifferent between a non-truth-telling equilibrium and its Pareto equivalent truth-inducing equilibrium" (Baiman, 1990) because both alternatives generates the same utilities for all parties. However, "one can then argue that the truth-telling equilibrium would be chosen because it is a natural focal point" (ibid.). According to Baiman (1990), for the revelation principle to work the following conditions should exist: (a) the principal who receive messages from the privately informed agent can credibly commit to how she will use the messages--

precommitment condition; (b) the privately informed agent is physically able to communicate all of his information if he chooses to do so -- ability to communicate condition; and (c) there are no restrictions on the form of the contract -- free-form contract condition. If one or more of these conditions does not hold, for example, the principal is not able to pre-commit, the revelation principle is invalid and then the truth-telling arrangement can no longer result in the desired optimum. In this case, it may be optimal for the principal to induce the agent to misreport. Baiman et al. (1987), Dye (1988) and Penno (1986) examine a variety of situations in which the revelation principle does not hold due to a certain reason(s) and explain why it is Pareto optimal for the principal to motivate the agent to misreport the results of firm's operations.

Where the revelation principle holds, it may be possible to increase the principal's welfare with the communication of private information. Strong and Walker (1987) illustrate that a properly designed contract based on the revelation principle may induce the agent's truth-telling message strategy and result in increased payoff for the principal compared to that resulted from the contract when communication is not possible. In particular, they assert that "the expected payoff of the principal when communication is possible is never less than his expected utility when communication is not possible and never more than his expected utility when the pre-effort information is observed publicly" (pp.197-188). In this context, it can be argued that communication of private pre-effort information is strictly valuable.

3.4.4 Public Pre-effort Selection Information

The role of public pre-effort information is as difficult to ascertain as that of private type of information. General analysis of public information reveals that in certain circumstances additional public information may lead to a Pareto improvement but in others it may have opposite effect (Bromwich, 1991). In the agency context, introduction of public pre-effort selection information may result in reduction of the principal's expected utility. It can lead to a Pareto improvement as well.

The different possibilities concerning the effects of public pre-effort information are related to degree of freedom of the principal in redesigning the

reward function after that information is revealed. If the reward function has already been determined and the principal promised to commit to the function regardless of any additional information available to her, and that function was so designed as such that it does not depend on additional public information after its agreement, then additional public information can be seen as equivalent to private information of the agent. Under the assumptions we made, this situation can only lead the agent to shirk, because the principal can do nothing even if she is informed because of her pre commitment. This deduction also applies to situations where communication of private information is possible but the informed principal has to commit herself to the pre-designed reward function without consideration of the additional information available thereafter.

However, an overwhelming assumption in the literature has been that the principal has crucial extra degree of freedom in changing the reward function. Suppose that the pre-decision additional information is observed by both the agent and the principal. The principal can then allow the reward function to depend on the publicly observed signals as well as other variables such as the observed payoff (Strong & Walker, 1987, p.185). If this is possible, as Strong and Walker have showed, there are two, sometimes counteracting, forces involved. On one hand, holding the agent's information constant "can never result in a Pareto loss and will often result in a Pareto improvement" (ibid. p.186). On the other hand, if additional information is accessible by the agent at the time he selects the level of effort (the principal has no time left to amend the reward function before the agent selects his effort), a Pareto loss can sometimes be resulted from the agent's shirking behaviour.

3.5 Criticisms and Extensions of the Basic Agency Model

Despite the intensive literature of the agency research, agency theory is relatively new. There naturally exist limitations associated with the theory, and criticisms have been raised concerning those limitations. In attempt to compensate for some of the limitations, some extensions have been offered of the basic agency model. In this section, we first briefly review the criticisms of the basic principal-agent model. Research on extensions of the basic model are then considered.

3.5.1 Limitations of the Basic Agency Model

Limitations and criticisms of the agency model are briefly presented in Baiman (1982, 1990) and Scapens (1985), among others. Baiman (1982) identifies two specific technical problems with the basic agency formulation: non-randomization of payment schedules and uniqueness of the optimal effort level, which restrict the agency analysis to a highly simplified organizational context. First of all, in nearly all formulations of the principal-agent problem, the principal's choice of payment schedules have been restricted to "the class of pure, non-randomized payment schedules". This simplification seems reasonable in that randomising payment schedules could introduce additional uncertainty and further complicate the problem. However, as Baiman (1982) points out, randomized payment schedules may be Pareto superior to non-randomized ones if the Pareto efficient frontier is not concave. Randomizing the payment schedule can make the Pareto surface concave if it is not otherwise. A question may be raised therefore as to whether or not pure payment schedules considered in the literature so far are Pareto optimal in the first instance. The second technical criticism of the basic agency model is that the agent's optimal level of effort, according to the formulation of the basic model (see (3-3), (3-4) and (3-5)), may not be unique. This problem was already considered in the context of the first-order approach. To ensure that the agent's solution is unique, some restrictive conditions have to be imposed. These restrictions make difficult the generalization of the basic agency model.

Baiman (1982) and Scapens (1985) also discuss the limitations of the model resulting from a number of restrictive assumptions underlying the basic agency model, such as assumptions of a single agent and of a single period. Scapens (1985) points out that the focus on the intricacies of the mathematical analysis, along with the restrictive assumptions prevent people from deriving valuable implications from the model and generalizing the results of the model beyond the simplified settings in which they were determined.

In a recent paper, Baiman (1990) presents three sets of criticisms made of the agency model in the literature. They deal with assumption unreality, model simplicity, and solution complexity respectively. With respect to the realism of some of the

assumptions underlying the agency model, criticisms have been levied upon the contract enforcement assumption, which takes it that the contract can be enforced costlessly and accurately, regardless whether the relevant parties will subsequently recontract. Related to the assumption issue is model simplicity. Because of the computational requirements of the agency formulation, and of the model's emphasis on internal consistency and optimal solutions, the agency models developed so far have been largely limited to "highly stylized, simplified" ones, leaving out many real-world environmental considerations such as market impacts and hierarchic characteristic of firms. Unfortunately, restrictive and simplifying assumptions and models do not lead to simple solutions, which, if in their original mathematical form, are often difficult to interpret and understand.

The limitations brought about by the consideration of mathematical tractability are highlighted recently by Ashton (1991). He believes that mathematical tractability prevents us enriching the models and widening the scope of application. The risk-neutrality assumption on the side of the principal, for example, is made largely for the reason of mathematical tractability, although the assumption can be justified in many cases. A similar consideration applies to the simplistic structure of the agent's problem, which has been modelled as a straightforward trade-off between effort and reward and both the utility of reward of the disutility of effort have been measured in monetary terms. Moreover, it is customarily assumed that effort can unambiguously increase output. This model of the agent's problem appears more appropriate for modelling physical labourers or farmers instead of managers. "It is extremely unlikely that the relationship between effort devoted to different managerial tasks and profitability are well defined, even in some probabilistic sense". (Ashton, 1991).

A more fundamental problem with the principal-agent model lies in its model of agent motivation. The agent is motivated solely by economic rationality to maximize his utility by balancing the gain from payment against the loss from working. This notion of economic rationality is most vulnerable to criticism, especially from the perspective of behavioural theory or theories of motivation. According to expectancy theory, for example,, individuals are assumed to want to achieve the greatest possible satisfaction from work; in goal-setting theory, individuals

are assumed to be motivated by challenging, specific goals; and in equity theory, individuals are assumed to desire that their outcome to effort ratio is fairly rewarded in comparison with their co-workers (Moizer, 1991). Compared with these theories of motivation, the economic model of motivation in agency models seems very simplistic and unsophisticated.

The agency theoretic view of the firm was also criticized by Hunt and Hogler (1990) and Armstrong (1991) from the organizational point of view. Based on the neoclassical economic assumption of individuals being self-interested, rational, utility maximizers, agency theory sees organizations as "simply legal fictions which serve as a nexus for a set of contracting relationships among individuals" (Jensen & Meckling, 1976). This contractual notion of organization dismisses the notion that an organization is a meaningful entity, therefore tends to overlook the sociopolitical environment of the firm and ignore social welfare issues of individuals in society. The contracting approach of agency also failed to explain the existence of corporate hierarchies and bureaucracy:

Embedded in the agency model, then, are the neoclassical assumptions that individuals will seek to maximize individual gain and that the "contracting nexus" is self-regulating, autonomous and economically efficient. But from the perspective of critical theory, corporate hierarchies are permeated with ideologies which inculcate beliefs, attitudes, and values in those individuals subject to the system of bureaucratic sanctioning. (Hunt & Hogler, 1990, p.449).

Outside of an organization, agency theory assumes there exist perfect, competitive markets characterized by rational expectations. These markets, especially the managerial labour market, are assumed to create an environment for perfect functioning of capitalism. The markets in agency theory become idealized explanatory mechanisms which broker all social relations within the organization (ibid.). It is argued that the notion of perfect market system ignores institutional imperfections and has misleadingly encouraged people to take the "free" market and its implicit institutional apparatus as "given" (Tinker, et al, 1982).

Armstrong (1990) criticizes agency theory as being "a particularly narrow-minded variant of functionalism", in which social phenomena are explained by reference to the benefits which they confer upon systems as a whole.

In the world of agency theory, individual utility maximization is simultaneously the sole motive for human action *and* the sole standard by which social institutions are evaluated. In such a universe, human beings *must* act so as to achieve the only functionality which is admitted into the model - the Pareto optimum of individual utilities. Thus, within whatever system boundaries are chosen, all social action and all social institutions are seen as functional. (Armstrong, 1991, p.3).

The narrowly utilitarian concepts of motivation and functionality characteristic of agency theory thus failed to address some critical aspects of the capitalist agency relationship such as the trust relation, resulting from the core contradictions of capitalist society. Armstrong (1991) proposed a radical agency theory, the core of which being that it views the agency relationship as constituted by social action in wider social structures, rather than as inhabited by utilitarian economic men.

In summary, it seems reasonable to say that agency research so far has mainly been at the stage of laboratory design and experiments. Limitations associated with the basic agency model prevent it from being applied widely in practice. Care should be exercised even in deriving implications from the model. It would be safer, however, to "view the principal-agent model as a framework for analysing issues and highlighting problems which arise and must be considered in applying managerial accounting procedures to real-world situations" (Baiman, 1990) than to use the model as a panacea and apply it indiscriminately. In the following subsections, we briefly review some extensions of the basic principal-agent model within the existing agency framework. As they will be fully considered in later chapters, the review here is intentionally made terse and can serve as an introduction to relevant topics.

3.5.2 Multiple Agents

Extension of the basic single-agent model to incorporate multiple agents provides a remedy against the model's two-person limitation. Holmstrom (1982) and Mookherjee (1984) make formal analyses of this extension. Green and Stokey (1983), Nalebuff and Stiglitz (1983), Demski and Sappington (1984) and Antle and Demski (1988) also consider the multiple-agent issue in the context of tournaments and in terms of information revelation.

The extension of the basic agency model to multiple-agent settings may have

no conceptual problems (Baiman, 1982). A theme of the papers dealing with the multiple-agent issue is that of relative performance evaluation under certain conditions, it is desirable to reward each agent according to not only his own absolute performance but also his performance level relative to the performances of other agents faced with similar production conditions, may be valuable and desirable.

Using his sufficient statistic approach, Holmstrom (1982) examines conditions under which relative performance evaluation will be valuable. Under conditions which allow variable θ_i in $y_i(e_i, \theta_i)$ to be non-random, efficiency can be achieved by holding each agent responsible for his own output. In this case, the general principle of responsibility accounting holds. That is, each agent is independent from others and is evaluated according to his own output. Under uncertainty, this principle holds if and only if outputs are independent. In this case, the random factor θ for i (θ_i) is independent of the random factors that influence the performances of the other agent, which implies that when the agents are faced with non-common uncertainties, the reward functions for the agents should be independent of each other. There is therefore no value in relative performance evaluation. If, however, there exist contingencies among the random factors, ie, there are common factors, that influence the agents' performances, the output of the other agents may provide information about the performance of agent i , and will therefore be useful for evaluating the performance of agent i . Holmstrom emphasizes that "what is of value is the information that may be gained" from relative performance evaluation. If the conditions which allow such information to be derived do not exist, there will be no value in creating competition among agents by using relative performance evaluation.

Antle and Demski (1988) make a similar analysis but in the context of responsibility accounting. They use the notion of information context to refine the controllability principle used in responsibility accounting and provide a rationale for using other sources of information than the agent's own output in performance evaluation. The concept of information context states that if the agent can affect the statistical pattern of some particular variable conditioned on a known variable, the first variable carries information context about the agent's action. An example is cost and revenue. Suppose cost is already known and we focus on the conditional

distribution of revenue. If the agent cannot influence this conditional distribution, revenue has no information content in the presence of cost. But if the agent can affect this conditional distribution, then revenue has information content in the presence of cost. The difference between the traditional controllability notion and the concept of information content is that the latter focuses on not only whether the agent controls the variable in question but more importantly whether the agent controls the variable in question, conditioned on whatever other information is present. The implication of this concept is that the agent should be evaluated based on the performance variables that not only are under his direct control but also carry information content of his action. The concept of information content therefore justifies the practice of tournaments, in which the peer's performance provides information about the common environment and therefore about the performance of the agent in question.

Green and Stokey (1983) and Nalebuff and Stiglitz (1983) examine the issue of using the rank-order tournaments in cases where relative performance evaluation is valuable. Green and Stokey show that, as Holmstrom (1982) proves, using the optimal tournament is dominated by using optimal independent contracts in the absence of a common uncertainty; because, from the point of information conveyance, "using a tournament in this case only introduces extraneous noise into the payoff function that agent faces" (Green & Stokey, 1983). The optimal tournament, however, dominates optimal independent contracting where the distribution of the common random factor is sufficiently diffuse. Nalebuff and Stiglitz (1983) also show that when common environmental uncertainty is large, competitive compensation schemes based on relative performance evaluation is preferable to individualistic reward structures. However, Holmstrom (1982) believes that such rank-order tournaments may be informationally wasteful if performance levels can be measured cardinally instead of ordinally. This assertion was confirmed by Mookherjee (1984), who specifies that "the condition for optimality of rank-order tournaments is that the outputs of different agents communicate information about agent action only through their ordinal rankings". He further derives conditions for attainability of the first best in the multiple agents settings. It is shown that with strictly risk averse agents, a sufficient and necessary condition for the principal to attain the first-best is that any shirking by an agent can be detected by the principal with positive probability and be punished

sufficiently heavily.

Demski and Sappington (1984) consider cases of multiple agents in which the agents possess perfect private pre-contract information about their own productivity. Their conclusions show that if the agents are risk-neutral, the principal can always induce truthful revelation from each agent as a dominant strategy and achieve the full information efficiency solution. In this case, because perfect private information held by the agent is also an informative signal about the state of nature that the other agents will face, the acquisition of private information does not allow the agents to benefit from the information, and the value of each agent's private information is nil to him. If the agents are strictly risk-averse, as Demski and Sappington show, among all incentive schemes in which truth-telling is a dominant strategy for all agents, the one most preferred by the principal will base each agent's compensation on the others' reports, rather than treat the agents independently, so long as their environments are correlated. This efficiency suggests a motivation for "merging" several single agent agencies, prompting one agent's report statistic to serve as a monitor of the others' performances.

3.5.3 Multi-period Agency

The basic agency model involves a one single period setting. Extension of the basic static model to multiperiod one has been another development in the agency literature. The main concern in this connection has been the effects on the incentive issues portrayed in the static model brought about by dynamic considerations. Examples of such effects worth mentioning here are discounting effects and reputation effects.

The first studies of dynamic agency are believed to be those by Radner (1981) and Rubinstein (1979).²⁰ Both studies are based on the assumption that there is no discounting for future utilities. The conclusion was that the first-best is attainable and the intuition was that incentive problems would be alleviated by long-term relationships. Criticism of this analysis points out that "the fact that first-best can be

²⁰A brief review of the literature can be found in Hart and Holmstrom (1987), pp.97-103.

achieved is more incidental and a consequence of the unrealistic assumption of no discounting paired with infinite repetition" (Hart and Holmstrom, 1987).

Later studies, such as those by Lambert (1983) and Rogerson (1985), show that memory is active in repeated agency context and long-term contracts may therefore be rather different from a sequence of short-term contracts. However, other studies, such as those by Allen (1985) and Fudenberg et al. (1986), suggest that the gains from long-term contracting are due to the restrictions on the agent's ability of borrowing and saving. It is argued that if the agent can access capital markets at the same interest rate as the principal, he need not be concerned about fluctuations in income since they can be smoothed out in the markets. In this case, long-term contracting is used to substitute for the self-insurance that would be available to agents, and will be no better than a sequence of single-period contracts. But again, the assumption that the agent can borrow and save freely is deemed "rather unrealistic" (Hart and Holmstrom, 1987). This in turn suggests that there are other forces than income insurance behind the benefits from observed long-term contracting in reality.

Radner (1985) gives a formal analysis of multi-period agency with discounting, offering an alternative explanation of efficiency of long-term contracts. He models the multi-period agency as a repeated game ("supergame") and allows the agent to discount his expected utilities. The analysis shows that the repetition of the game gives the principal an opportunity to use "review strategies" to achieve optimum. Roughly speaking, review strategies allow the principal to use the cumulative performance of the agent in evaluating the agent's current performance repeated as periodical review process. If a review results in a satisfactory evaluation, a new review phase is begun; if not, the players enter a penalty phase, after which a new review phase is begun. In the former case, the agent is paid according to reward function; in the latter case, the players revert to the short-term equilibrium. Radner's conclusion shows that for all discount factors above some critical values there are equilibria in review strategies that yield the principal and agent discounted expected utilities strictly greater than their one-period expected utilities respectively. Moreover, it is shown that the equilibrium strategy pairs are self-enforcing, the principal and the agent mutually induce each other to follow an equilibrium review strategy.

Studies on the reputation effects provide some other suggestions which support the common intuition that there are gains involved in long-term contracting.²¹ Although the reputation effects have been "largely ignored" in the agency literature (Baiman, 1990) due to its concentration on complete contracts, some initial studies have generated some interesting results, noticeably those by Bull (1985), Kreps (1984), and Holmstrom and Richard-Costa (1986). This literature views contracts in their incomplete form and has stressed the role of reputation in "completing" a contract. It is generally believed that the reputation of involved parties plays an important role in making an implicit or self-enforcing contract work by "rationalizing" the behaviour of relevant parties. The following remarks present the importance of reputation though the term is used in a slightly different way:

Obviously, if the world only lasted for one period, the manager would have no incentives to put out extra effort. But if he wishes to stay in the profession longer, matters are different. Prospective employers will follow the manager's performance and forecast his future potential from past behaviour. Logically, this means that there must be some characteristic of the manager that is not fully known to the market and that is being signalled by past performance. ... (Hart and Holmstrom, 1987, p.100).

The notion of incompleteness of the contract, which allows reputation and discretion to play a role in sustaining a contract, arises from the concern for transaction costs involved in writing and enforcing an explicit, detailed complete contract. Presumably, transactions between "reputable" parties can be more efficiently accomplished than between those without such reputations by reducing such transaction costs (Baiman, 1990, p.356). In the agency research, however, because of its emphasis on "optimum solutions" and complete contracts, transaction costs have been simply ignored,²² leaving no room for such things as discretion and reputation,

²¹According to Baiman (1990), reputation has been used in different ways in the literature. Basically, reputation is established based on observations by others of an individual's actions or the results of his actions. Here it is used in a general way that one's reputation reflects the history of one's actions and leads others to believe that he will choose to act in a certain way in the future.

²²Instead, agency costs have been the main concern in the agency research. Agency costs arise from divergences between the interest of the principal and that of the agent, and are defined as the sum of:

(1) the monitoring expenditures by the principal,

which are generally conceived to affect behaviour (ibid.).

3.6 Summary

This Chapter presented the basic structure and certain extensions of the principal-agent model. The model was examined primarily in the business environment where the two parties represent the owner(s) and the manager respectively. This setting allows us to see the relevance of agency research to our concerns in this thesis. The similarities between the problems studied in the bonus literature reviewed in Chapter 2 and the game structure of the agency relationship prompt us to do some comparison in a later chapter.

The language used in agency research is basically drawn from game theory and information economics. However, many terms and concepts used in the literature are not yet well established, especially when different types of information are considered. Moral hazard and adverse selection are two main concepts but different meanings may have been vested with by different writers and in different contexts. In the introduction their use in this Chapter, and generally in the whole thesis, was defined.

Section 2 described the basic principal-agent model, which involves two individuals and covers one period. Some general assumptions were first made. They include self-interest motivation, economical rationality, decision autonomy for the agent, and uncertain environment. The utility functions for the both parties were then defined, with the assumption that both are expected utility maximizers. The principal's problem of designing an optimal contract in order to motivate the agent to exert desirable level of effort in an uncertain production setting was stated as formulation of the base model, followed by discussion on the two constraints in the

(2) the bonding expenditure by the agent, and (3) the residual loss resulted from divergency between the agent's decisions and those decisions which would maximize the welfare of the principal (Jensen and Meckling, 1976, p.308).

Despite some incomparability between notions of agency costs and of transaction costs, it seems that the former is a narrower concept than the latter.

model. The first-best solution to the problem was shown to be possible when perfect information on the agent's action is available. With different combinations of risk preferences for the two individuals, appropriable reward arrangements can be made to achieve the first-best result. The principal can always induce or force the agent to exert optimal level of effort without incurring additional costs. It was also shown that even where the observation on the agent's action is not perfect but the principal can infer the right action of the agent from the imperfect observation, the first-best is still attainable with a "forcing" contract.

The solution to the agency model becomes difficult to reach when the incentive compatibility constraint is binding. An approach named "first-order approach" has been developed in the literature and was presented in section 3. Under several assumptions about the agent's utility function, such as separability in items and changes in the distribution of output with changing effort, this approach tries to solve the agent's problem of effort choice in the first instance and get a first-order condition for the agent's maximization solution. The condition is then used to replace the complicated incentive compatibility constraint in the basic model. Solving the simplified model yields the characterization of the optimal reward scheme, which characterizes the second-best solution. For the first-order approach to be valid, two conditions have to be met: the monotone likelihood ratio condition and the convexity of the distribution function condition. These two conditions were briefly discussed in the concluding part of section 3.

In consideration of the importance of information in agency and in this whole thesis as well, the information issue was given a separate treatment in section 4. However, research on the role of information in agency is so rich that the section can only serve as an introduction or summary. Various topics concerning information will be considered later on in specific contexts but section 4 provides useful guides on important concepts and corollaries. Types of information were first classified according to their timing and distribution. Public post-payoff information was then considered in terms of its value to the principal. The basic idea is that any additional information about actions or states of nature is of value because it allows a more accurate judgement of the performance of the agent. This statement confirms the value of management accounting and auditing procedures. The role of private pre-

effort selection information was then examined in a little more detail, in cases of both communication and non-communication. The effects of this type of information on contract improvement are a controversial issue, and research has not established whether the information should be communicated. In the case of communication, an important principle, the revelation principle, has suggested conditions under which communication is strictly valuable. The revelation principle also establishes the possibility for the principal to induce truth-telling reporting behaviour from the agent if he elects to do so. Public pre-effort selection information is the last category of information considered in section 4. The assertion on its value is again a mixed one.

In the last major section, criticisms and limitations of the basic agency model were briefly reviewed. A primary sentiment against the principal-agent model has been related to the its limitations resulted from a number of restrictive assumptions. In particular assumption unreality, model simplicity, and solution complexity have limited the model to highly stylized, simplified settings. It has also been criticized from perspectives of motivation theory, organization theory, and social structures. In response to certain criticisms, a number of studies have offered extensions of the basic single-agent, single-period model to incorporate wider settings found in the real world. One of the major extensions is to have multiple agents instead of a single agent. In this area, the most important achievement so far has been the discovery of the relative performance evaluation technique. The idea is that each agent is rewarded according to not only his own absolute performance but also his performance level relative to the performances of other agents faced with similar production conditions. It is also found that if the agents are risk-neutral the principal can always induce truthful revelation from each agent as a dominant strategy and achieve the full information efficiency solution. Another major extension of the basic agency model is to take into account the effects of repeated, multi-period contract. Examples of such effects include discounting effects and reputation effects, both have connection to the ratchet principle reviewed in Chapter 2. In the following two chapters, we are going to jump from literature review to description and preliminary analysis of Chinese reward systems.

CHAPTER 4

PERFORMANCE EVALUATION AND REWARD SYSTEMS

APPLIED TO CHINESE STATE ENTERPRISE

4.1 Introduction

This Chapter and the next will be devoted to the description and preliminary analysis of Chinese industrial management systems in general and of the performance evaluation and reward systems applied to Chinese state enterprises in particular. Two main objectives are hoped to be achieved. First, it will provide a general account of the functioning of Chinese industrial institutions and serve as a chronological background of changes in areas of our interest, such as enterprise behaviour and objectives and relevant reward systems. Second, it describes the peculiarities of Chinese reward systems applied to state enterprises and highlights their features and problems that can be incorporated in our later analysis. Only certain details of the main systems will be covered and some figures and facts drawn from surveys and reports will be included as illustrations. However, as this is not a case study or a practical and technical analysis of Chinese industrial reforms,¹ only selected aspects of relevance to our later analysis will be covered. Moreover, in order to avoid great confusion between theory and practice, concept and reality, technical and theoretical analysis of the described facts will be intentionally limited in these two chapters.

There exists a large branch of literature on the Chinese economic systems and industrial management systems in Chinese and, in recent years, in English as well. It may therefore seem surprising that it is not easy to find a systematic and authoritative account of the performance evaluation and reward systems applied to Chinese state enterprises. The reform schemes since the late 1970s have been received

¹Some such studies can be found in English. For example, Granick (1990), Byrd (1991), and Zhang (1992) are a few among the latest.

great attention both in China and in the West. The open-door-policy accompanying the reforms has also made those schemes widely known in the West. However, as far as we know, there is a lack of research in the specific areas that we are interested in, especially in a systematic manner. Detailed descriptions of the Chinese reform schemes are an area many researchers do not bother about. The pre-reform systems are another story. There has been little exposure of the systems in the literature presumably due to the access problem to the relevant data.² The description in this Chapter and Chapter 5 has been based on a large amount of data collected both from China and in the UK (especially from the SOAS). Much data discovery has been done from official documents, laws, unpublished surveys and reports, and research papers and articles. Because of their unique sources, it can be confidently said that these two chapters have no competitors in English as far as we know, and they constitute an important contribution this thesis makes.

As indicated in the Introduction (Chapter 1), Chinese state enterprises have experienced several substantial changes in the industrial management system over times. The major changes occurred in the late 1970s, when the economic reform scheme was launched. Correspondingly, two main systems can be roughly distinguished: the pre-reform system (1950-1978) and the reform system (from 1979), which is still in the process of change. The two systems can be generally referred to as the centralized and decentralized systems. Our analysis will cover both systems but will place different emphases upon them. In the reform period, a number of schemes, most of which were of a trial nature, have been implemented in various scales and with varied degrees of success. Examples of a large scale application include the profit-retention scheme, the tax-for-profit scheme, and more recently the contracted operating responsibility system ("the contract system"). In this Chapter, Chinese reward systems prior to the contract system will be briefly described in a chronological way. A detailed application of the contract system, which is currently being implemented throughout China, will be left to the next Chapter.

²Richman (1969) is an exception and contains much data that cannot be found elsewhere. His account of the pre-reform Chinese industrial management systems was based on his unusual visits in China. Granick (1990) also covers the pre-reform systems. We shall make use of both these studies in later chapters.

In section 2, we shall describe the Chinese industrial system in the pre-reform period (1950-1978). The administrative and financial aspects of the state-enterprise relationship will be first introduced. The objectives that state enterprises were expected to achieve, the performance evaluation for and rewards available to enterprises will then be considered. In sections 3 and 4, we shall describe two main reform schemes prior to the contract system, the profit-sharing scheme and the tax-for-profit scheme. The main concern of section 5 will be the new bonus system used under the reform schemes. The problems with the bonus system will be highlighted. Section 6 will evaluate impacts of non-financial incentives during the reform period.

4.2 Characteristics of the Pre-reform Chinese Industrial System

4.2.1 Administrative Aspect of the Chinese Industrial System

It was indicated in the Introduction that prior to 1979, Chinese state enterprises were placed under extensive control and supervision of government departments. Such a general statement, however, needs further explanation.

In March 1950, the Government Administration Council (GAC) promulgated a Resolution Concerning Unifying National Financial and Economic Work ("Resolution").³ According to this Resolution, state-owned factories and enterprises were to be "managed" in one of three ways: first, those to be directly managed by ministries under the Central People's Government; secondly, those to be owned by the Central People's Government, but to be temporarily managed by local peoples' government or military organs as trustees; and thirdly, those to be managed by local government or military organs (as owners).

Accordingly, the managerial responsibility for every state enterprise was to be ascertained. Generally speaking, the control of a state enterprise was exercised by either a Ministry at the central level or its corresponding agencies at a local (provincial, city or county) level. Some enterprises were, however, controlled by two or more government departments at the same level. In addition, a number of

³See the text in Chinese, in Laws and Regulations of the PRC Central Government (1949-1950), pp.239-44.

enterprises were identified as under the dual leadership of both central and local government authorities, though in this case one department, either central or local, had to be identified as the principal supervising authority.⁴

From 1950 and until the present day, the department or departments granted with the authority to manage a state enterprise are usually described as "government departments (authorities) in charge of the enterprise" (department in charge). The main authority and responsibility of the department in charge are: defining the product direction and production scale of enterprises, handing down planned targets, evaluating fulfilment of plan targets and rewarding enterprises, ensuring that enterprises produce and control the materials which must be supplied according to the national plan, arranging the marketing of products, and helping enterprises solve production and operation problems.⁵

In addition to the department in charge, many other government departments and agencies such as banks, public finance office and tax bureaux are also empowered to supervise and control the operation of state enterprises. Moreover, local government departments possess significant powers to control enterprises which are not under their direct supervision but which are located in their territories. Under the unified national state planning system, an enterprise which is put under exclusive supervision of a central Ministry may nevertheless have to obtain its production material from relevant local government departments.

In fact, since the 1950s, a state enterprise has been put under both "production branch vertical" (tiaotiao) control and "local horizontal" (kuaikuai) control. Usually, the department in charge, together with many other government departments that have the authority to supervise enterprises, are referred in China as enterprises' "mothers-in-law", a term which, in the Chinese context, usually denotes excessive control.

⁴ It is very difficult to describe the jurisdiction of each government department at the same level, as the criteria for dividing the authorities of different departments are frequently changeable. For an attempt to define the responsibility for the eight Ministries concerned Machine Building, see A. Donnithorne, China's Economic System (1967), George Allen and Unwin Ltd., Second Impression 1981, p.150.

⁵ For a general description in English, see Ma Hong (ed.), Modern China's Economy and Management, Beijing: Foreign Languages Press, 1990, pp.119-22.

One of the results of this rigid control system was that enterprises were deprived of decision-making powers. All important management decisions were to be made by government departments in charge. Enterprises had to obey and implement the government's production and operation plans. Materials needed for enterprise production were supplied by the government; products were purchased for redistribution by relevant government departments;⁶ profits were delivered in total to the state treasury; the additional fixed assets and working capital of enterprises were appropriated by government financial departments; enterprises' workers and staff members were assigned by the government, and their welfare and reward fund was drawn according to a fixed percentage of the wage payroll and was included in the cost.

In the 1950s and 1960s, the central government made several attempts to reform the relationships among enterprises, the central government, and local governments. However, except for occasional and insignificant move to grant enterprises certain autonomy by, for example, reducing the number of mandatory targets, those attempts were mainly concerned with the reallocation between central and local governments of the powers and control over enterprises (Ma, 1990). Little attention was paid to the fundamental issue of promoting enterprise autonomy and providing substantial incentives. To a great extent, state enterprises remained as "appendages" of government departments.

4.2.2 Financial Relationship between the State and Enterprises

The financial system applied to Chinese state enterprises between the 1950s and 1977 is usually described as tongshou tongzhi, literally "unified income and unified expenditure". Under such a system, a state enterprise first paid industrial and commercial taxes. Income tax was not applicable to state enterprises which had to transfer all of their profits to the state budget. The State would compensate for losses any enterprise had sustained. And the capital which an enterprise needed for

⁶Products produced by state enterprises were not simply transferred to the state free; instead, they were "bought" by the state at fixed prices. This enabled enterprises to generate "profits".

expanding production could only come from the state budget.

This Chinese tongshou tongzhi system seems to have gone further than its Soviet prototype. In the former Soviet Union, profits made by an enterprise were, in principle, kept by the enterprise and its supervising government department for the purpose of expanding future production. Thus, the amount of profits which went into the state's pocket actually consisted of two parts: the first was just ten per cent of the amount of the profits which the enterprise was required by the state plan to fulfil; and the second part was the amount of profits which were deemed to be excessive to the needs of the enterprise and its supervising government department. In contrast, the Chinese government ordered every state enterprise to transfer all profits to the state. The funds were then repaid from the state budget to the enterprises in terms of the needs of the enterprises and as incentives to the enterprise. Therefore, the differences between China and the Soviet Union lay in both the process of profit distribution and the amount of profits being distributed. But in terms of productivity and economic efficiency, the Chinese system simply failed to provide proper incentives to enterprises. It failed because it removed the direct link between profits which an enterprise had made and the amount it could expect to retain for its own use. In the late 1950s, after the breakdown of the Sino-Soviet relations, the Chinese government sought to justify its pooling policy by openly criticising the Soviet style on the ground that the later was excessively concerned with material incentives, thus following the erroneous "revisionist" way.⁷

It must, however, be mentioned that in order to provide certain material incentives for the enterprise, during the periods of 1952-1957 and 1962-1968, the Chinese government implemented the enterprise bonus system. Under this system, an enterprise could expect to receive a limited bonus if it overfulfilled profit quotas prescribed in the state plan. In the early 1960s, a profit-sharing system was even experimented. These limited financial incentives will be further described in the incentive subsection below.

⁷The term "revisionist" was used to refer to a way which was condemned to be against traditional Marxist theory.

4.2.3 Objectives of Chinese State Enterprises

One of the features that distinguished Chinese state enterprises from profit-maximizing firms in a Western market economy was the objectives that were expected to be achieved by enterprises. These objectives, in a general sense, comprised what the State required the enterprises to accomplish. They might not be consistent with the objective(s) that the enterprise wished to achieve in order to serve its own interests. On the other hand, they may be regarded as the overall objectives of the State (a detailed discussion on objective or utility functions of the planner and of the enterprise can be found in Chapter 8).

In the pre-reform years, three types of objectives were expected of state enterprises. They were social objectives, economic objectives, and political objectives.

(i) *Social objectives.* A Chinese state enterprise in the pre-reform period was first of all a "unit" of the society. For many years until the late 1970s, governments at different levels and their departments directly managed enterprises. And to a great extent through the overall administration of enterprises, the government was able to command effectively the society. As such, enterprises merely operated as state organs and performed various administrative functions. Connected with the administrative functioning are the social functions that state enterprises had to (and still do) carry out. For example, state enterprises, in particular large or medium-sized ones, were (and still are) required to provide their workforce with many social and welfare services which in the West are usually provided by government agencies, social and economic institutions, as well as the market. These services range from the building and distribution of housing facilities to the education of workers' children. It is mainly because of these social functions that Chinese state enterprise are often informally referred to in China as "small societies" (Fu, 1992, p.43).

Production is the main function of industrial enterprises. It is also the main economic activity of a Western manufacturing firm. Production activities of Chinese enterprises cannot be simply regarded as economic ones because the main purpose of production was not making profits. According to the orthodox socialist theory, the fundamental aim of socialist production is not to pursue economic profits, but "to

satisfy the increasing material and cultural needs of the people".⁸ Therefore production activities (at least some of them) of state enterprises may be best regarded as of social nature. These included production of certain goods considered vital to the economy and of highest priority to national and regional development and the provision of goods to meet social demands (World Bank, 1988, p.96; Commonwealth Secretariat, 1978).

(ii) *Economic objectives.* The economic feature seems to be common for all types of enterprises across the world. That is, enterprises must be engaged in economic exchanges by producing goods or providing services. However, prior to economic reforms, this feature was far from being an explicit feature for Chinese state enterprises. For many years, Chinese state enterprises were "appendages" of governments and their departments, rather than independent economic entities. However, the pursuit of economic efficiency were from time to time called for. This included the generation of revenues for the state budget and the promotion of economic growth through the efficient use of resources. Reduction in cost, improvement of product quality, economization on funds, and profitability were included in this type of objectives.

(iii) *Political objectives.* This category of objectives appear difficult to define because of their variation and implicit nature. The socialist nature of state enterprises lies particularly in their political role.⁹ In socialist countries, it is generally believed that political pursuit of enterprises can boost workers' enthusiasm which ultimately enhances production efficiency. Moreover, in order to uphold and reinforce the leadership of the Communist Party, the establishment of grass root party organisations is required within state enterprises. In order to maintain their authority within

⁸This thinking continues even today. Art.3 of the SEL (adopted in 1988) provides that the fundamental tasks of the state enterprise shall be to develop commodity production, create wealth, increase accumulation (of wealth) and meet "the growing needs of the people with respect to their material and cultural lives" in accordance with state plans and market demand.

⁹For a detailed account of this aspect, see Andrew G. Walder, Communist Neo-Traditionalism (Work and Authority in Chinese Industry), University of California Press, 1986, especially Chapter 3, "The Party-State in the Factory".

enterprises, party organisations must be involved in enterprise management.

State enterprises in socialist countries were expected to provide political education to the employees and to organize political activities through the party organization and various mass organizations of a political nature, per se. Enterprises were expected to be supporters and executants of the government's and Party's policies and strategies. From time to time, their status and performance were used by relevant agencies in pursuit of the career interests of agency officials (World Bank, 1988, p.94, Battat, 1986).

Prior to 1979, Chinese state enterprises were the major forces predominate in industrial production, accounting for some 78 percent of urban employment and 83 percent of gross industrial output. This implies that social objective to produce social goods were the main objective for these enterprises. Political objectives, however, were also deemed important, especially during the periods of the "Great leap forward" (1956-1958) and of the "Cultural Revolution" (1966-1976). During these periods, when political movements were in full swing nationwide, political requirements predominated all others. This can, perhaps, be illustrated by a quotation from a textbook used soon after the end of the Cultural Revolution:

... Socialist enterprises must take class struggle as the key line, adhere to the party's basic line, stick to a socialist direction in enterprises, struggle against capitalist and all exploiting classes; ... (Hebei Univ. 1977, Quoted from Battat, 1986)

Economic objectives, which are the sole objective for Western private firm, were also required of Chinese state enterprises and even sometimes given priority by the government. This happened mainly during the periods following the above-mentioned political movements, when national economic situation had been considerably worsened. To practise strict economy and reduce costs was then called for. But the effects were constantly diluted by the general non-economic orientation of enterprises and by a lack of an appropriate management system for the achievement of economic objectives. As a result of general de-emphasis of economic objectives, Chinese industry exhibited tremendous inefficiency and slack in the pre-reform period. Total factor productivity in state industry stagnated since the late

1950s, despite the relatively high economic growth rate in that period.¹⁰

4.2.3 Performance Measurements

The political requirements, by the nature, could not be explicitly and quantitatively defined, and tended to vary according to the political atmosphere. While they are important factors in analysing the objectives and behaviour of Chinese state enterprises, it becomes difficult to take them into account when the specific performance evaluation system is considered. These requirements are somewhat implicit and are difficult to be put into form of target or quota.

One way of measuring them as targets is to set up some important and measurable indicators that can approximately reflect performance of the enterprise in the political and ideological area. Candidates for such indicators could include the number of new Party members per year, number of Advanced Workers of different levels, frequency of political seminars,¹¹ and absenteeism rate.¹² Observations suggest that performance measurement in the political area was informal and subjective, which by no means suggests it was not important. The use of official indicators could not be found in official instructions and documents, though some indicators were often included in year-end performance reports by enterprises. Enterprise performance in the political and ideological area was more often self-

¹⁰The overall industrial growth in the pre-reform period was impressively high (9.7 percent per year in real terms from 1957 to 1978). However, it is believed to have been achieved primarily through increases in investment (extensive growth), as it was accompanied by a poor record of factor productivity (Tidrick, 1986; Byrd, 1991).

¹¹Nearly every enterprise and institution in China was required to hold political seminars at least once a week, during the normal working time. At the seminars, it was a common practice to read Party newspaper and important official documents and to have every participant to talk about his or her understanding afterward. This practice still continues nowadays but is limited in scale and frequency.

¹²In China, breaches of working discipline have been taken as problems in "political consciousness" and a routine remedy was to give the person concerned an additional political lesson and sometimes to publicly criticize the person in such occasions as political seminars. A recent pervasive measure is, however, to use financial penalties.

evaluated and reported to the higher authorities by the party organization within the enterprise. One of the main criteria for performance appraisal was ideological "purity" and activeness (Laaksonen 1988, p.253), measured by the indicators listed above and the report by the enterprise itself.

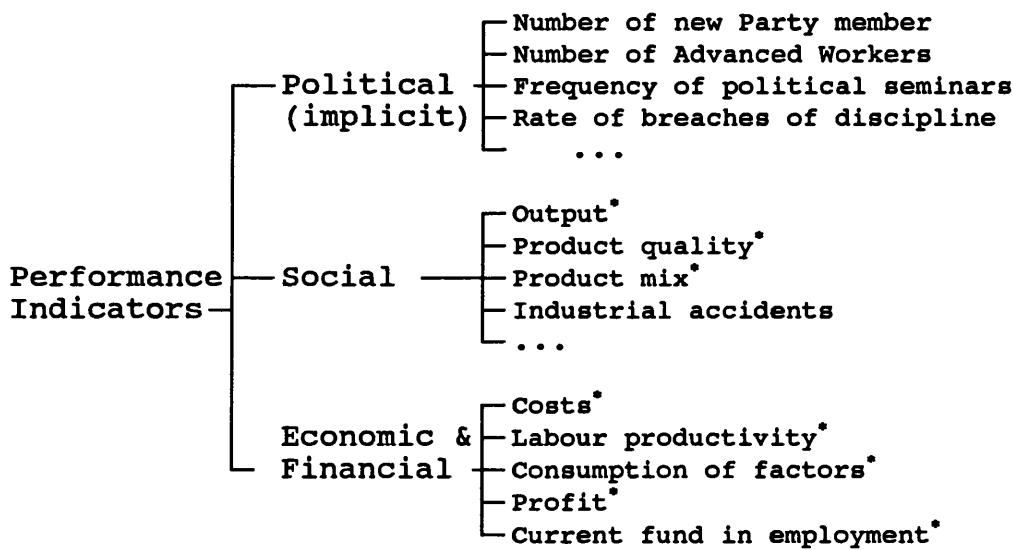
Social objectives represented by production targets had officially been given priority in periods when political movements were less active. Maximization of the output was the most straightforward, among other social objectives and political and economic objectives. Production targets (in both physical and 'value' terms) were most visible and given top priority by the Centre (Ministry of Finance, 1987, p.164). Fulfilment of production targets was the main official indicator of enterprise performance during the pre-reform period (CEEM, 1984, p.222).

Some economic and financial indicators were also included in the performance appraisal system prevailing prior to 1979. Among them the most emphasized and often used were cost indicators.¹³ In theory, when prices were fixed extraneously, costs should be very appropriate indicators of enterprise's economic efficiency. Under certain conditions, cost minimization can be taken as equivalent to profit maximization. In particular, aggregate cost information should be very valuable if the centre wished to use it in their control mechanism (Laffort and Tirole, 1986), since cost information can reveal the real efficiency of the enterprise that the planner wishes to know. But in reality, a number of factors made these types of cost indicators little more than ornamentation in pre-reform China. Except for the top priority given to the output targets, the lack of a link between financial performance and incentives contributed greatly to the limited use of these indicators (as explained in the next subsection).

In 1958, the State Council set the indicators of output, quality, consumption of raw materials, cost, and current fund. A formal system of performance appraisal was formulated in 1972, including seven indicators: output, product mix, quality,

¹³Cost indicators consisted of a set of cost-related indicators computed by different standards. Those included in the cost plan and financial reports were total costs of products manufactured and "sold", the unit cost of main products, and the cost reduction rate of comparable products (main products previously produced and had therefore the data on the unit cost available).

consumption of factors, labour productivity, cost, and profit. The indicator of current fund in employment was added in 1975. These indicators were used to evaluate the economic performance of the enterprise and linked to some financial incentive schemes applied during certain periods, which are described below. Overall, important performance indicators used in the pre-reform time included the following.



*included in the official version of socioeconomic performance indicators applied to Chinese state enterprises, 1975

Fig. 4.1 Enterprise Performance Indicators, 1975

4.2.4 Incentives Available to Enterprises

Incentives are needed where interests of different parties diverge and agency problems arise. During the three decades prior to the reform, Chinese central authority had attempted to eliminate or reduce the divergence of interests of the State, managers, and workers, and therefore to simplify the control and reduce the need for incentives at the enterprise level. In order to achieve this, the authorities put a great effort into carrying out sustained political and ideological education, trying to convince the groups that the basic interests of all groups were identical, and

restricting individual's desire for material benefits. This strategy did work during some certain periods. For example, in the early 1950s, people were willing to sacrifice their own interests for the state interests (Zhang, 1991). During the Cultural Revolution, people were led to believe that pursuit of material benefits was revisionist's idea (Battat, 1986). But in other periods of time, when people realized the existence of their own independent interests and tried to pursue them, a need for providing incentives arose.

Some Western observers deny the existence of a performance evaluation and reward system during the pre-reform years. For example, Granick (1990) states that "an enterprise was neither rewarded nor punished, regardless of what it did". Byrd (1991) notes an "interesting feature of the immediate prereform situation was the virtually complete absence of financial incentives at the enterprise and individual levels"(p.6). These statements are generally correct as far as the following are concerned: a) financial incentives, and b) individuals within an enterprise. However, if the term "incentives" is understood in a broader sense and not confined to individual money bonus as in the Soviet case, we can perhaps safely argue that there did exist a reward system connected to the performance evaluation system described in the previous sub-section. This reward system had two distinct features relative to the Soviet system. First, it emphasized non-material incentives. Second, it was collective-oriented.

During a great part of the pre-reform period, performance in accomplishing output targets however, was of often some relevance to non-financial incentives and sometimes to very limited material incentives (bonus). A review of incentive policy since 1949 revealed a circling or fluctuating use of non-material incentives and material incentives, reflecting the general political atmosphere and elasticity of economic policies (Adelman & Sunding, 1987). There were several ups and downs in the pre-reform period in terms of economic versus political dominance. Roughly speaking, the period can be divided into four sub-periods, with different types of dominance associated with them (see Fig.4.2). Accordingly, the use of financial (material) incentives changed over times.

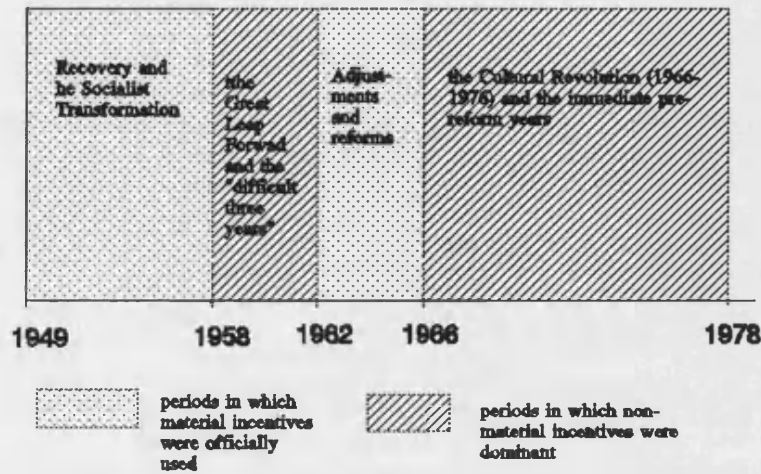


Fig. 4.2 Material versus Non-material Incentives, 1949-1978

Material incentives, being constantly criticized by some officials as a "capitalist measure", were used in a very limited and cautious way. During some periods, enterprise-oriented financial incentive schemes were applied. From 1952 to 1957, the Enterprise Incentive Fund System was introduced. If the enterprise had fulfilled the targets on production (sales) and profits, it could claim 3.5 percent of planned amount of profits and 20 percent of the above-target amount of profits as the incentive funds, which could be used for bonus distributions (Ministry of Finance, 1987, p.164). From 1958 to 1961, the profit-retention system, a scheme similar to a reform scheme with the same name, was tried out. Under this system, the department in charge might, according to the quotas fixed by its superior government offices, set the rate by which an enterprise under its supervision could share out all profits that the enterprise made. It was estimated that the average rate for the profit-sharing by enterprises during those four years was 10.2 percent of the total profits made by relevant enterprises (Ministry of Finance, 1988, p.95). From 1962 to 1968, the Enterprise Incentive Fund System was restored but the enterprise was subject to a new performance evaluation system. Fulfilment of all six targets on output, product quality, introduction of new products, payroll, costs, capital in employment, and

profits would entitle the enterprise an incentive (bonus) fund up to 5 percent of payroll. Failure to fulfil each one of the six targets would mean a proportional reduction in the fund (Ministry of Finance, 1987, p.164). Bonuses could be awarded to individual works who achieved outstanding performance in production, technical innovation, or even political and social activities.

In contrast to material incentives were the non-material incentives, which were used intensively and predominantly during the Pre-reform period. Within enterprises, these incentives were basically of a moral nature, including election as "advanced workers", nominating candidates for the Party membership, issuing certificates of honour, which could be awarded according to individual's performance in the above-mentioned activities (Lee, 1987). Heads of enterprises, on the other hand, showed more concern for their career development, which might be a main motivation for them. Seen as more government civil servants than professional managers, they were incorporated into the huge hierarchy of the Chinese government, each having a rank within the hierarchy which corresponded to that assigned to an administrative official. The career path of an enterprise manager depended on a performance evaluation which related to performance of his or her enterprise as a whole, as well as upon his or her seniority, political affiliation, and connections with higher authorities. Fulfilment or overfulfilment of the production targets would generally increase opportunities for promotion and public recognition.

In considering the incentives for enterprises in the pre-reform years, there was one type of special incentive that should not be ignored. This is a host of services and welfare utilities for employees, ranging from housing¹⁴ to day-care facilities, medical care, entertainment facilities (such as cinemas and clubs), commuter transport, and pensions. In large enterprises, subsidised shops, schools, and sporting facilities were also provided specially to their employees. Enterprises in the late 1970s also had responsibility to provide employment for employees' children. These kinds of

¹⁴Granick (1990) provides some data on housing sources in China's two hundred cities in early 1980s. A survey showed that 18 percent of rented housing, measured in floor space, was owned by individuals, 29 percent by municipal administrations, and 54 percent by enterprises and institutions that rented only to their own labour forces.

incentives, which are referred to as the "welfare incentives" in this thesis, affect the work force of an enterprise as a whole. As Granick (1990) correctly points out, they may be "of major significance", particularly in centrally planned socialist economies, where various goods and services are typically not freely available in the market place.

How were these welfare incentives related to the enterprise's performance? Unfortunately, this question cannot be answered fully due to a lack of relevant data. But one fact may help us make an intuitive judgement. Investment for the welfare facilities and particularly for housing comes from two sources: state grants and in certain periods, profits retained by the enterprise. As the latter was rare in the pre-reform period, the only source became the state grants. It has been common knowledge and reasonable practice that "advanced" enterprises can get "favourite treatment" from their higher authorities. It seems logical to link the title "advanced" with the enterprise's performance in fulfilling political, social, and economic tasks, especially in fulfilling the production targets, and the manager's reputation and relationship with the higher authorities.

4.3 Profit-sharing Systems (1978-1983)

From this section on, we shall look at the Chinese performance evaluation and reward systems since 1979. These systems have been introduced as parts of economic reforms initiated in 1979, they may therefore be referred to as the reform schemes. A number of reform schemes have been introduced, as Fig.4.3 illustrated. The Enterprise Fund System was the first reform scheme introduced in late 1978. It was short-lived and was replaced by the Profit Retention System in 1979-1980. The Profit Retention System had two versions with the second version being the main one. In 1983, the Tax-for-Profit System was applied to the majority of state enterprises in 1987. Three major schemes can thus be identified. They are profit-sharing scheme (including the enterprise fund system and the profit-retention system), tax-for-Profit scheme, and the contract system. In the remaining part of this Chapter, we shall describe the profit-sharing scheme and the tax-for-profit scheme, while leaving the contract system to the next chapter.

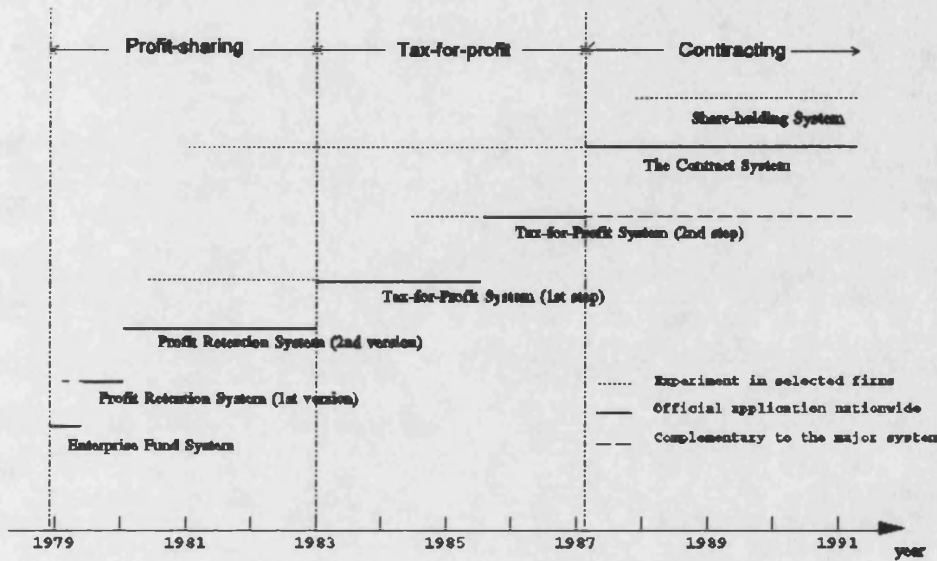


Fig.4.3 Reform Schemes Since 1979

4.3.1 Enterprise Fund System

A major intention of the Chinese government in carrying out economic reforms has been to achieve higher efficiency in individual enterprises and in the society as a whole by granting enterprises more autonomy and linking the authority, responsibilities, and benefits of enterprises together. As was described in Chapter 1, a considerable degree of decentralization has been since realized at the levels of local government and of enterprise. The basic relationship between enterprises and government administration is, however, sustained by the ownership of the state over the enterprises. The control over the enterprises by administrative authorities remains, though the extent has been gradually reduced and flexibility has been made available to enterprises with regard to production, sale, finance, and personnel.

One of the areas that has been subject to great changes since 1979 is finance. In the pre-reform years, all the revenue generated by state enterprises were transferred to the State, therefore there was no division of revenues between the State and enterprises. Since 1979, in order to create direct financial incentives for enterprises to increase net income, a number of schemes have been introduced to divide the cake between the two parties. The net income of an enterprise should then be distributed, according to a pre-set scheme between the State and the enterprise.

This process is generally referred to in China as the income distribution between the State and the enterprise.

In 1978, some state enterprises were allowed to withdraw "enterprise fund"¹⁵ out of their annual profits. To qualify for a withdrawal of enterprise fund, an enterprise had to fulfil certain targets and indexes prescribed in the state plans. At the beginning of the introduction of the system, the targets and indexes included: annual output; variety of products; quality of products; consumption of raw and processed materials, fuel and power; labour productivity; costs; profits (including realised profits and profits transferred to higher authorities); and amount of working (current) capital and fulfilment of supply contracts.¹⁶ In 1979, the number of targets and indexes was reduced to just four. They were annual output (physical output of main products, sometimes the gross value of industrial output); quality of products; profits; and fulfilment of supply contracts (China Encyclopedia of Enterprise management, Vol.1, p.222).

An enterprise which had accomplished all four targets would be entitled to collect as enterprise fund up to as much as five per cent of its total annual wages bill for workers. An enterprise which failed to fulfil all the four targets but nevertheless succeeded in realising profits quotas imposed by state plans, could still collect enterprise fund of 1.25 percent of its total annual wage bill for workers, for each of the four targets it had actually carried out. An enterprise which failed to fulfil profits quota set by state plans was deprived of the right to withdraw enterprise fund. Moreover, enterprise fund had to be invested in employees' welfare facilities and up to 20 percent of the fund could be distributed as bonuses. In addition, under this scheme, enterprises might also claim enterprise fund out of the profits exceeding the

¹⁵See Ministry of Finance (as approved by the State Council), "Regulations Regarding the Experimentation of Enterprise Fund System in State Enterprises", Nov.25, 1978), in Selected Enterprise Laws and Regulations, pp. 319-21. The Regulations were later amended by the Ministry of Finance on Oct.17, 1979 in "Circular Concerning Improving Measures Used by State Enterprises to Draw Enterprise Fund", *ibid*, pp.337-41.

¹⁶The fulfilment of supply contracts was important because it was one of the major ways to implement state economic plans.

previous year's total profits (the percentage varied according to industry from 5 percent to 15 percent), which was expected to be used only for productive investments (Sun & Zheng, 1988).

Under the enterprise fund system, the direct link between the percentage of the financial resource to which the enterprise was entitled and the fulfilment of plan targets, and the right of enterprise to utilize the fund for bonuses and employees' welfare demonstrated the motivational implication of this scheme. The financial incentives under this scheme were directly based on the fulfilment of state targets, especially of the profit target. The enterprise fund system can therefore be classified as a plan target-based incentive system. It is interesting to note that under the enterprise fund system, the profit target acted as the decisive measure of performance, i.e., whether or not an enterprise was eligible for the enterprise fund would depend on the fulfilment of the profit target, which reflected increased importance of financial performance.

The enterprise fund system was, however, short-lived and only applied for approximately two years. Even in 1979 when this system was widely applied, some enterprises were selected to experiment with a new profit-retention system.¹⁷

4.3.2 Profit-retention System

The profit-retention system was officially introduced in 1980. This system was similar to the system that operated between 1958 and 1961. The objective of this scheme was to provide enterprises with greater financial autonomy and more powerful financial incentives.

In some respects, the profit-retention system was similar to the enterprise fund system. In order to qualify for sharing profits, an enterprise had to fulfil four targets: annual output, product quality, annual profits, and the fulfilment of supply contracts. These four targets were the same as those under the enterprise fund system.

The calculation of retainable profit under the profit-retention system was

¹⁷ "Provisions Concerning the Implementation of Profit-Retention System by State Enterprises", promulgated by the State Council on 13 July 1979. For the text in Chinese see Laws and Regulations of the PRC (1979), pp.253-55.

different from that of the enterprise fund. The initial method was applying a pre-set percentage to the total amount of realized profit (referred to as the "full-amount based retention" or version 1). This method was replaced by version two before long. In version two, the retainable profit was calculated in two parts, one part based on the base amount and another based on the increased amount (referred to as the "base-amount- plus incremental-amount- based retention"). The percentage applied to the base amount was preset by the higher authorities by taking into account 1) 1% -3% of total profits for a new product trial run fund; 2) the actual amount of research funds and technical training funds for employees granted by the State in the base year; 3) employees' welfare fund amounting up to 11% of total payroll; 4) bonus fund equal to up to 10% of total payroll; and 5) an enterprise fund up to 5% of payroll, which served as a reserved fund. The percentage applied to the incremental portion of profits varied according to industry from 10% to 30% (Ministry of Finance, 1987).

Under the second version of the profit-retention scheme, when all the four plan targets (output, quality, profits, and supply contracts) were fulfilled, the enterprise could be eligible for a certain amount of profits, which was calculated by

$$B(\pi, \bar{\pi}) = \begin{cases} \alpha \bar{\pi} + \beta (\pi - \bar{\pi}) & \text{if } \pi \geq \bar{\pi} \\ \alpha \bar{\pi} & \text{if } \pi < \bar{\pi} \end{cases}, \quad (4-1)$$

subject to $q_k \geq \bar{q}_k \quad k=1, \dots, 4,$

where B is the amount of profits retainable by the enterprise; π and $\bar{\pi}$ represent respectively the actual profits realized and the base amount of profits (usually the average profits realized per annum in the immediately previous three years); α and β are percentages applied to the base profits and to the profit increments respectively. Failure to fulfil anyone of the four plan targets would reduce 10 percent of the profits retainable as calculated in (4-1). The profits retained by enterprises had to be used for special purposes, including production development, workers' welfare, and workers' bonuses.

The importance of the plan was greatly increased under the profit-retention

system (Tidrick, 1987). The profit retention system also reinforced the importance of profits and profit targets. Overfulfilment of profit targets could qualify enterprise for accelerated retention of an above-base portion of profits (10%-30%). It is claimed that the new system created an incentive to maximize profits and to overfulfil the profit target rather than simply to reach a threshold of 100-percent of target fulfilment (ibid). The new system was therefore characterized by both being plan-target based and its direct profit incentives.

The most difficult and controversial issue facing the profit-retention system was the way by which profit-retention rates were determined. Generally speaking, the rates were to be set through gradation. In practice, such gradation took two steps:

The profit retention rate for each province, municipality, autonomous region and central government department shall be set by the Ministry of Finance; and then within the set rates, each province, municipality, autonomous region and central people's government department shall respectively decide the profit-retention rate for every enterprise under its supervision. ("Provisions", 1979, see Footnote 3).

Accordingly, the profit-retention rate, which would in principle be applied for at least three years, could vary considerably in terms of region, department and indeed enterprise. The main consideration for such flexibility was that each enterprise was confronted with its own particular set circumstances because of the irrationalities in the supply of materials, in pricing policies and in many other factors. And for this reason, it would be grossly unfair if all enterprises were put under a single rate for profit retention. In fact, at that time, and indeed even at present, external environment and internal circumstances vary considerably from enterprise to enterprise. Some enterprises have little difficulty in making huge profits, but others are never profitable.

In an attempt to equalise profitability among enterprises, the government implemented a discriminatory rate policy which operated to lower profit margins for highly profitable enterprises and to increase profit margins for struggling enterprises. However, the outcome deriving from such discrimination, as well as variable base profit figures, proved to be highly unacceptable. First, due to the existence of the above mentioned irrational factors, some enterprises could benefit greatly even if the rate for their share of profits was set at a low level. But others had to suffer despite

endeavouring to enhance efficiency. Consequently, complaints were inevitable. Secondly, the possibility of negotiating for favourable profit-retention rates blocked, rather than helped, the implementation of the policy of separating government administration from enterprise management in financial matters. Instead of providing enterprises with financial autonomy, the profit retention system operated to strengthen the position of government departments in charge of enterprises. An enterprise which had better relations and succeeded in its negotiations with government departments could expect to hand over less, and to retain more, of its profits. In addition, enterprises were again put under tight control from regional and departmental governments which were allowed to retain some of the profits handed over by enterprises under their supervision. Finally, and very importantly, one of the original purposes for implementing the profit-retention system was to encourage the efficiency of enterprises by breaking up the so-called "big rice bowl" system in which inefficient enterprises received favourable protection. Although some enterprises did sincerely pursue this objective, many were able to escape from liability for inefficiency and bad management since the base profit figure could always be lowered by supervising government departments. Even worse, no liability was incurred for those enterprises which even failed to fulfil lowered base figures.

Besides the above problems caused by the distorted nature of profits, the profit-retention system appears to have two obvious and observed problems associated with its implications for performance appraisal and for incentives. First, the problem so-called in China "whipping the fast ox" or of the ratchet reviewed in Chapter 2. The plan targets assigned by the State were worked out in the most cases on the bases of the previous accomplishments of enterprise. This meant that the better the enterprise fulfilled its plans, the higher targets it would receive for the following year. To avoid or reduce the difficulty of fulfilling the future targets, enterprises often conceal their production capacity, smooth performance reports by balancing the benefits and costs of overfulfilling the targets, and haggle and bargain with the higher authorities in order to get lower plan assignments (Chen, 1987). It is also observed that "the assignments sent down are usually dissociated from reality and sometimes degenerate into blind, subjective bureaucratic directives" because of information asymmetry and distorted information from the enterprise (ibid.).

The second problem was related to possible inefficiency that the scheme might lead to. Using the plan targets as performance measure and incentive standards lead to enterprises to concentrate on fulfilment of the targets by all possible means. When the targets, especially the profit target, can be achieved by other means than increasing efficiency, the increased importance of the plans and profit does not assure efficiency. Moreover, the direct link between realized profit, retained profit and bonuses and material benefits has also created an enterprise motivation to maximize the shares of bonuses and welfare payments at cost of production development. These problems will be further discussed later with support of empirical evidences.

4.4 The Tax-for-Profit Scheme: 1983-1987¹⁸

The enterprise fund system and profit retention system were plan-target based. Target fulfilment was the main performance indicator, to which financial incentives for the enterprise was linked. As reforms proceeded, the proportions of planned production, sales and input allocations were decreased. Only 26 percent of output, for instance, was subject to mandatory planning for a large sample of industrial enterprises in 1984 (Zhang & Zhang, 1987). this reduced importance of plan targets meant that target-based performance evaluation and incentives was losing relevance. An important change in the sphere of income distribution between the state and enterprises took place in April 1983, when the tax-for-profit scheme was brought into effect in place of the profit-retention scheme. The new tax system was implemented in two steps. The first stage, between January 1983 and September 1984, was a period of coexistence of profit payments and taxation. Although enterprises were asked to pay taxes, direct profit payments from enterprises continued to be an important source for the state revenue. The second step started in October 1984 and was aimed at radical conversion by which the state would only levy taxes from state enterprises.

¹⁸For a description and assessment of this period of the tax reform, see Yang Xiaoping, "Progress and Problems in the Development of a New Income Tax System for State-Owned Enterprises in China"(in Chinese), *Journal of Chinese law*, Vol.3, Summer No.1 1989, pp.95-115.

4.4.1 The First Step

In 1980, almost at the same time as the profit-retention system was initiated, the State Council decided to choose some five hundred state industrial enterprises located in eighteen provinces and municipalities to experiment with a new system in which profits payments were replaced by tax payments. Those selected enterprises were instructed to pay to the state not only fees for both fixed and working capital but also taxes -- including industrial and commercial tax, adjustment tax, income tax and city construction tax. The profits after the payments of these taxes and fees would be retained by enterprises for the purposes of production expansion and workers' collective welfare facilities as well as workers' bonuses which should be restricted to be less than twenty percent of the total retained profits. As such, the experimentation paid considerable attention to taxation. Income Tax was reintroduced and applied to state enterprises. In addition, an "Adjustment Tax" was introduced for the first time in the history of the PRC. This type of tax was intended to adjust the inequality existed between enterprises, mainly caused by external economic and administrative forces beyond enterprise control, such as the irrational state pricing system. The rate of Adjustment Tax for an enterprise was determined in accordance with a proportion between the profits to be retained by the enterprise after payment of City Construction Tax and Income tax, and the total income of the enterprise concerned. As a result, the Adjustment Tax rate varied from enterprise to enterprise. And this characteristic made this type of tax unique among the various taxes.

In 1983, an important decision was made to "convert profit payments into tax payment", hereafter the "Conversion"). The ultimate objectives of the Conversion can be described as: enterprises would pay taxes, and only taxes, to the state; all the profits after taxes would be retained by enterprises which would be entitled to use the retained profits autonomously.

On April 29, 1983, the Ministry of Finance promulgated the Trial Measures Concerning the Conversion of Profits to Taxes in State Enterprises.¹⁹ This document set forth a basic framework for the first stage of the Conversion. An Income Tax, as a significant part of the financial contribution from enterprises to the State, was firmly

¹⁹ See the text in Chinese, in Bulletin of the State Council (1983), pp.584-88.

established. All large and medium-sized profit-making enterprises had to pay Income Tax at a single rate: fifty-five percent of all their incomes. The profits after the payments of Income Tax should be divided between the State and enterprises. Enterprises could retain a certain amount of profits in accordance with the quotas arranged by the state. The remaining part of the profits would be transferred to the State in four different ways -- depending upon the specific situation, especially the profitability of an enterprise in question. These ways were: (1) increased progressive payments: (2) payments at a fixed rate: (3) payments in the form of Adjustment Tax; and (4) payments in a fixed amount (only applied to mining enterprises). In contrast, for small profitable state enterprises, Income Tax was based on eight graduated rates ranging from seven per cent on the first 1,000 RMB Yuan of taxable income to a maximum rate of fifty-five per cent over the portion of taxable incomes exceeding 200,000 Yuan. After the payment of taxes, all enterprises had to be responsible for their own financial affairs and the State would no longer allocate funds to them. But for those enterprises whose profits after taxation were still significant, the state could collect either contracting fees or a fixed amount of profits from enterprises.

4.4.2 The Second Step

The second step for the Conversion started in late 1984, the same year as the Chinese urban economic reforms officially commenced. After 1984, state enterprises would no longer directly make direct profit payments to the state. Instead, the imposition of eleven types of taxes was proposed. The relevant regulations read as follows.

The present industrial and commercial tax shall be divided, in terms of taxpayers, into Product Tax, Value Added Tax, Salt Tax and Services Tax. Both Income Tax and Adjustment Tax which have already been established in the first step of the Conversion shall be improved. And Resource Tax, City Preservation and Construction Tax and Vehicle and Boat Use Tax shall be introduced.²⁰

²⁰"Trial Measures Concerning the Second Step of the Conversion by the State Enterprises", drafted by the Ministry of Finance, approved by the State Council on 18 September 1984. For the text in Chinese, see Laws and Regulations of the PRC (1984), pp.224-31.

In September 1984, the Standing Committee of the National People's Congress adopted a Decision which authorised the State Council to issue relevant draft tax regulations for trial application.²¹ Many regulations and draft regulations have since been promulgated by the State Council as a guidance for implementing the new tax system. The proposed eleven types of taxes and their application are briefly discussed below.

Firstly, Income Tax is the major tax within the new tax system.²² As at the first stage of the implementation, all large and medium-sized profit-making state enterprises pay fifty-five percent of their incomes to the state revenue. However, the eight graduated rates which formally applied to small profit-making enterprises²³ were amended. The present range is from ten percent to fifty-five percent. Moreover, the amounts of taxable incomes for small enterprises were also significantly increased.

Secondly, there were minor changes to Adjustment Tax. In order to determine an Adjustment Tax rate for an enterprise, a base figure has to be settled. This base figure is calculated on the basis of the enterprise's realised profits in 1983, after balancing any possible changes following the varied rates concerning Product Tax, Value Added Tax and Service Tax, and after the introduction of Resources Tax. The formula for determining the Adjustment Tax base rates is:

$$\bar{r} = [\bar{\pi} - (T+R)]/\bar{\pi}, \quad (4-2)$$

where \bar{r} is the Adjustment Tax base rate, $\bar{\pi}$ is base profits in 1983, T the imputed Income Tax, and R retained profits as approved in 1983. In addition, an enterprise's

²¹See "Decision of the Standing Committee of the NPC on Authorising the State Council to Reform the System of Industrial and Commercial Taxes and Issue Relevant Draft Tax Regulations for Trial Application", in The Laws of the People's Republic of China (1983-86), Foreign Language Press (Beijing) 1987, p.150.

²²See "the PRC Draft Regulations on the Income Tax of State Enterprises"(in Chinese), promulgated by the State Council on 18 September 1984, effective from Oct.1, 1984, in Ministry of Finance, Caizheng Fagui Gongzuo Shouce (Work Handbook on Financial Laws and Statutes, hereafter "Handbook", in Chinese), Beijing: China Financial and Economic Press, 1988, pp.126-30.

²³The criteria for judging a small enterprise were also relaxed. Many previously labelled large or medium-sized enterprises were degraded into small enterprises and as a result they might pay less taxes.

incremental profits are only subject to a reduced Adjustment Tax rate. The formula applied is: Incremental Rate = Base Rate x (1-70%).²⁴ This rate was set for incremental profits above the 1983 base level and was supposed to remain unchanged until 1990 ²⁵(Sun & Zhang, 1988).

Thirdly, until the time of the writing, Household Property Tax, Land Use Tax and Vehicle and Boat Use Tax have not been put under any formal regulations. Actually they only exist nominally. There, however, have been detailed regulations on Product Tax, Value Added Tax, Service Tax, Salt Tax, Resources Tax, and City Preservation and Construction Tax.²⁶

The combination of all these types of taxes have made the taxation for state enterprises a very complex system. For the purpose of this discussion, it is neither possible nor necessary to describe this complex system in great detail. Next, we shall discuss some problems with this tax system in terms of its incentive implications.

4.4.3 Problems with the New Tax System

The tax-for-profit system can be seen as a major effort of the Chinese authorities in reaching the somewhat ambitious goal of making enterprises substantially independent entities responsible for their own profits and losses. In respect of the income distribution between the State and enterprises, the income tax system ostensibly makes the enterprise itself the residual claimant in place of the State as the previous years (World Bank, 1988, p.97). The old control mechanisms, such as imposition of plan targets, rewarding enterprise according the fulfilment of the targets, and restrictions on use of retained profits, have become less important. The performance evaluation by the State was significantly blunted, leaving profit as the

²⁴"PRC Measures for the Collection of State Enterprises Adjustment Tax"(in Chinese), the State Council, 18 September 1984, effective from 1 Oct. 1984 (Art.7), in the Handbook, pp.131-4.

²⁵The widespread of the contract system (see Chapter 5) since 1987 means this promise has lost its relevance, because at the time a contract was negotiated, different base levels (normally the level of the year or average annual level of the three years immediately before the contract was negotiated) was used.

²⁶See the Handbook for relevant regulations with regard to these taxes.

de facto measure of enterprise performance. Under the tax-for-profit scheme, the amount of profits enterprise could retain for its internal use depended mainly on two factors: the total net income generated by the enterprise and negotiation or bargaining over division of after-tax-profit and rate of adjustment tax. A direct link was thus established between the benefits of the enterprise and its performance in profit generation, in contrast with performance in plan fulfilment under the previous schemes. It was therefore expected that enterprise manager would be motivated to increase the profits of the enterprise (World Bank, 1988, p.52). This development can be deemed desirable theoretically, in the sense that enterprises could be transformed from the output-driven style to the efficiency-driven style provided the relative prices reflect relative scarcities. Profits can thus reflect the efficiency of production and indicate the management performance. However, profit-based incentives require certain strict conditions to work well. Two of the conditions are the existence of perfect competition and a rational price system.

The Chinese economy in the 1980s is far from market-regulated. Partial decentralization in decision-making for enterprises, the existence of the dual-pricing system, and the still limited influence of market forces especially of competition,²⁷ may disqualify profit as a powerful indicator of managerial performance as it is in a market economy.

The problems associated with the profit indicator are fully recognized by the central authorities, and a number of measures have been taken to try to dilute their adverse effects. The differential tax treatment through Adjustment Tax is one of them.

²⁷The Chinese industrial system during the mid-1980s was featured by coexistence of central planning and markets and the corresponding dual-price system. Under this price system, in principle, products and factors within the plans were "marketed" at the state-fixed prices, while extra-plan products could be sold at the market prices, which were normally higher than the state prices. After several years' efforts of decentralization, Chinese state enterprises enjoyed a certain degree of autonomy in decision making in the mid-1980s. But central planning and market forces played equally important roles in regulating the economy. According to a CESRRI survey in 1984, the planned supply of major raw materials in the 429 surveyed state enterprises accounted for 73.16 percent of the total material consumption, output under mandatory plans made up 23.97 percent of the total output, and the planned allocation proportion of products was 57.42 percent (Chen & Wang, 1988, p.174).

The flexibility was, in principle, intended to compensate for inequalities caused by price distortion and other factors out of the control of enterprises. But the result have not been as good as one might have expected. Although the state has set certain rules for determining the Adjustment Tax rate for each enterprise, the fact that each enterprise has its own special rate has caused problems. Most notably, the Adjustment Tax gives government authorities great discretionary power. The Measures for Collecting Adjustment Tax provide that the rate shall be settled through negotiations between competent government financial and taxation departments and the government departments in charge of the enterprise concerned. Such a process means not only flexibility but also uncertainty. Moreover, enterprises continue to be dependent on government authorities which are free to determine the rates of the Adjustment Tax. Finally, the negotiated nature of the tax has reduced the potentially distorting effect of changes in incentives and of profits, it has also in effect erode "the link between enterprise performance, as measured by profits, and retained earnings", and is likely to "divert the energies of enterprises to bargaining from improving efficiency and product quality" (World Bank, 1988; Tidrick, 1987).

Another measure that the authorities took to compensate for the inefficiency of the profit indicator was introducing a new set of performance indicators under the new tax system. In March 1983, a new group of indicators for performance appraisal was worked out jointly by the State Economic Commission, the State Planning Commission, the State Statistics Bureau, the Ministry of Finance, the Ministry of Labour and Personnel, and the People's bank of China. These indicators include:

- (1) the gross value of industrial output and its rate of increase;
- (2) the fulfilment rate of physical output plan target for major industrial products;
- (3) the quality index of major industrial products;
- (4) the proportion of industrial products of high quality;
- (5) the rate of reduction in consumption of raw materials, fuel, and power for major industrial products;
- (6) the ratio of resource consumption of production to output value, and the rate of decrease;
- (7) sales and the rate of increase;
- (8) realized profits and the rate of increase;
- (9) remitted profit and the rate of increase;
- (10) profit and tax as a ratio to output value, and the rate of increase;
- (11) the profit to sales ratio, and its rate of increase;
- (12) turnover (by day) of working capital, and its rate of decrease;
- (13) inventory of finished products and its rate of reduction;

- (14) cost reduction for comparable products;
- (15) labour productivity and its rate of increase;
- (16) the number of injured and dead workers in industrial accidents, and its rate of reduction.

All the various rates are calculated in comparison with the same figures for the previous period (year or quarter). The indicators have no planned or expected target values, but the various rates provide an indication of performance improvement over the previous period.

A Composite Economic Development Index is also calculated for each enterprise and administrative agencies. The index is calculated on the basis of the selected indicators listed above (Nos.1, 3, 5, 7, 8, 9, 12, 14, 15, 16). When the performance as measured by an indicator is considered to have improved (for example, a rate of increase or reduction equals or exceeds 5 per thousand), ten points will go to the index; if a rate is unchanged, five points will add to the index; if the performance is deemed to have been worsen, no points for that indicator will be added to the index. The points are then accumulated by equal weights to obtain the index (China Encyclopedia of Enterprise Management, Vol.I. p.222).

This performance evaluation index seems complicated. It is intended to make comparable performances of different enterprises, of same enterprise in different periods. This set of indicators does not bear direct relation to financial incentives for enterprises, though. It does, however, have non-material incentive implications. The publication of relevant data is supposed to put pressure on and provide incentives for enterprise managers and officials in supervisory agencies, for whom good records mean opportunities for promotion, public recognition and job satisfaction. The impacts of non-financial incentives will be further discussed in the last section of this Chapter.

4.5 Evaluation of the Bonus System in the Reform Period

4.5.1 Reinforcement of Financial Incentives

The Chinese economic reform at the enterprise level started in the late 1970s with the provision of material incentives, as was the case in the Soviet Union and in other Eastern European countries such as Hungary and Poland. As a Chinese observer

deducted, the logic behind the reform was not simply fortuitous; Rather, it has been argued to be the inevitable choice that had to be made by the Chinese reformers basing on recognition of the drawbacks associated with the pre-reform enterprise control system (Zhou, 1989). These drawbacks were mainly related to two elements: incentives and autonomy. Under the traditional system, all revenues generated by enterprises had to be transferred to the State and in turn all financial resources required by enterprises had to be allocated by the State. All state enterprises saw themselves a unit of the State. This eventually developed into the practice of every enterprise eating from the State's big pot.²⁸ Within the enterprise, a unified pay scale meant that the system of pay according to effort was not really used, which led to the practice of every employee eating from the firm's big pot. Moreover, the traditional rigid mandatory planning system left enterprise management little room for using their own discretion. This lack of decision-making power resulted in turn in their unwillingness to assume responsibility (Yang, 1990). The lack of driving force and vitality at the enterprise level caused primarily by the absence of financial incentives and autonomy was thought to be a vital problem demanding a prompt solution at the beginning of the reforms. As a result, the introduction and reinforcement of material incentives, along with the decentralization of autonomy for decision-making and the introduction of limited market forces, became the starting point and thereafter the theme of reforms at the enterprise level. The priority given to providing material incentives was explicitly reflected in the earlier reform schemes applied to the state enterprises.

Under both the profit retention system and tax-for-profit system, the enterprise was allowed to use up to 40 percent of its retained or residual profits for bonus dispensation and investment in welfare facilities. In practice, the payments of bonuses enjoyed a rapid increase in 1980s. According to the CESRRI Survey, the ratio of retained profits to gross profits rose to 21.59 percent in 1984 from 19.36 percent in 1983, and the ratio of bonus payments to retained profits went up from 25.43 percent

²⁸"Eating from the same big pot" is a Chinese idiom to describe the egalitarian practice in which different people (enterprises) get the same reward regardless their efforts and performance.

to 36.70 percent. The absolute amount of retained profits increased by 66 percent in 1984 over 1982, with the share of bonus in retained profits increased from 25 percent to 39.50 percent, according to a survey of state industrial enterprises in sixteen cities (Xia & Li, 1987). The link between these bonus payments and retained profits was also evident. The correlation coefficient between the growth rate of per capita bonuses and the increase rate of retained profits was 0.29 in the CESRRI surveyed enterprises in 1985, while the correlation coefficient between the increase rate of retained profits and that of realized profits was 0.57 (ibid.).

This dependence of bonus payments on retained profits and on gross profits generated by the enterprise ultimately highly motivated enterprises to generate profits, to shift from fulfilment of production targets to realization of higher profits and pursuit of financial results. The wish to maximize individuals' income has implications for the motive to increase or maximize profits. This profit orientation of enterprise, how imperfect the link between the profit and efficiency has been, could be regarded as representing major progress for Chinese enterprises.

However, there existed a lot of problems associated with the new bonus system in China, which have made bonus payments in Chinese enterprises lose gradually efficacy as incentives.

4.5.2 Weak Link between Profit and Efficiency and Productivity

In the reform period, when the dual price system operates, profits are not mainly determined by efforts; rather, they are determined, to a great extent, by factors and decisions out of control of enterprises, such as prices. Therefore, in many cases, increase in profits does not indicate increases in productivity or improvement in efficiency. The asymmetry of profit retention to profits earned, the divergency of rewards from retained profits caused by price distortions, and ad hoc variations and bargaining in the tax treatment have been evidenced by a CESRRI Survey in 1985.²⁹

²⁹In 1985, a large-scale, authoritative survey concerning the pre-1985 reforms was conducted by the China Economic System Reform Research Institute (CESRRI). This survey covered a random sample of 429 enterprises in 27 cities, and the report's findings was presented to the Chinese State Council in October 1985. The full version (continued...)

In seven iron and steel plants investigated, the profits for 1984 rose by 30 percent compared with 1983, largely due to increases in the share of self-marketed outputs and in their prices. The ratio of adjustment tax to the total profits fell to 18.6 percent from 27 percent, and retained profits were almost doubled because of price rises in 1984. Tax-to-profit ratios dropped from 53 percent in 1983 to 8 percent for 1984, with an increase of 2.5 times in retained profits (Xia & Li, 1987. p.102). According to the CESRRI survey of 429 enterprises, in 1984 alone, enterprises were able through "negotiation" with the higher authorities to raise the percentage of retained profits to total profits from 19.36 percent to 21.59 percent and the ratio of bonuses to retained profits changed from 25.43 percent to 36.70 percent.

The CESRRI Survey also reveals the problematic correlation between the increase of profits and productivity improvement (Fig.4.4). Fig.4.4 plots rates of

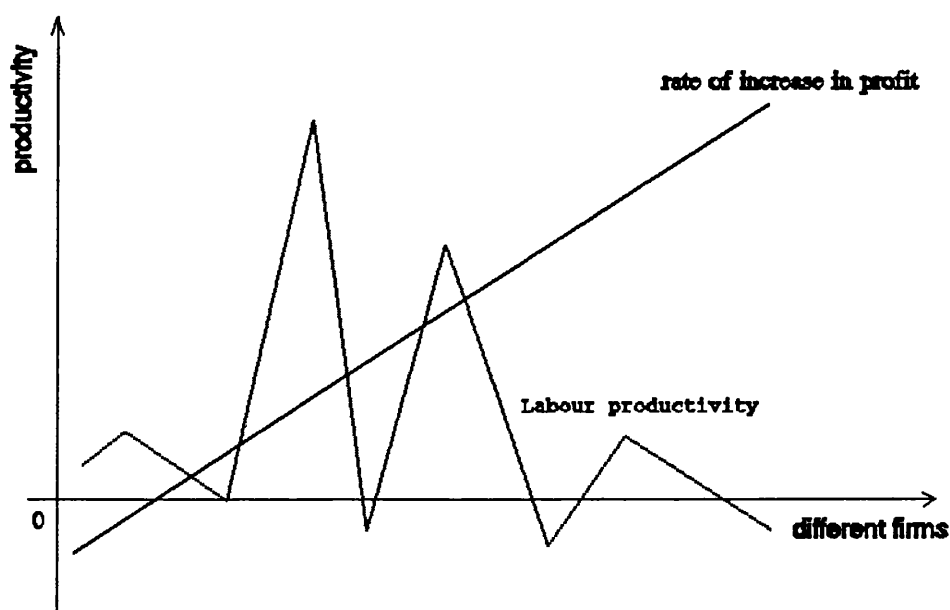


Fig.4.4 Profit and Labour Productivity

increase in profit and labour productivity in deferent firms along two lines. The straight line plots different rates of increase in profit ranging from the low to the

²⁹(...continued)

of the report was published in Chinese in 1986. Its English version was published in 1987 under the title "Reform in China: Challenges and Choices" (edited by B. L. Reynolds). A summary of the report was presented by Chen and Wang (1988).

high. The jagged line plots the labour productivity corresponding to the different rates of increase in profit of different firms. This poor correlation between the two lines indicates that high labour productivity does not necessarily mean high rate of increase in profit, or alternatively, high rate of increase in profit is not necessarily a result of high labour productivity. This poor correlation disqualifies bonuses as rewards for efforts in the real sense.

4.5.3 Widespread Abuse of Bonuses

Abuse of bonuses as a means to increase individual incomes has further reduced the incentive implications of bonuses. In China, the scale for the basic wage for workers and staff (including the managers) is fixed by the State, increases in wages are rare and limited in scale (normally increased with age or at the time of promotion). The payment of bonuses has therefore become a major way of increasing workers' income, regardless of the understood incentive properties of bonuses. In 429 enterprises covered by the CESRRI Survey, the share of the basic wage in total payroll dropped from 72 percent in 1983 to 63 percent in 1984, while the "variable" part of the payroll (bonuses, subsidies, etc.) rose from 28 percent to 37 percent (Xia & Li, 1987, p.90). Table 4.1 provides details of changes in the composition of the average monetary income for a worker in the state enterprise. It can be seen from Table 4.1 that two items have enjoyed gradual increases since 1978. One is various subsidy payment, which mainly reflects a series of price rises; and another is bonuses, which rose from 2.3 percent to 17.6 percent in 1989.

In attempts to control the bonus inflation, the State set some limits for bonus payments (a top percentage of bonus payments and investments in welfare facilities to retained profits and ceiling on total bonus payments up to three months' basic wage) and even levied a tax on extra bonus payments.³⁰ The effects of this have

³⁰In order to combat the irrational increase in bonus payments, in May 1984 the government introduced a tax on bonuses which exceeded a certain level. A rate of 30 percent was set on bonuses equalled 2.5 to 4 months' wages; 100 percent on bonuses between 4 and 6 months' wages; and 300 percent above this limit (Beijing Review, June 25, 1984, p.4).

TABLE 4.1
COMPOSITION OF WORKERS' MONETARY INCOME
1978-1990 (IN PERCENTAGE)

Year	Total	Time-rate Wages	Piece-rate Wages	Various Bonuses	Various Subsidy Payment*	Overtime	Others [#]
1978	100	85.0	0.8	2.3	6.5	2.0	3.4
1979	100	75.5	2.5	7.5	8.8	2.0	3.4
1980	100	69.8	3.2	9.1	14.1	1.6	2.2
1981	100	67.2	5.5	10.2	14.0	1.6	1.5
1982	100	64.4	7.6	10.9	14.1	1.5	1.5
1983	100	63.5	8.5	11.1	14.1	1.3	1.5
1984	100	58.5	9.5	14.4	14.5	1.5	1.6
1985	100	57.2	9.5	12.4	18.5	1.6	0.8
1986	100	56.3	8.7	12.8	18.8	1.8	1.6
1987	100	54.3	9.2	14.7	18.9	1.9	1.0
1988	100	49.0	9.4	17.2	21.4	1.9	1.1
1989	100	47.4	9.2	17.6	23.1	1.7	1.0
1990	100	48.9	8.9	17.0	21.8	1.6	1.8

* price subsidy and transportation subsidy are the main components of subsidy payment

mainly additional wages (*fujia gongzi*)

Source: Sukhan Jackson, Chinese Enterprise Management: Reforms in Economic Perspective, Berlin: Walter de Gruyter, 1992, Table 7.4, p.177.

been very limited owing to difficulties in supervision and collection of the tax. One estimate revealed that as much as about 80 percent of retained profits have been distributed as bonuses and used for welfare purposes (He, 1988). The excessive increase in wages and bonuses was illustrated by the higher increase rates of personal income compared with the rates of increase in of labour productivity (Table 4.2). The distorted nature of income incentives greatly diluted the motivative effect of the

TABLE 4.2
INCREASE IN INDIVIDUAL INCOME COMPARED WITH
THAT IN LABOUR PRODUCTIVITY

	1986 over 1978	1986 over 1984	1986 over 1985
Average Increase in Annual Income per Head (%) ^a	116.4	74.4	15.7
Price Index (%)	35.8	25.6	6.0
Increase in Labour Productivity (%) ^b	38.8	28.5	1.66

Note: ^a included wage and bonuses; ^b calculated in constant prices.

Source: He, 1988.

schemes. It was also held to account for some of the inflation which has plagued the Chinese economy in recent years (Dai & Li, 1988).

Deviating from the initial wish of the central authority, there has existed a tendency towards equalization of bonus payments between enterprises, regardless their profitability. While more fortunate enterprises can benefit from increase in profits and retained profits, the less fortunate one would see the benefits as results of favourable external conditions (prices and plan allocations) rather than of efforts in increasing efficiency. This gave rise to a strong feeling of "inequality" or "unfairness". The latter types would seek to increase bonuses through negotiation with the higher authorities or/and by various ways of evading regulations. This phenomenon, well-known as "upward emulation" in China, is said to have greatly contributed to profit-reward equalization among enterprises and to the expansion of consumption (Granick, 1990; Xia & Li, 1987). In many enterprises, especially in those with low profitability, bonus payments have also led to a restraint of long-term development (Economics Weekly, 2 October 1988).

4.5.4 Intensive Bargaining between the State and Enterprise

Bargaining in China did not start with the profit-sharing system. It was part of the Chinese traditional planning process, which led a Western observer to believe that Chinese plans were neither taut nor firm (Tidrick, 1987).³¹ The profit quotas in the profit retention system were set on an *ad hoc*, negotiated basis, because enterprises were seen as faced with different internal and environmental conditions and should therefore be treated differently. This process did allow enterprises to bargain with government agencies and their superior authorities, and could deteriorate into generalized bargaining over profit delivery and even the proportion of retained profits to be used for bonus distribution. Moreover, bargaining in the profit retention system did not really ameliorate the inequity between enterprises caused by conditions out of control of enterprises. Instead, the diversity of the bargaining power and skills of enterprises and favour of higher authorities towards particular enterprise(s) sometimes aggravated the inequity.

The income tax system sought to create an environment for equal competition between firms and to impose a tax restraint on enterprises. An uniform income tax rate (55 percent) was introduced in attempt to place a bound on profit sharing between the State and enterprises. At the second stage of the tax-for-profit programme, an adjustment tax was imposed in hopes of compensating for price distortion and the diversity of capital and technological conditions among enterprises. Similar to the profit quotas in the profit-retention system, the adjustment tax rates were also set on a case-to-case basis through negotiation between the government authorities and enterprises. This process arbitrarily changed the relative profitability

³¹David Granick (1990), in analysing the same sample of enterprises as Tidrick's comments that Tidrick is correct as to the first characterization, but the data that show the relation between the fulfilment of original and final plans does not support Tidrick's assertion with regard to the second. Here, I would be inclined towards Tidrick's view, simply because the great consistency between the original and the final plans, which Granick uses as an evidence against Tidrick, does not necessarily mean firmness of plans. Chinese plans, as indicated by a Chinese common saying "*Jihua buru bianhua*" (changes are superior to plans), were often subject to subsequent changes during their implementation, arising from substantial environmental changes which might require changes in plans or/and renewed bargaining between the State and the enterprise.

of different enterprises, and therefore erode the link between enterprise performance, as measured by profit, and retained earnings³² (World Bank, 1988, p.85).

The bargaining process also distracted enterprise management from increasing efficiency (Tidrick, 1987). It led to what Kornai called soft budget constraints. Kornai (1980) assumes that in centrally planned socialist economies, the vector of budget constraints that exists for the enterprise is "soft" rather than "hard". They are soft because the enterprise's demands for financial resources are not constrained by impersonal market forces but rather are subject to allocation constraints imposed by the higher authorities, which are always subject to negotiation. Kornai (1987) once observed that in Hungarian state enterprises, "an important characteristic of the soft budget constraint is levelling", which results in "a peculiar egalitarian tendency in contradiction to a profit incentive". He notes:

Under such circumstances, the dual dependence of profit appears. It will be determined in part horizontally -- by success or failure in the market -- and in part vertically -- by the generosity of financial authorities or the firm's ability to bargain with them (p.327).

More accurately, perhaps, Kornai's concept of dual dependence of profit here can be interpreted as the dual dependence of profit retained by the enterprise. This dual dependence very much diluted the intended incentive effects of profit under the tax-for-profit system.

4.6 The Impact of Non-financial Incentives

The predominant profit incentives since 1978 have supposedly relegated previously prevailing moral incentives to a secondary, if not inconsiderable, position. During the first years of reforms, emphasis was placed on designing financial incentives systems, while moral incentives were almost ignored because of the lack of interest and somewhat negative attitude of many workers to them. During this

³²*Ad hoc* variations and bargaining in the tax treatment were intended to minimize the unfairness among firms faced with diversified conditions but subject to a unified income tax rate. But this individual treatment tended to result in arbitrary and egalitarian tax imposition in the absence of explicit objective guidelines regarding to tax rate-setting and of unbiased information from firms.

time, however, dysfunctional behaviour of enterprises regarding to bonus distribution was not obvious due to the relatively rigid state control over financial resources and the direct link between the fulfilment of plan targets and profit incentives. As the tax-for-profit scheme was introduced, the State control was loosened and enterprise discretion on use of residual profits was considerably enlarged. Price distortion and imperfection of the State control mechanisms have led to unexpected and undesirable behaviour of enterprises, which did not exist in the past.

To counter the undesirable behaviour of enterprises and compensate for the profit and price distortions, in addition to some administrative directives, the central authority introduced non-financial incentives linked with performance in increasing overall efficiency (see section 4.4 for a performance indicator system designed under the tax-for-profit system). These incentives were designed to help regulate enterprise behaviour and shift enterprise energy from purely seeking profits to increasing economic efficiency and product quality (Newsletter of Economic Work, No.6, 1987). Public appraisal of product quality, publication of enterprise performance data concerning economic efficiency (as indicated by ratio of profit and tax to capital, rate of return of sales, and labour productivity) have been the examples of attempts to motivate enterprises to pursue higher efficiency and product quality.

Non-financial incentives are basically management-oriented. It has been observed that one prominent managerial stimulant in China is engineering or technological superiority (Byrd & Tidrick, 1987; World Bank, 1988). This is manifested in striving to win various kinds of medals and awards for product quality from supervisory agencies and professional bodies (World Bank, 1988). In a survey conducted jointly by the World Bank and the Institute of Economics of the Chinese Academy of Social Sciences during 1983-84, almost all of the twenty sample enterprises proudly recounted their achievements in winning prizes for high-quality products and in other technological areas (Byrd & Tidrick, 1987). Engineers and managers often derive their greatest satisfaction from producing high-quality medal-winning products. However, there were some economic implications underlying the prize winning besides moral satisfaction and public recognition. "Gold or silver prizes for high quality products sometimes mean an extra bonus for workers" (ibid.). The medals can also attract more customers and allow the winning of a greater market

share. But in some cases, enterprises strive to win a medal regardless of its economic benefits and costs, leading sometimes to uneconomically high quality. The practice of awarding quality medals was therefore discontinued recently.

Since 1987, when the contract system was applied nationwide, a new campaign called "the upgrading of enterprises" has been active. It was intended to motivate enterprises to concentrate on increasing economic efficiency by grading them according to their levels of efficiency. Each state enterprise would be evaluated and those qualified would be titled "national special grade", "national first grade", "provincial first grade" or "provincial second grade" and so on. The indicators used in evaluating enterprise efficiency include three categories:

1) Indicators of product quality. The indicators vary according to industry. International and national standards for product quality are used.

2) Indicators of the consumption of raw materials and energy. A number of indicators have been designed for different products and industries. Examples include the utilization rate of materials, the ratio of materials cost to total cost, the costs of energy to output value ratio.

3) Indicators of economic efficiency. Examples are return on investment, labour productivity, and average profit and taxes realised per worker. Other indicators such as the rate of return on sales and the turnover of current capital, sometimes supplement or replace the three main indicators of economic efficiency (Xinghua Yuebao, 1987).

The upgrading of enterprises is a motivational campaign oriented to inducing enterprises to increase efficiency with a variety of incentives. Enterprises are told that "being graded national class is a extremely high honour and will greatly increase enterprise credit, which is more important and valuable than material incentives". It has also been declared that the enterprises with national titles are entitled to "preferential treatments" by the State in areas of credit, export, wages, and bonuses (Xinghua Yuebao, 1987).

Managers perhaps take more interest in these campaigns, because of their sensitiveness to their perceived reputation. The title of "advanced enterprise" can win not only professional reputation for the managers, but political honour and advantages for the managers, both of which are critical for their career development. The

workers and staff can also enjoy a sense of honour and pride. Moreover, advanced enterprises normally receive favoured treatment in many areas. Sometimes, these long-term, more strategic advantages can appear more attractive to some enterprises than such immediate benefits as bonuses. One enterprise in the World Bank / CASS Survey is reported to have forgone easier bonus targets to maintain its "honoured place as an advanced unit" (Byrd & Tidrick, 1987, p.64).

It seems reasonable to infer that financial (profit) incentives have implications for the enterprise as a whole with workers' interests being closely tied to them, while non-financial incentives are more management-oriented in nature. In most cases, a certain amount of material benefits (mainly bonuses) -- perhaps the average level of the industry to which the enterprise belongs -- acts as "threshold" of workers' benefits. When the "threshold" is not reached, the need to improve the profit situation of enterprise and workers' benefits thereby may take precedence over other concerns; financial incentives may therefore have strong impact on profit-seeking behaviour of enterprise in this situation. Once the "threshold" has been reached, however, non-financial incentives (though they may have financial implications) may appear more attractive to managers, who may then feel freer to indulge their own objectives in winning "goodwill" for the enterprise and for themselves as well (World Bank, 1988, p.205). As the contract system was instituted in recent years, some new features have been added to the prevailing incentive mechanisms and enterprise behaviour, which is presented in detail in the following chapter.

4.7 Summary

In this Chapter, Chinese systems of performance evaluation applied to state enterprises and their incentive implications were reviewed in a chronological order. This review is intended to serve as a background briefing and provide some raw materials for the models and analysis in later chapters. The listed problems associated with these performance evaluation and incentive schemes also enable us to aim specifically at certain points of interest in later analysis.

Section 2 of this Chapter described the Chinese management system for the pre-reform period. The Chinese traditional industrial system, which was shaped after

the Soviet prototype, featured originally the centralization of resource allocation and control over enterprises. Enterprises were seen as appendages of government agencies instead of independent economic entities. As a result, they were subject to tight control and direct supervision of higher authorities. They were expected to fulfil a number of objectives of different types. These included social objectives, economic objectives, and political objectives. Correspondingly, they were subject to performance evaluation in social, economic, and political areas. This performance evaluation is believed to have been linked to certain incentives available to the enterprise as a whole. In particular, plan fulfilment was taken as a major indicator of the economic and social performance of the enterprise. Non-financial incentives were used intensively and financial incentives were very limited.

One particular area that has not been paid much attention to by scholars of Chinese economy is the information issue in the pre-reform period. In consideration of the perceived importance of plans and the information requirement in planning,, intuition is that there should exist some device by which the planner could gather required information from more knowledgeable enterprises. Enterprises should have been provided for some incentives to reveal true information on their capacities and productivity. This information elicitation problem was not considered in this Chapter. It will be examined in a later chapter (Chapter 9).

Since 1979, a major economic reform programme in China has brought about a lot of changes in the area of enterprise control. The most fundamental has been the recognition of the necessity and the efforts made by the Chinese central authority in creating a direct link between the economic performance of the enterprise and material incentives accruing to its management and workers. In attempts to achieve this, several reform schemes have been introduced, with the profit retention system, the tax-for-profit scheme, and the contract system being the major ones. The schemes before the contract system were reviewed in this Chapter, leaving the contract system to the next chapter.

Earlier schemes (the enterprise fund system and the profit retention system) were basically plan-based and they were reviewed in section 3. Under these schemes the enterprise was evaluated by indicators that based on plan targets. The idea was that the enterprise was entitled to a portion of its profits provided that specified plan

targets were fulfilled. This portion of profit could be used for bonus distribution and welfare investments, subject to certain limits set by the state. The tax-for-profit scheme, described in section 4, put much emphasis on the profit indicator and effectively made the enterprise the residual claimant. At the same time, the number of plan targets imposed on the enterprise was reduced. A new set of performance indicators based on efficiency of the enterprise was then worked out. However, this set of indicators had no direct relation to the financial incentive system for enterprises. They were expected to act as the regulator and guide of enterprise behaviour, through their implications of non-financial incentives.

The contract system, which became widespread in 1987, added some new features to the Chinese industrial system. Under this system, a contract between the enterprise and its supervisory authorities is agreed upon and the profits and taxes that the enterprise will turn over to the state are specified. In addition to other features (full review in Chapter 5), the contract system was expected to stabilize and regulate the relationship between the state and the enterprise and to provide the enterprise with greater incentives to improve its profitability. At the same time, the upgrading of enterprises was launched in order to provide the enterprise with non-material incentives to concentrate on increasing economic efficiency. Under this grading system, the enterprise is evaluated and graded according to a new set of performance indicators, which emphasize the product quality, costs, and profitability.

The new incentive systems have prompted enterprises to switch from being plan-fulfilling appendages to profit-seeking agents. However, the profit-seeking behaviour of the enterprise was based on a partially decentralized control system and an irrational price system. This has created a number of problems, especially for the new bonus system. Since profit may be generated from price differentials, using profit as the base or main determinant of gains for the enterprise has in fact weakened the link between bonuses and efficiency. Abuse of bonuses as a means of increasing individual incomes has further reduced the incentive implications of bonuses. The equalitarian tendency and a feeling of "unfairness" have also created intensive bargaining between the enterprise and its higher authorities. These problems with the new bonus system were discussed in section 5.

In section 6, we considered the roles of non-financial incentives in the reform

years. These incentives were designed to help regulate enterprise behaviour and motivate enterprise to pursue higher efficiency and product quality. It seems that these non-financial incentives are more appealing to enterprise management than to the enterprise as a whole.

CHAPTER 5

THE ENTERPRISE CONTRACT SYSTEM

5.1 Introduction

The Contracted Management Responsibility System, as officially termed in China, (hereinafter "the contract system") has been the most popular management system applied to the Chinese large and medium-sized state enterprises since 1987. This system is intended by the designers to stimulate state enterprises and their managers to further efforts in increasing efficiency and revenues for the State, by making explicit the enterprise's share in decision-making power, responsibility, and economic benefits through an *ex ante* contract agreed by the representatives from the State agency (agencies) and the enterprise. Up to 1989, over 95 percent of the large and medium-sized State enterprises had instituted this system, while most small-sized state enterprises had adopted the leasing option.¹ Despite much controversy over its merits and problems and suggestions for its replacement or improvement, the contract system does not seem likely to be replaced by any other schemes in the near future, because of strong theoretical support and claimed practical success, which are to be mentioned below. Moreover, it has been officially confirmed that "the contract system will be continued and improved over a certain time period" (He, 1989). The current relationship between the State and enterprises and incentive and micro-control mechanisms in China may be said to be characterized by and embodied in the contract system. It is therefore worthwhile to examine this system separately and in detail in this Chapter.

This Chapter begins with the background of the contract system by reviewing

¹Almost simultaneous with the widespread popularization of the contract system among large- and medium-sized enterprises, small ones were allowed to be leased out to individuals, who would then run the firms nearly autonomously, subject to comparatively loose state control and fixed after-tax payments to the State as rents. The experiments with the leasing system began in late 1984 (Gao, 1987).

Chinese experience with the rural contract system, the prototype of the enterprise contract system. The theoretical and political considerations and general guidelines in employing the contract system are then presented, followed by a description of formulas for various aspects of the system in practice with some cases as illustrations. Some overall observations are then made basing on a large-scale survey. Problems of the contract system are finally outlined from a Chinese perspective. This Chapter is designed to provide basically descriptive background and to present materials, along with the previous chapter, upon which later analysis and observations will be based. This description represents one of the few critical examinations in English in relevant areas and constitutes an important contribution this thesis makes.

We shall start in the next section with an short introduction to the rural contract system, the prototype of the later contract system applied to state enterprises. The experience with the rural contract system, together with successful experiments in some pilot enterprises, encouraged the rapid and widespread application of the enterprise contract system in 1987. The contract system is also favoured by Chinese authorities due to its perceived theoretical strength. Section 3 will discuss the principles underlying the contract system from the Chinese perspective. In section 4, we shall examine various aspects of current practice of the contract system. Certain details of policy regulations, practical formulas, and survey data will be presented. In section 5, some overall observations will be made. In particular, performance of enterprises and observed problems with current practice will be covered.

5.2 The Initiation and Evolution of the Enterprise Contract System

5.2.1 Experience with the Rural Contract System

The contract responsibility system was born in the countryside, and was claimed to "have a long history" traceable back to the early 1950s (Sun, 1988). In the late 1970s, China started its major reform programme first in the agricultural sector, because the majority of its huge population live in the countryside and agriculture plays a vital part in the economy. A household output-related system of contracted responsibility was then introduced in place of the old commune system.

Under the new system, farmland is contracted out to the households while its nominal collective ownership remains unchanged. Farm output quotas are set and fixed for each household by low-level administrations (normally village or town-based). Each household with a piece of contracted farmland signs a contract with the administrative authority based on the historical record of output of the land and renegotiation. The contract is intended to ensure that a quota will be met and that the State gets its contracted share of output at state fixed prices. The collective (normally the village or town government) keeps a certain proportion of output, and the farmer claims whatever remains as his own, a portion of which can be sold at the market and the remaining being consumed by the farm family. The farmers have freedom in arranging their production depending upon the purchasing contracts signed with the State and market demand.² By granting farmers actual personal ownership of the means of production (including land, farm machinery and implements, though the land is nominally owned by the collective) and a share of the fruits of their own labour, the contract system achieved a remarkable success in boosting the agricultural output and individual incomes of farmers (Table 5.1). Gross agricultural output value was increased from 1,397 hundred million yuan in 1978 to 4,013 hundred million yuan in 1986, an increase of more than ten percent. The net income per head per annum was increased from 133.6 yuan in 1978 to 423.8 yuan in 1986. The latter increase has been largely due to the growth of the so-called village or town-run enterprises. As a result, according to Chinese officials, China has basically become self-sufficient in grain since 1984 and the problem of feeding its huge population has been solved (Gao, 1987, p.19). The rural contract system continues. Up to 1989, 1.8 hundred million households (account for 98 percent of the total) are operating under the system.

Despite the tremendous achievements in applying the rural contract system, some problems have also emerged. One of the problems that have worried the authorities is that a large number of irrigation facilities built prior to the reform have

²Under the old commune system, farm land was owned by collectives. Farmers were told by cadres of the bureaucratic hierarchy what and how to grow, and every farmer got a equal share of a portion of pooled output that subject to distribution.

almost broken down because of management by individual farmers. Some other equipment and facilities owned by the collective before, such as big and medium-

TABLE 5.1

INCREASES IN AGRICULTURAL OUTPUT AND IN FARMERS' INCOME UNDER THE CONTRACT SYSTEM

	1978	1986	Average Annual Increase Rate (%) [*]	
	(in real terms)		(1978 -1986)	(1952-1978)
Gross Agricultural Output Value (hundred million ¥)	1,397	4,013	10.0	3.2
Annual Grain Output (hundred million ton)	3.0	3.9	3.3	2.4
Net Income Per Head (¥)	133.6	423.8	--	--

Source: Gao Shangquan, Nine Years' Chinese Economic Structure Reforms (in Chinese), the People's Publishing House, 1987, pp.19,173-174.

* calculated in constant prices.

sized tractors, have been standing idle due to difficulties in distributing them among individual households (Zhang, 1989). Division of farmland into small pieces may cause a loss of long-term efficiency because of a lack of economy of scale. Moreover, since the implementation of the contract system, the short-term behaviour on the part of farmers has been observed. Many farmers refuse to invest in land. The main reason for this behaviour is that the ownership of the land still belongs to the State (the collectives being its representatives) and farmers are somewhat suspicious of the stability of the state policy.

5.2.2 Application and Popularization of the Contract System in Industry

Encouraged by the initial success of the contracting system in the agricultural sector, the Chinese leaders decided in the late 1986 to introduce the system into the industrial sector, in hopes of revitalizing large- and medium-sized enterprises by

solving the problems associated with the previous reform schemes, as discussed in the last Chapter. In view of the believed complexity of introducing such a system, there was much controversy at the beginning concerning such a move (Sun, 1988). One of the views was that the success of the contract system in rural areas, where production is small-scaled, might not necessarily render it successful in the industrial sector, which is characterized by socialized large-scale production and interdependency. Moreover, as argued by people who view the contract system as a transitional mechanism, the relationship between the State and the enterprise should be standardized by developing macroeconomic regulating mechanisms and market mechanisms, not something that has to be worked out on a case-by-case basis through negotiations and the writing of a contract (*ibid.*). Nevertheless, achievements in applying the contract system as a pilot scheme in some regions and in enterprises provided examples in support of the movement toward spread of the system nationwide.

In as early as 1982, Jilin Province, a comparatively backward region in the northeastern China, began to introduce the contract system into the state enterprises within the province. This move was initiated primarily by financial pressure. In 1981, the province's industrial sector registered virtually no growth. Of the 1094 state enterprises, 42 percent were operating at losses totalling 248 million yuan, which was more than any other province in China. This prompted the National State Council to stop all financial subsidies to the province in 1982. The provincial government

TABLE 5.2

PERFORMANCE OF CHANGCHUN ENTERPRISES
UNDER THE CONTRACT SYSTEM

	1983	1984	1985
Total Realized Profits (ten thousand ¥)	5,991	10,568	16,595
Increase Rate Compared with the Previous Year(%)	100.0	76.4	57.0
Total Retained Profits by Enterprises (ten thousand ¥)	1,526	5,418	7,522
Increase Rate Compared with the Previous Year(%)	--	355.0	38.8

Source: Du Haiyan, *The Contract System: An Initial Choice in Reforming the State*

Enterprises (in Chinese), Economic Research, No.10, 1987, p.12.

therefore decided, with the consent of the central authorities, to follow the successful example of the rural areas and introduce the contract system for industrial enterprises in April 1982. By the end of that year, the province's industrial losses were down by 60 million yuan, and revenue had increased by 126 million yuan (Yue, 1988). The figures for Changchun City, the capital of the province, provide a more detailed picture (Table 5.2). The realized profits and retained profit by enterprises all registered large increases during the years subsequent to the introduction of the contract system.

Another frequently cited example of the successful early application of the contract system has been the case of Shoudu (Capital) Iron and Steel Company, a giant state enterprise with over 100,000 employees. In 1982, the company introduced the contract system with the special approval of the State Council. The main contents of the contract were as follows:

1) Profit-tax payments to the State were to be increased by 7.2 percent annually with the base figure fixed at the level in 1981. Any profits over this amount would be kept by the company.

2) Of the excess profit, 60 percent was to be used as production expansion funds, 20 percent as employee welfare funds, and the remaining as a bonus fund.

3) Asset depreciation was to be retained by the company, while no financial resources from the state were available in this regard.

4) The total payroll was to be linked to profits, that is, every 1 percent increase in profits should mean a 0.8 percent rise in the payroll (Yang, 1987).

Since the implementation of the contract system, the Company has registered a continued large increase in profit (Table 5.3) and other remarkable achievements in the areas of technological improvement, investment, and employees' welfare (Shoudu Iron and Steel Co., 1987). In 1986, the company produced 2.519 million tons of rolled steel, 115.5 percent more than in 1978, while the same figure for other iron and steel companies averaged 49.86 percent. From 1981 to 1984, the company's average annual output increased by 25 percent, ranking first among the 11 steel and iron enterprises under the Ministry of Metallurgical Industry (Yang, 1987). In terms

of efficiency and profitability, return (including profit and tax) on investment increased from 21.96 percent in 1978 to 60 percent in 1986. The average amount of profit and tax generated by each employee increased 3-fold from 4,717 yuan in 1978 to 14,396 yuan in 1986. During the period 1979-1986, the increase in the company's profits was comprised of a 44.1 percent improvement due to improved product

TABLE 5.3

ACHIEVEMENTS OF SHOUDU IRON & STEEL CO.
UNDER THE CONTRACT SYSTEM

Item	1981	1986	1986 over 1981	
	(hundred million yuan)		Increase Rate (%)	Average Annual Increase Rate(%)
Realized Profits	4.45	11.21	252	20.32
Total Payments to the State	4.88	9.02	185	13.08
Average Monthly Income Per Head for Employees	76.32	162.00	212	16.25

Source: Shoudu Iron & Steel Co., Achievements in Five Years' Contracting (in Chinese), *Enterprise Management*, No.7, 1987, pp.22-23.

quality, 39.8 percent to increased sales, and 15.7 percent to reduced production costs (ibid.).

In over 20 other large- and medium-sized enterprises which adopted the contract system as a pilot scheme during 1983 to 1986, positive results were also reported. Most of these enterprises achieved progressive annual increases in profit of over 20 percent, while enterprises which did not adopt the system experienced a continuous decline in profits for 20 months during the same period (Yuan, 1989).

These examples seem to have shown that the contract system can produce favourable economic results. Under the promotion and publicity of various government administrations, the contract system has spread across the country quite rapidly since 1987. Fig. 5.1 shows the development in applying the system to the

large- and medium-sized state enterprises over the period 1987 -- 1989, based on some fragmentary statistics available to the author (Yin & He, 1988; Yuan, 1987; Yuan, 1989; He, 1989; CESR, 1990).

As can be seen in Fig. 5.1, the spread of the contract system has been astonishingly rapid and wide spread considering the large number of the enterprises involved and the complexity due to the immense variety of conditions from enterprise to enterprise. By the end of 1987, around 80 percent of large- and medium-sized enterprises had adopted various forms of contracting with the state authorities. In February 1988, the State Council promulgated the "Interim Regulations on the Contracted Management Responsibility System in State-Owned Industrial Enterprises" (hereinafter "the Regulations"). The Regulations agreed that the contract system is the direction for enterprise reform, and therefore the State further promoted the extensive implementation of the system. Up to the beginning of 1990, the contract system has been adopted in over 95 percent of large- and medium-sized state enterprises.

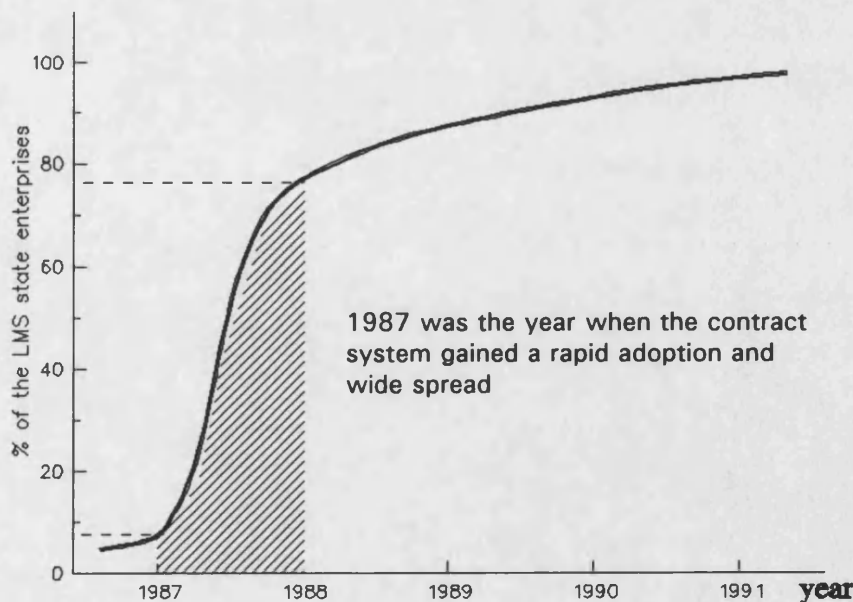


Fig. 5.1 Spread of the Contract System

5.3 The Principles of the Contract System

Unlike the previous reform schemes at the enterprise level, which had mainly dealt with the division of profits between the state and enterprises, the contract system was seen as the first relatively comprehensive system which is both an operational and management mechanism³ and a way to define the relationship between the state and enterprises (Sun, 1988). It is different from the other schemes in that it embodies some basic ideas which are absent in others schemes. These principles include the following.

Maintaining public ownership while endowing enterprises with the vitality.

This principle is consistent with the general ideal of the Deng Xiaoping-style economic reform. As this general reform reached the stage where ownership and property rights become bottleneck problems, opinions and appeals for privatization could be heard, especially during the period 1986-May 1989 (Economic Weekly, 15 April 1989). In practice, some small-scale experiments using the share-holding system⁴ were carried out to explore ways of revitalizing state enterprises while maintaining the public ownership of enterprises. While there still exists much controversy concerning the share-holding system and it might seem risky and premature for the Chinese authorities to adopt the share-holding system on a large

³The profit retention scheme and the income tax system dealt with the distributional relationship between the State and the enterprise, but had little to do with the internal operation of the enterprise. The contract system, however, by defining explicitly in the contract the extent of authority, responsibility, and benefit to be shared by the enterprise management, is expected to have a far-reaching effect on improving enterprise management, on perfecting internal operational mechanisms of enterprises, and to become "an important part of modern management science with Chinese characteristics" (Sun, 1988). The contract system is therefore seen in China as not only a mechanism regulating the distributional relationship between the state and the enterprise but an operating system playing an important role in enterprise management.

⁴The share-holding experiments in China involve mainly dividing into shares the assets of existing state-owned enterprises and sell part of the shares on the market. The government normally holds the majority of shares; hence the public ownership. since the average low income of individuals, the number of individual share-holders are still small. Up to September 1992, there were more than 120 state enterprises which issued shares publicly (RMRB, 19 Sept. 1992). In 1993, the scale of experiments with share-holding system was expanded.

scale, the contract system is regarded to be "first of all maintaining a firm stand in favour of the public ownership system, in opposition to privatization, and be distinctly opposed to any inclination toward privatization that would dismember the system of ownership by the whole people" (Yuan, 1989). Such political considerations may account partly for the full endorsement and promotion of the contract system by the Chinese authorities. The contract system was seen as provided the authorities with the best choice to date to balance political and economic considerations (Yang, 1988). This point should be borne in mind when we try to understand the Chinese contract system or make proposals concerning the future development of Chinese enterprise reform. Yuan Baohua, minister in charge of the State Economic Commission and president of the National Association of Enterprise Management, has made it clear: "If it is said that we may in future have some system to replace the contract system, that system must be better than the contract system in the two respects that we have mentioned", ie. more favourable to both the public ownership and high economic efficiency (ibid.).

Separating ownership rights from operation rights.

Separating enterprise ownership from management powers, a much debated topic in the West, has been a main theme of the Chinese enterprise reform. It is also the essence of the Enterprise Law passed in April 1988. The Law stipulates that property of enterprises belongs to the whole people but that enterprises are granted the right to possess, use and dispose of the property mandated to them by the state to operate and manage (Art.2). The differentiation of state-ownership from state's direct management of enterprises is believed to be the theoretical and practical foundation allowing state-owned enterprises to adopt the contract system (Lin, 1988). Theoretically, the separation of the ownership rights from management powers means the state has proprietary rights over the enterprise assets, and therefore has a claim to a portion of return in addition to taxes levied on all forms of enterprises, while the enterprise enjoys the rights to hold, use and legally allocate the state-owned assets, and full managerial autonomy. Despite some deviations from this ideal in practice, the contract system seems to have played a positive role in protecting enterprise autonomy against previously prevailing administrative intervention. A recent survey of 403 state enterprises show that while the enterprise autonomy has been

continuously increased in the 1980s, this trend has been especially remarkable since 1987 when the contract system was widely adopted (Du, et al, 1990). It is argued that the contract system can facilitate the separation of ownership rights and management rights in that it helps the establishment of a legal property system, under which the owners' rights to intervene in day-to-day management are restricted and they therefore bear limited property responsibility (RTCER, 1988).

Clearly specifying the responsibilities, rights, and privileges of both state agencies and enterprises, and their distribution relationship.

The contract system was intended to reduce the continued bargaining between the supervisory agencies and their subordinate enterprises when dealing with the quotas and targets, by clearly defining the relevant items at the beginning of the contract and fixing them for the contract period. According to the "Regulations on the Contract System", in defining the distributional relationship between the two parties, the principle to be followed is that the enterprise is to "commit to a fixed base figure of profit-tax payments, guarantee the payments to the state, retain the extra profits over specified target, and make up for the shortfall using its own reserve fund" (Art.5). In most cases, enterprises shall guarantee first of all the payments to the state and secondly, the completion of specified technological upgrading projects financed by the residual profits. Some enterprises must also ensure fulfilment of mandatory plans for certain products.⁵ As a major incentive, enterprise payroll may be linked

⁵Most consumer goods have been released from the State planning and control system. Their production and marketing are left to their producers according to the market demand and the State guiding plans (in contrast with the mandatory plans). Many raw materials and intermediate products are still subject to the State mandatory planning and direct control, but the number has decreased. The numbers of products under the state and ministerial control was reduced from 256 and 581 respectively in 1980 to 26 and 555 respectively in 1987. The percentages of important raw materials under state direct control was also greatly reduced as shown below.

Product	Percentage of Planned Production & Distribution (%)	
	1980	1987
Rolled steel	74.3	47.1
Coal	57.9	47.2
Lumber	80.9	27.6

up with the profits (for details, see next section). In principle, the government agencies concerned must ensure that enterprises enjoy the rights and autonomy explicitly granted by the State Council without reservation or interference. They shall guarantee the availability of energy, materials, etc. which are essential for the fulfilment of mandatory planned production quotas and profit quotas specified in the contract.⁶ Failure to do so means the government agencies shall be held responsible for economic losses caused thereby.

5.4 The Contract System in Practice

Although almost all large- and medium-sized state enterprises have since 1987 adopted the contract system on the above-mentioned general principles, there exist a great diversity of formats representing differences in forms of contracting, in the determination of base figures, the duration of contracts, the make-up of contracting parties, and in incentive and risk-sharing arrangements. In this section, these elements are examined separately for both the documented designs and for the practical models. The description and cases are intended to give a presentation of various aspects of the contract system currently practised in China in a general way. Some overall observations are made in the following section.

5.4.1 The Form of Contracting Concerning Payments to the State

Cement	35.0	15.6
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Source: Gao Shangquan, 1987, p.60.

⁶In most areas of China, enterprises are subject to constraints of physical inputs due to shortages of inputs, such as materials and electricity. Under the contract system, those enterprises to which state assigned mandatory production plans are normally entitled to the provision of required inputs at the state-fixed prices, which are usually much lower than the market prices. The products produced in this way are in turn purchased by the State at fixed prices. The state plans for material supply are therefore regarded by enterprises concerned as the most important plan and as a privilege for them as well (RTCER, 1988, p.211). For a discussion on the possible advantages that the enterprise may take in this regard, see Chapters 9 and 10.

Enterprises with different financial conditions and perceived potential profitability are given by the authorities different forms of contracts. The assessment of enterprise's financial conditions is made by the authorities offering the contract⁷ mainly on the basis of the historical financial performance records of the enterprise in question. In practice, the determination of the form of the contract, the base figure, and expected rate of increase in payments to the State often involves negotiation between the two parties. Some of the models are:

(1) A contract based on progressive increases in profit-tax payments to the State. This applies to enterprises experiencing stable growth in production, sales, and profits (see Fig. 5.2-1). Party A and the enterprise decide and agree on a specific base amount to be turned over to the state treasury (for those enterprises to which the second stage of the income tax system was applied prior to the contract, this amount includes the income tax and the adjustment tax paid in the previous year(s)), and an annual increase rate. The remaining profits are to be retained by the enterprise. Symbolically, the total amount of retainable profits for the enterprise can be expressed as

$$w(y) = \sum_{i=1}^n [y_i - y_0(1+\alpha)^i], \quad (5-1)$$

where $w(y)$ is residual profits for the enterprise during the contract period ($i=1,2,\dots,n$), y_i is realized profit in the i th year. y_0 is the base figure for profit-tax payment to the State. Normally y_0 is determined by $y_0 = \hat{y}_0$ (\hat{y}_0 stands for the actual payment in the year immediately before the contract), and α is the decided annual increase rate for the payment to the State.

(2) A contract based on a fixed amount to be turned over to the state. This applies to those enterprises with small profit margins at the beginning of the contract period and a limited potential for higher profitability during the contract period (Fig.5.2-2). Any profit increments resulted from improved profit margins during the contract period will be retained by the enterprises. Symbolically, the contract can be

⁷"Party A" is used to stand for the authorities until we discuss these authorities in more detail later.

written as

$$w(y) = \sum_{i=1}^n y_i - iy_0, \tag{5-2}$$

where the meanings of symbols are the same as in (5-1) and since y_0 and i are fixed iy_0 is fixed.

(3) A contract based on a fixed payment to the State and a proportional share of the above-base profits. This applies to those enterprises which have relatively small profit margins at the time of contracting but are deemed to have a high potential for improved profitability (see Fig.5.2-3). The percentage of the above-base earnings to be shared by the State is predetermined along with the base figure. Symbolically, the contract can be written as

$$\begin{aligned} w(y) &= \sum_{i=1}^n [y_i - (y_0 + \beta(y_i - y_0))] \\ &= (1 - \beta) \sum_{i=1}^n (y_i - y_0), \end{aligned} \tag{5-3}$$

where β is the percentage of the above-base portion of profits that goes to the state, and the meanings of the other symbols are as above.

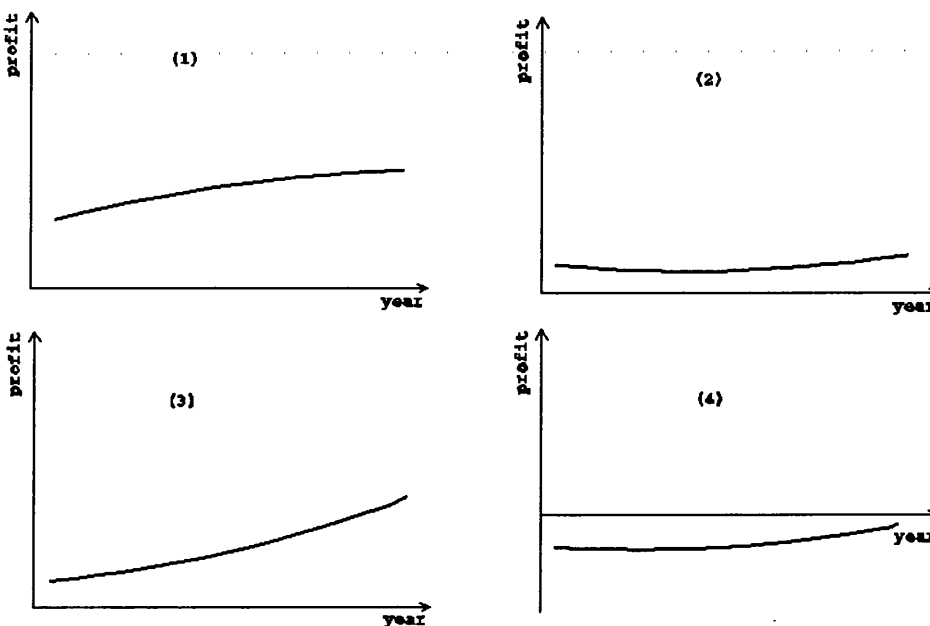


Fig. 5.2 Patterns of Enterprise Profitability

(4) A contract based on loss reduction. This applies to loss-making enterprises (Fig.5.2-4). At the beginning of contract, Party A sets limits for annual losses and provides fixed financial subsidies accordingly. Savings from loss reduction are to be kept by enterprise while the losses exceeding the required limit will be the contractor's own responsibility.

The decision as to which model is to be applied to a specific enterprise is normally made by Party A, sometimes through consultation or negotiation with the potential contractor. The pattern of enterprise profitability can be determined comparatively easily according to the enterprise's recent past financial records.

5.4.2 Determination of Base Figures and of Duration of Contract

According to the "Regulations", the base figures for payments to the State should be based on the actual performance of the enterprises in question during the previous year(s). In most cases, the actual amount of the taxes and profits turned over to the State in the immediate past year has been taken as the base. For some enterprises which have experienced relatively large profit fluctuations because of the influence of factors out of the control of the enterprise, the average amount of the profits and taxes turned over to the State for the immediate past two or three years may be taken as the base. In determining the base figures, adjustments can be made in reference to the average return on investment for a particular region or industry (Art.10).

The main intention of the central authorities by setting and fixing the base figures at the levels of the preceding year(s) was to guarantee State revenues against reduction. In practice, however, some local governments and central ministries did make tax exemptions and profit concessions in negotiating with enterprises over the base figures. It was revealed that the total target amount of payments to the state for the contracted enterprises decided upon in 1987 was 0.9 percent lower than the actual amount paid to the State by these same enterprises in 1986, and the contracted target for 1988 decreased further by 3.6 percent compared with the actual amount for 1987 (Ding, 1988).

Setting of base figures can be complicated and difficult. In practice, two methods are being used in China. The first and most common is historical performance based, in which financial accounting figures for the previous year(s) serve as the main basis for setting the base figures. The effects of extraordinary factors may be ignored, while performance of other firms and forecasts may be taken into account. The second method may be called zero-based target-setting, in which base figures are calculated according to the average return on assets for the industry in which the enterprise is located. In this case, the enterprise's historical performance may be referred to but would not be taken as the base for these calculations.

The duration of contract varies in practice, ranging from one year to five years. The "Regulations" stipulate that a minimum three-year duration will be reasonable. In determining the duration, consideration has to be given to the trade-off between the short-term behaviour resulting from a short-term contract and the uncertainty and risks involved in a long-term contract.

5.4.3 The Authorities that Offer the Contracts

The authorities which offer the contracts shall, according to the "Regulations", be relevant departments designated by the government (Art. 14). They shall, in theory, represent the government and the interests of the State in dealing with the contractors. In practice, there exist three types of organisations which can function as the party to offer the contract: (1) The department in charge. At the present the prevailing mode is that the department in charge of the enterprise in question offers the contract. In 1990 when the many contracts were renewed, 51.7 percent of the contracts were offered by the department in charge (Yu, 1991). Offering the contracts seems a logical extension of the roles played by the department as a delegated agency of state administration. In addition, the department in charge has advantages for this purpose in respect of the information it possesses and its acquaintance with business in which the enterprise operates. In some cases, the department in charge is a contractor itself, who signs a contract with the higher authorities in the hierarchy. It can hardly act on the behalf of the State under these circumstances.

(2) Joint institutions consisting of representatives from relevant government

departments. In such cases, a temporary coordinating organisation is set up as the authority to offer the contract, to evaluate the candidate(s) for the contract and sign the contract with the contractor. The coordinating organization is normally composed of representatives from a local government office, the economic commission, the planning commission, economic reform office, department in charge, departments of finance, taxation, public auditing, price control, and of personnel each, of appropriate level of the government, and banks. In 1990, 39.4 percent of the second-round contracts were offered by this type of organizations, compared with 36 percent in 1987 (Yu, 1991). The governmental coordinating organization can act in the interest of the State and avoid the problem of multiheadedness. The terms of contract tend to be objective and fair. In certain sense, it should be the ideal organization to offer the contract. It is proposed that a permanent organization at each level of government should be set up to specialize in this function (RTCR, 1988, p.8).

(3) The highest authoritative organ within the enterprise. In the former two cases, the two parties to the contract can be said to represent the government and the enterprise involved respectively. In a small number of cases, the highest authoritative organs of enterprises, such as the board of directors and workers' congress, act as the party that offer the contract to managers. In the case of board of directors, officials from government agencies normally head the board, which also includes the high-ranking leaders of the enterprise in question such as the Party secretary and chairman of workers congress. This scheme is normally operative in enterprises that have adopted the sharing-holding system. The board of directors acts on the behalf of the owners of the enterprise and government officials represent the interest of the State. The enterprise in question must be highly autonomous without being subject to the State planning. The firm is somewhat similar to a Western limited company, where the ownership and management are separate.

5.4.4 Choice of Contractors

The "Regulations" specify that qualified individuals, groups or enterprises as legal persons may make tenders for contracts (Art.26). In practice, four different types of contractors have emerged: The factory director or manager himself or herself

is the contractor; a management team headed by the factory director is the contractor; the entire staff and workers represented by the factory director is the contractor; and one enterprise contracts with another enterprise⁸ (Lin, 1988). At present, the first two formats ie. individual contracting and group contracting, are more common, while the last two are being increasingly recommended and promoted by officials and commentators (ibid.). The problems with the individual or group contracting, such as conflict of interests and risk sharing within the enterprise, are discussed in the latter part of this Chapter.

Choice of the contractor is made through a process of tendering, evaluation, and, sometimes voting, in the case of choosing contractor through competition. According to the "Regulations", the tender committee organized by Party A, with participation from the workers' representatives of the contractor enterprise, shall make a thorough evaluation of the tenderers, engage in public discourse, and choose the most qualified tenderer (Art.28). In practice, the tender committee usually consists of representatives from government and from the enterprise and invited specialists. The appointment of the contractor is made by either Party A or the workers' congress of the enterprise in question. However, direct appointment by the higher authorities or selection by voting by the workers' congress with confirmation from higher authorities is a simpler way followed in many cases.

In spite of the application of techniques such as inviting tenders and public evaluation, a survey indicates that most successful contractors are from the contracting enterprises (90 percent), and, moreover, most of contractors used to be former leaders of the contracting enterprises (85 percent) (RG CER, 1988, p.199). There clearly exist so-called "entry barriers to outsiders" (Table 5.4). As indicated in Table 5.4, only 6.8 percent of state enterprises were contracted to outsiders. This phenomenon, according to the RG CER survey, can be explained by the still limited

⁸Contract by a legal person (an enterprise) is a new development in Chinese contract system. It has common features with contract by a natural person in that the contractor acquires the managerial powers over assets of the contracted enterprise. This process is actually a form of merging enterprises, or using a Chinese term, optimal realignment (an enterprise with higher profitability and productivity merges a competitively inferior enterprise(s)). Some successful cases this type of merger such as the Jilin Chemical Co. have been publicized in China (RG CER, 1988, Chap.9).

use of public tenders and by the disadvantages outsiders have in terms of information acquisition and less familiarity with higher authorities and the enterprise (ibid., p.200).

TABLE 5.4

SELECTION OF CONTRACTORS:
INSIDERS VS. OUTSIDERS (%)

Enterprises	By Ownership			By Profitability	
	State	Collective	Others	High	Low
Insiders	93.2	87.6	85.7	94.0	84.9
Outsiders	6.8	12.4	14.3	6.0	15.1

Source: RGCER, *Contract System in Practice* (in Chinese), Beijing: Economic Management Press, 1988, p.200.

5.4.5 Incentive Formulas

Establishing a linkage between the total wage payroll and the economic efficiency of the enterprise is one of the main ideas embodied in the contract system (Art.8). As in the previous reform schemes, enterprise efficiency (or "economic effectiveness" in Chinese terminology) is still in reality measured by performance indicators such as realized profits and tax-profit payments to the State. Under the contract system, in enterprises where such a linkage has been established (most of which have adopted the first form of contract), a rate of increase in total wage payroll was predetermined, which was made dependent on increase in profits. It is assumed in this design that an increase in tax-profit payments results in higher wages, higher wages result in more labour effort, and more effort results in higher efficiency and higher tax-profit payments to the State (Korzec, 1988). In the well-known case of Shoudu Iron & Steel Company, every 1 percent increase in profits means a 0.8 percent rise in the payroll.

In addition to the increasing wages, enterprise employees can also benefit from

increase in profits in forms of bonuses and welfare facilities. A certain portion of retained profits can be used for the purpose of bonus distribution. The division of retained profits among production investments, bonuses, and welfare investments is normally specified in the contracts through negotiation. In the case of Shoudu Iron & Steel Company, the percentages for the three parts of the distribution are respectively 60%, 20%, and 20%.

Algebraically, in the cases where the contract is based on progressive increases in payments to the State (see Expression 5-1, p.158), the total income (W) (including wages and bonuses) for the enterprise employees for the contract years can be presented as follows:

$$\begin{aligned} W(y_0, y_i) &= ar_0 \sum_{i=1}^n \frac{y_i - y_0}{y_0} + b \sum_{i=1}^n [y_i - y_0(1 + \alpha)^i] \\ &= ar_0 \sum_{i=1}^n \frac{y_i - y_0}{y_0} + bw(y_0, y_i), \end{aligned} \quad (5-4)$$

where y_i , y_0 are realized profits in year i within the contract period and the base profits respectively; r_0 is the total payroll in the base year; a is the increase rate for the payroll linked with the increase in profits and $0 < a < 0.01$; b is the percentage of the bonus fund relative to retained profits ($0 < b < 1$); and α is the contracted annual rate of increase in payments to the State. In (5-4), w is the profits retainable by the enterprise determined by (5-1). $W(y_0, y_i)$ represents the total monetary incentives available to the whole personnel of the enterprise. A clear linkage between these incentives and profit generation is shown in (5-4) by the inclusion of y_0 and y_i in both terms of the right-hand side of (5-4).

5.4.6 Rewards and Penalties for Managers

Under the contract system, rewards and penalties for managers or factory directors (the contractors or representatives of contractors) are clearly indicated for the first time since the initiation of reforms. One Chinese observer even complains that "contracts tended to emphasize personal reward and punishment for individual

contractor and often overlooked the economic benefits of the staff and workers" (Lin, 1988). The income motivation for individual contractors has been a special feature for the contract system. According to the "Regulations", the annual income of the manager (the contractor) may be two to four times the average annual income of an ordinary staff member or worker in his enterprise, and even higher when his performance is deemed outstanding. The said income shall be reduced to as low as half of his or her basic salary, in case of failure to fulfil the contract because of mismanagement (Art.33). In practice, however, the specific rewards and penalties a contractor will receive are not clearly stated in many contracts. The rewards and penalties tend to be subject to the will of superior authorities (Chu, 1989).

Published and unpublished information reveals some believable cases in which contractors were actually rewarded or punished in accordance with contracts⁹

TABLE 5.5

**INCOME FOR MANAGERS UNDER THE CONTRACT
SYSTEM: CONTRACT TERM AND THE REALITY**

Basic Salary increased by	Contract term (% of all samples)	Actually increased by (% of all samples)
0 - 99%	57.6	71.0
100%	30.8	24.3
200%	5.7	3.6
300%	4.5	1.0
400% +	1.4	0.1
	100	100

* Figures in the tables are the percentages of specific groups of managers at same income levels in the total samples.

Source: RGCER, *The Contract System in Practice* (in Chinese), Beijing: Economic Management Press, 1988, Tables 7 & 8, pp.214-5.

⁹The sub-section "Risk Sharing" presents some cases in which contractors were penalized.

(RGCER, 1988; Zhang, 1988; Yu, 1991). Table 5.5 presents the details of individual income set in contracts and actual income for managers of the contracted enterprises covered by the survey. The results of the RGCER Survey¹⁰ present a general picture of the rewarding of managers (or directors). According to the survey, among the sampled enterprises, 71 percent of the managers' individual income actually increased by 0-99 percent, 24.3 percent of managers by 100 percent, 3.6 percent by 200 percent, 1.1 percent by three or more times (RGCER, 1988, p.213).

Overall, the contract-set income levels are higher than the income actually received by the managers. 42.4 percent of contract-set income levels are 100 percent or more higher than the previous levels, but only 29 percent of managers actually received income at these levels. In most cases, the failure of Party A to reward the manager the prescribed income is due to failure of the party to honour the reward commitment. In others, it was due to managers' failure to fulfil the contract targets (RGCER, 1988, p.216).

Besides the failure of the higher authorities to honour the contract commitments, traditional egalitarian ideology has been another cause of difficulties in rewarding managers according to the contract. Most extraordinary have been some cases in which the manager who deserved a reward showed reluctance to accept the reward for fear that it would arouse grievances among his colleagues and workers (Xiao, et al. 1988). In some cases, the manager who accepted a reward had to distribute it evenly to every staff member and worker working in his factory (CASS, 1989). In some enterprises, in order to ease a sense of guilt and placate the subordinates, the manager who received a bonus tried his best to get a similar bonus for the other people in his enterprise. As a result, "1,000 yuan turned into 200,000 yuan" (Lin, 1988).

A recent questionnaire¹¹ (Yu, 1991) reveals the actual situation with regard

¹⁰For details of this survey, see Footnote 13 in this chapter.

¹¹The questionnaire was conducted at the end of 1990. It was addressed to directors and managers of 2,000 enterprises covered by the Enterprise Tracking Observation System. The sample enterprises locate in 30 cities and operate in 39

to penalizing contractors in the case of failure. During the period 1987-1990, the percentages of enterprises which failed to fulfil annual contract targets were:

Year	1987	1988	1989	1990
Percentage(%)	5.8	9.0	21.2	39.9

Among those failed enterprises, 53.4 percent of contractors were penalized in the way of deducting salaries and cancelling bonuses, 5.1 percent of failed contractors had to make good losses using pledged personal assets, but 41.5 percent of failed contractors were not penalized at all. A principal consideration of the party that offers the contract was that a number of enterprises fell into difficulties during 1989 and 1990 simply because of the tightened macro-economic policy. It was difficult to distinguish between the adverse effects of this policy and under-supply of effort from the enterprise. In face of this difficulty, the party that offers the contract was not determined to stand firm and to penalize failed contractors.

5.4.7 Risk Sharing

The introduction of a risk allocating mechanism is one of the special features of the contract system. The "Regulations" use the word "risk" sparingly and do not provide specific risk-sharing formulas; Instead, duty or responsibility is used more often in the "Regulations" (Chapter 4). For a contractor, when he fails to fulfil the contract targets, according to the "Regulations", he "shall be held responsible for the breach of contract. The enterprise operator shall be investigated and obliged to assume administrative and economic responsibility where severity justifies it"(Art.25). As far as individual income is concerned, the income of the enterprise operator(the contractor in most cases) "shall be deducted to as low as half of his normal salary. Other members of the leading body shall also assume corresponding economic responsibility" (Art.33). As far as the enterprise as a whole is concerned, the "Regulations" stipulate that enterprise capital shall be established in contrast with the

industries (see also Footnote 11 of this chapter). 1,246 valid responses were received.

state capital by calculating retained profits and any assets brought in thereby during the contract period into separate accounts, and that "enterprise capital shall be treated as risk funds for any losses incurred by a contracted operation". Specifically, enterprise capital may be used to make up the shortfall when an enterprise does not generate enough profit to turn over the amount due to the state (Art.35).

In practice, risk bearing or sharing under the contract system is practised in various forms. Examples include risk sharing by contractor and the department in charge, all-personnel collateral risk sharing by responsibility, risk sharing by enterprise manager and the enterprise as a whole, and risk bearing by contractor secured by personal assets. The following cases illustrate some of these forms of risk sharing.¹²

Case 1) Risk sharing by the contractor and the department in charge. Chengdu No.1 Knitting Mill is a large state enterprise with 1,677 employees. At the beginning of 1987, its former director signed a three-year contract with the department in charge of the city government. In addition to the main targets in terms of realized profit, profit to be turned over to the state, loan repayment, technological transformation, product quality, and production consumption, the contract specifically stipulated the contractor's risk obligations as follows: (a) If the profit payment and loan repayment targets are not achieved but other targets are achieved, the contractor would be entitled only to his basic salary; every 10 percent below these other targets would mean 10 percent reduction in his basic salary, with a maximum 50 percent reduction. (b) Fulfilment of the profit payment and the loan repayment targets but failure to achieve other targets would mean a proportional reduction(s) in the contractor's portion of increase in personal income resulted from the fulfilment of the aforesaid two main targets. Failure to achieve targets of realized profit, technological transformation, quality, and production costs would lead to 10 percent, 10 percent, and 20 percent of reductions in income respectively.

At the end of the first year, the two main targets were not fulfilled because of a bad sale record resulted from demand changes in the market. As a result, the

¹²Source: RTCER, The Contract System in Practice (in Chinese), Beijing: Economic Management Press, 1988, Cases 5.7, 5.8 and 5.9, pp.94-100.

contractor was penalized by being paid a monthly salary of 50 yuan, one half lower than his normal salary. At the same time, the shortfall in profit payment was made up by the department in charge using excess payments from other enterprises under its jurisdiction. In this case, the risk was actually shared by the contractor in the form of salary reduction and the department in charge by pooling the profit payments from its enterprises and paying the state treasury.

Case 2) All-personnel collateral risk sharing. In the contract signed by Chengdu General Bearing Manufacturer in 1987, it was agreed that an all-personnel collateral risk fund should be raised in addition to enterprise capital. In case of shortfall in profit-tax payment to the State, the collateral risk fund would be used first to make up the shortfall. The contribution to the risk fund payable by each employee working in the enterprise was calculated by $r_i = \bar{r} a_i$, where r_i represents contribution payable by the person i , \bar{r} is risk fund base and $\bar{r} = 300$ yuan(¥), and a_i is the responsibility coefficient for the person i and is determined as follows:

Individuals	a_i	r_i (¥)
Director, Party Secretary	3.5	1,050
Deputy-directors, Chief Economist, Chief Engineer, Chief Accountant, Deputy Party Secretary, Chairman of the workers congress	3.0	900
Heads of departments, Assistant Chiefs, Directors of Divisions, Heads of workshops	2.5	750
Engineers, Accountants, Deputy-Directors of divisions	2.0	600
Heads of working teams, Section Chiefs, White-collar staff	1.5	450
Workers	1.0	300
Apprentices	0.5	150

In this way, a risk fund of 700,000 yuan was raised from the 3,160 employees working in the enterprise. The over-fulfilment of the contract targets in 1987 allowed this fund to finance production.

The all-personnel collateral risk sharing is usually associated with a collective contract system or all-personnel contract system. It is believed to be able to

strengthen enterprise capacity to withstand losses; it also can turn some money in the hands of workers and staff into production funds; with a share from each employee, it can enhance the risk consciousness of all people working in enterprise and motivate them to strive for the common goal -- fulfilment of the contract targets. It has therefore been highly recommended by researchers and commentators(Zhang, 1988; Zheng & Xie, 1989).

Case 3) Risk sharing by the contractor and the enterprise as a whole. At the beginning of 1987, Shenyang Ventilator Manufacturing Factory, a large state enterprise with 1,700 employees, was contracted out. The contract stipulated 1.97 million yuan realised profit and 0.8 million yuan profit payment for 1987. At the end of the year, only 0.4 million yuan profit was generated owing to various factors including wrong market forecasts, unwise product decisions, and increase in prices of raw materials. The contractor was penalized by deduction of all bonuses and half of his basic salary, in accordance with the contract. Other members of the top management were also penalized. In addition, the city financial authority took 0.18 million yuan of the enterprise capital to make up the shortfall in profit payment, and the remaining shortfall was accounted as profit remittance in arrears, which was expected to be paid in the following year(s).

5.4.8 Investment and Finance

Among targets included in contracts, completion of technology transformation shall be regarded as equally important as profit payments to the state, according to the "Regulations" (Art.8). The inclusion of targets related to long-term development of enterprises are supposed to put constraints on the short term income-maximizing behaviour on the part of enterprises (Xun, 1990). Indeed, contracts of limited length in duration led to a fear that enterprises would exploit their equipment and resources to make quick profits, only to distribute and use them all up, leaving the State with nothing but a shambles (Yang, 1990). The setting of and inclusion of targets related to development in contracts are therefore a common practice. A typical contract includes not only targets for profit payment and for technology transformation (investment), but also for product quality, safety, new product development, inventory

turnover, rate of serviceable equipment, and even of enterprise upgrading (RG CER, 1988, pp.228-9). Appendix 5-B shows a contract that includes a number of targets besides profit payment to the State. It has been confirmed that new contracts will pay more attention to targets for profitability, long-term development, as well as for management improvement (CESR, 1990).

Do these targets really work? A questionnaire indicates that after contracting, 82.1 percent of the surveyed enterprises have invested in or had plans for major projects of which 70.7 percent are of a technology transformation nature and 13.2 percent are expansionary projects (RG CER, 1988, p.212). Another source reveals that, in the period 1987-1988, eight Beijing enterprises in the machine-building industry have invested a total of 169 million yuan on technical transformation, an increase of 47.3 percent over the 89 million yuan in the two years before the implementation of the contract system (Yang, 1990). Some commentators believe, however, that setting targets on technological transformation had very little effect in combating enterprises' short-term actions. One argument was that it is difficult to judge an enterprise's long-term behaviour from the amount of investment it uses on technological transformations and product development. It is only the long-term effectiveness and efficiency that can tell this story. However long the contract duration, it is short compared with the long-term development of enterprise (Xun, 1990).

Despite the debate about the effectiveness of investments, it seems that contracted enterprises have given considerations to and taken actions, more or less, on the development issue, at least to the extent of being able to convince their higher authorities that they are fulfilling the targets. The funding of the development projects is another issue of interest. According to the RG CER Survey, among four major sources, bank loans top the list (60 percent of the surveyed enterprises list them as the source of first importance), followed by the enterprise reserve fund. Because of the enterprises' dependence on the banks for funds, limitation on money supply by banks in 1988 has made many enterprises hungry for circulating funds and in serious arrears with their debt payment (Li, 1989).

As can be seen from above description of current practice under the Chinese contract system, the forms and methods are various despite some general principles

and guidelines laid down by the central authority. This variety is a result of the still experimental nature of the contract system and limited experience with it. While a lack of uniformity increases difficulties and complexity for our analysis, it does, on the other hand, provide us an opportunity to examine a variety of alternatives and therefore increase the chances of reaching a more realistic judgement at the end.

5.5 Overall Observations

In this section, we examine the overall situation in term of practical application, rather than the principles and specific forms and techniques, of the current contract system in China. This section is based substantially on a large-scale survey and a supplementary questionnaire carried out by the Research Group on Chinese Enterprise Reform (RG CER) at the end of 1987.¹³ The performance and new behaviour of the contracted enterprises and problems of the contract system are considered.

5.5.1 Motivations for Contracting: Government vs. Enterprises

As discussed in Section 1 of this Chapter, a major factor that prompted the government to decide to apply the contract system to the industrial sector had been the encouragement received from success of the system in the rural sector and in some pilot enterprises and cities. Other considerations include the desire to overcome the problems associated with the previous reform schemes, to further enterprise reform, and the hope of stabilizing and increasing the State revenues received from

¹³The survey covered about 300 contracted enterprises scattered in more than ten cities all over China. It was conducted by a group of young researchers from the Institute of Economic Reform Research, under the guidance and support of the State Economic System Reform Committee and the State Economic Commission. A supplementary questionnaire was addressed to directors and managers of 2,000 enterprises covered by the Enterprise Tracking Observation System, whose sample enterprises scattered in 30 cities and 39 industries. 1,296 valid responses were collected. The information is presented in RG CER (Research Group on the Chinese Enterprise Reform), The Contract System in Practice (in Chinese), Beijing: Jingji Guanli Chubanshe (Economic Management Press), 1988.

enterprises. It was indicated there that the rapid and widespread application of the system could be mainly attributed to the initiation and promotion of the government. Further observations and analysis help us to see the attitudes of enterprises to the system and their motives for positive response to the government's promotion.

According to the information in Table 5.6, large- and medium-sized

TABLE 5.6
DISTRIBUTION OF THE CONTRACTED
ENTERPRISES¹⁴ (PERCENTAGES)

Size		Ability to Compete		Profitability	
Large	21.9	Strong	35.2	High	29.1
Medium	50.0	Moderate	58.9	Average	54.8
Small	28.1	Weak	5.9	Low	15.3

Source: RGCER, *The Contract System in Practice* (in Chinese), Beijing: Economic Management Press, 1988, Table 1, p.196.

enterprises accounted for 71.9 percent of the total contracted enterprises. Those with strong or moderate ability to compete accounted for 94.1 percent, and those with high or average profitability for 84.9 percent. The RGCER Survey indicates that enterprises with higher profitability or/and stronger ability to compete in market are more ready to adopt the contract system, while others show reluctance to accept the system or have more problems in reaching an agreement with the higher authorities when negotiating over contracts (RGCER, 1988, pp.195-6).

The data in Table 5.7 shows ranking of reasons for adopting the contract system by different groups of enterprises. The data evidences our earlier statement

¹⁴The contracted enterprises covered by the RGCER Survey include those which adopted the leasing system, most of which are small enterprises which are outside the scope of our analysis. A small number of collective-owned enterprises were also covered by the survey. This enlarged scale is not deemed to have distorted the whole picture considering their small numbers but should be mentioned when the data quoted in this section are interpreted.

that the government plays an active role in popularizing the contract system. The

TABLE 5.7

REASONS FOR ENTERPRISES TO ACCEPT
THE CONTRACT SYSTEM (IN COMPOSITE INDEX*)

Classification of Enterprises	By Ability to Compete			By Profitability			By Contract Duration		
	Strong	Moderate	Weak	High	Average	Low	1-2ys	3-4ys	5-6ys
1.Requirement of the authorities	5.20	5.53	5.43	5.13	5.42	5.48	5.86	5.26	4.81
2.Profit maximization	5.01	4.66	4.30	4.96	4.96	4.33	4.40	4.98	4.80
3.Increase in employees' income	3.85	3.74	3.40	3.86	3.75	3.54	3.76	3.75	3.72
4.Expansion of enterprise size	3.95	3.73	3.33	3.81	3.84	3.45	3.29	3.92	4.27
5.Fulfilment of the targets set by the higher	3.94	4.27	4.45	4.03	4.12	4.52	4.08	4.11	4.73
6.Higher income for contractor	0.95	0.95	1.18	0.94	0.95	1.02	0.80	0.96	0.89
7.Strengthening the director's position in enterprise	3.04	3.10	3.31	2.87	3.21	3.07	2.80	3.19	3.08

* Composite indexes are calculated on the basis of weighted percentage of positive answers to the seven options by the sampled enterprises. The higher the index, the more important the motive to a specific group of enterprises.

Source: RGCER, The Contract System in Practice (in Chinese), Beijing: Economic Management Press, 1988, Table 2, p.197.

statistics reveals that 54.6 percent of the surveyed enterprises admit that "requirement from the higher authorities" is the first and primary reason for the implementation of the contract system in their enterprises, whereas the remaining 45.4 percent hold that their first motives for applying the system are associated with such objectives as

increasing profit and individual income (RG CER, 1988, p.196).

Table 5.7 also reveals that enterprises with different levels of contestability and profitability rank the reasons differently: the higher the contestability and profitability, the lower the indexes for "requirement from the higher authorities" and for "fulfilment of the targets set by the higher authorities", and the higher those for the objectives related to enterprise development and employees' welfare. This trend does not necessarily mean that those enterprises with higher ability to compete and profitability are freer of state control. It does indicate, however, that although contracting remains a choice made mainly by the government, enterprises with a stronger ability to compete and higher profitability pay more attention to seeking enterprise development and have stronger sense of independence and confidence, while others show relatively higher level of passivity in applying the contract system, which reflects to a certain extent their dependence on the government and lack of confidence in their future performance.

The length of contract duration accounts to some extent for the difference in the enterprise ranking of reasons for contracting. As shown in Table 5.7, the longer the duration, the lower the indexes for the items associated with higher authorities (Nos.1 & 5), and the higher those for the items related to the enterprise development (Nos.2 & 4).

5.5.2 Management Behaviour under Contract System: Enterprises and Market

Under the present dual-dependence system, enterprises are faced with both state control and a market test. In China, one of the negative results of previous long-term involvement of the government in direct administration and tight control of enterprises was that it created an artificial unequal environment for different enterprises via policy-making and common favourable treatments (Dong, 1988). On the other hand, market rules (limited though they may be) require equal competition among enterprises. The contract system therefore provides enterprises a common opportunity to compete at different levels. In general terms, it could be said that the implementation of the contract system has weakened enterprises' contact with the administrative agencies and exposed enterprises more than before to the market tests.

This assertion is supported by the results of the RGCER Questionnaire addressed to directors and managers of the contract enterprises (Table 5.8). Table 5.8 demonstrates two obvious changes: on the one hand, targets from superior departments are no longer the main source of pressure for enterprises because of their standardization in form of the contract base figure or/and contract targets, while such market-related items as supply, marketing, and prices have become directors' main concerns. It is worth noting that supply and prices of materials have been the main sources of worry for enterprises both before and after contracting. Shortage of many types of raw

TABLE 5.8

**SOURCES OF PRESSURE ON THE MANAGERS:
BEFORE AND AFTER CONTRACTING***

Main Source of pressure for directors/managers	Before contracting	After contracting	Variance
Supply and prices of materials	34.5 (1)	46.9 (1)	+12.2
Targets from the higher-levels	24.1 (2)	4.7 (6)	-19.4
Marketing and prices of products	5.1 (3)	16.4 (2)	+1.3
Increasing employees' income	10.7 (4)	10.4 (3)	-0.3
Expanding enterprise's capacity	6.2 (5)	6.7 (5)	+0.5
Developing new products	5.1 (6)	10.0 (4)	+4.9

* Figures in the table show the percentages of directors who rank the item as the main source of pressure for them.

Source: RGCER, *The Contract System in Practice* (in Chinese), Beijing: Economic Management Press, 1988, Table 3, p.202.

materials led to tight planning control of the supply and pricing of these materials by the State. The availability of materials at reasonable prices has therefore been a major concern. The increased concern in this area after contracting is understandably due to the reduced state planned supply at relatively low fixed prices. Hunting for needed materials in the market and paying the higher market prices seem to be something that managers are disinclined to do but to which managers have to accustom

themselves.

According to the same source, among the measures the contracted enterprises took after contracting, adjusting product mix to the market demand was ranked No.1 by the surveyed enterprises. Other measures included changing intra-firm bonus distribution schemes, increasing the output of existing products, and changing management personnel (RG CER, 1988, p.208). These short-term measures reflect short-term expectations and behaviour of many contracted enterprises. Surveys indicate that a large part of retained profits is being spent on employees' bonuses and welfare, in spite of the State appeal that a larger part should go to production and

TABLE 5.9

USE OF RETAINED PROFITS IN THE CONTRACTED ENTERPRISES: A SURVEY*

Purpose	Average	Large-sized	Medium-sized	Small
Production & Development	34.0	34.5	37.6	25.0
Bonuses	6.5	9.6	1.2	6.2
Welfare	59.5	55.9	61.2	68.8

* Figures in the table show proportions of retained profits spent for different purposes by enterprises of different sizes.

Source: Lin & Zou, *Opinions on Enterprises' Short-term Behaviour (in Chinese)*, *Economic Management*, No.3, 1990, Table 4.

development. The result of a survey on use of retained profits in 149 state enterprises in 1988 presents the detailed situation in this regard (Table 5.9). The problem of short-term behaviour on the part of enterprises, along with other problems associated with the current practice of the contract system in China, is to be examined in Chinese context later on in this Chapter.

5.5.3 Enterprise Performance under the Contract System

The contract system was implemented nationwide at the time when ever

declining production and economic efficiency put China's overall economic situation and the economic reform programme into difficulties. Fortunately, the contract system seems to have stood up to the test and produced positive results generally. Two sets of figures are often cited in China as evidence for this judgement: First, during the eight years from 1979 to 1986, industrial enterprises achieved a 2.73 percent progressive annual increase in their profits, while after instituting the contract system, the same figure rose to 11.1 percent during 1987 and 1988. Increased profits during the two years after introduction of the contract system even exceeded by 3.8 billion yuan the total profit increases during the preceding eight years. Second, during the period from 1979 to 1986, profits and tax transferred to the State by industrial enterprises within the state budget increased at the rate of 0.13 percent, while the same figure for 1987 and 1988 was 11 percent (Yuan, 1989). In 1988, when tight monetary policy put many enterprises into difficulties, profits and taxes transferred to the State by industrial enterprises still registered a 17.4 percent increase (Yang, 1990).

In addition to the favourable records on profit-generation and the contribution to the state revenue, many enterprises under the contract system registered a comparatively controlled and reasonable growth of employees' income in contrast with the expansion trend of consumption and abuse of bonuses under the previous reform schemes, which were mentioned at the beginning of this Chapter. Yang Peixin, a senior researcher of the Development Research Centre under the State Council and a warm advocate of the contract system, points out, in an analysis the arguments in regard to the expansion of consumption funds, that the contract system and the associated system whereby total wages are tied to profit and taxes realized are not to be criticized (Yang, 1990). In support of this argument, he provides the following information. In 1988, bank payments in respect of wages rose by 21.1 percent, while workers' average wage only rose by 19.3 percent. A 20.7 percent rise in the cost of living indicated a real decrease in workers' wages. Despite this, the labour productivity in 1988 registered an increase of 9.3 percent (in constant prices). This increase, coupled with the price rise factor, should have justified a 30 percent increase in wages. A 19.3 percent rise in workers' wages shows that wage growth was below labour productivity growth (*ibid.*).

The results of a RGCER survey also support the view that the contract system has contributed to efforts to control the expansion of individual income and consumption. According to the survey, which covered 2,172 contracted enterprises in 11 cities, performance measured by a set of indicators in these enterprises was generally better than that of other enterprises (Table 5.10). As regards increases in wages and bonuses, every 1 percent increase in retained profits led to 1.32 percent and 0.35 percent increases in bonuses and in wages respectively in the contracted firms, while the corresponding figures were 1.77 percent and 0.55 percent respectively at the overall level. Another set of figures have a similar implication: Every 1 percent increase in bonuses brought in 0.21 percent and 0.20 percent

TABLE 5.10

PERFORMANCE OF CONTRACTED ENTERPRISES*

Indicator	Overall performance of all state industrial firms	Performance of surveyed contracted enterprises
Realized profit	8.1	9.8
Taxes on sale	10.2	10.9
Profit & Tax payments	6.6	1.2
Retained profits	25.3	34.8
No. of employees	0.8	2.2
Payroll	13.9	12.2
Bonuses	44.7	45.9
Value of fixed assets	16.8	13.3
Labour productivity	8.1	9.4

* Figures in the table show the increase rates (%) for the period January-September 1987 over the corresponding period of the previous year.

Source: RGCER, *Contract System in Practice* (in Chinese), Beijing: Economic Management Press, 1988, Table 4, p.205.

increases in realized profits and in labour productivity respectively in contracted

enterprises, while the corresponding figures were 0.18 percent for both indicators at the overall level (RGCER, 1988, pp.204-205).

Statistics for contract fulfilment in 1989 also provide some evidence in favour of the contract system. According to the statistics from 28 provinces, autonomous regions, and municipalities directly under the Central Government, and eight cities under separate state planning, 81.8 percent of the 32.4 thousand contracted enterprises fulfilled their contracts. Although the year 1989 is deemed the most difficult year for enterprises in terms of the external environment,¹⁵ profit-tax payments to the State from 23 provinces and municipalities were increased, indicating that the contract system did play an important role in stabilizing the economy and assuring the growth of state revenue (CESR, 1990). In a sense, the contract system has helped the Chinese economy pull through the crisis brought about by sky-high inflation, serious economic dislocation, and political turmoil in the late 1980s.

5.5.4 Problems Associated with the Current Practice of the Chinese Contract System

Like its preceding reform schemes, the Chinese contract system as currently practised has its problems, which are being discussed and analyzed in a serious way in China. A number of problems have been noticed and suggestions made in regard to improvements to the system as a whole or on the techniques and methods specifically. Some of the problems are presented below with some relevant suggestions in the Chinese context.

1) Irrationality in base figure setting.

Fixing a contract base figure is a main element in almost all forms of contracting. But how to set the base figure at a rational level seems to have been a most difficult problem in practising the contract system. There exists a tendency in this regard that base figures are fixed generally low in the negotiating process between the state agencies and enterprises (Xun, 1990). Several factors may explain

¹⁵In 1989, tight monetary supply by banks, big increases in prices of materials and semi-finished products, and political and social turmoil brought about many difficulties for enterprises, and indeed, for the Chinese economy as a whole.

this tendency. The first seems to be concessions normally made by the party that offers the contract because of its wish to reach an agreement more quickly (Qu, et al., 1989). Information asymmetry in favour of enterprise makes it difficult for the party that offers the contract to judge accurately the real potential of the enterprise in question (Sun, 1989). Finally, the lack of set of objective and operational guidelines increases the arbitrariness in setting base figures (RGCER, 1988).

The main figures used as frame of reference in base-figure-setting have been the historical performance records of the enterprise in question and the average return on capital in the Industry. In RGCER's view, neither of these two sets of figures can provide reliable and accurate information concerning the enterprise's real profitability and potential, with the existence of great environmental differences between enterprises and of great market fluctuations (*ibid.*). Accounting tricks may also render the figures unreliable and inaccurate. Moreover, basing the figure on the past performance of enterprise in question has the adverse effect of "whipping the fast ox", as did the profit sharing system (Sun 1989; Zhu, 1989). It has therefore been suggested that instead of fixing the figures using the "base method" as currently practised, the contract figures should be determined primarily using the "input- output method" or the indicator of return on investment(*ibid.*). A recent official formula in this respect reads as follows:

Base figures must be fixed rationally in accordance with the demands of the state's industrial policy, with reference to the average return on capital in the locality and in the industry in question, and must be based on the way the enterprise has fulfilled its preceding contract, as well as with consideration of the heavier or lighter financial burden occasioned by the need for technological transformations and of anticipated beneficial results therefrom (Yuan, 1989).

This statement may be seen as setting up some guidelines in determining base figures. In setting figures, information asymmetry between the party that offers the contract and the enterprise seems to be the root cause of problems. In the agency language, it constitutes a typical problem of adverse selection. The government may well set up the above guidelines, but if the actual figures are fixed without considering the real profitability and potentials of the enterprise, problems remain unsolved.

2) Enterprises' short-term behaviour.

In contrast with the unanimous recognition of the problems in setting base figure, there exists much controversy about connection between enterprises' short-term behaviour and the contract system. What short-term behaviour really means here is the tendency for enterprises to distribute an irrationally large portion of retained profits in bonus distribution and welfare-related investments instead of seeking long-term development through production-related investments and product developing activities. While the problem was recognized and reported in China (see Table 5.8, for example), the explanations of the causes of the problem were very divergent. One view has been that it was the contract system that caused the short-term behaviour on the part of enterprises, because of the limited contract durations (Xun, 1990). It is argued that it would seem natural and reasonable for the manager to commit himself only to the performance within the contract duration and think little of the future (Xiao, 1988).

Contrary to the above-mentioned argument, some commentators hold that short-term behaviour is not endogenous with the contract system. Some methods and elements in practice are accused of encouraging short-term actions, however. These include contracting by individuals, very short-term contracts, and linking the payroll to the amount of profits realized by the enterprise (Yang, 1990). Short-term expectations and behaviour on the part of the higher authorities, some argue, have been an important cause of the short-term actions on the part of enterprises (Luo, 1988). Yuan's comments in this regard may be representative: "The root cause of short-term actions on the part of enterprises lies in the higher authorities. Ever-changing policies, over-lapping policy making procedures, poor assessment, and undesirable contracting methods will all lead to short-term actions on the part of enterprises. The cause of short-term actions does not lie in the contract system itself" (Quoted in Yang, 1990). He suggests that in order to guide enterprises to use retained profits rationally, the share of the production development funds in retained profits must be fixed and may vary according to profitability of the enterprise in question.

It may not be entirely convincing to equate short termism and the contract system. Short termism on the part of higher authorities may cause short termism on the part of enterprises. Imperfections of the contract system are another source of

problems. One cannot deny, however, that the contract system does produce short termism. A simple reasoning is that however long the contract term is, it is short relative to the life of the enterprise. Imposing long-term targets in contracts is a remedy. Regulating the use of retained profits and prolonging the contract term period may also help constrain contractors to think more about long-term development of their enterprises.

3) Failure to honour the contract commitments.

Present practice in the contract system is that it is fairly easy for the enterprises which have fulfilled their targets to get what they are entitled, that may be, for example, extra profits for the enterprise, increases in individual income, and better welfare (an exception is the difficulty for individual contractors to get promised rewards, see subsection 5.4.5); but difficult for the higher authorities to punish those enterprises which did not fulfil the targets (Zhu, 1989). This phenomenon, known as "enterprises being responsible only for profits but not for losses", is largely due to the equivocal attitude of the higher authorities towards the commitments specified in contracts. This not only damages the legal authority of contracts, it also greatly dampens the incentives implied in the contracts. According to statistics, up to the August 1990, commitments in only half of the contracts for 1989 had been honoured. Of the enterprises which did not fulfil the payment target to the State in 1989 (accounting for 18.2 percent of all contracted firms), 24.6 percent made up the shortfalls using the profit otherwise retainable for the year or accumulated enterprise funds, 10.1 percent using their risk funds, 32.8 percent treated the shortfalls as payments in arrears, and the remaining 32.5 percent of the failures had not been dealt with at the time the statistics were published (CESR, 1990). These facts support the opening assertion of this paragraph.

As for honouring the rewards and punishments for managers in contracted enterprises, the reality seems to be far away from the theoretical ideals or proposals of policy-makers. Despite the recommended level (2 to 4 times the average annual income of employees), the average annual incomes of managers in reality hardly reaches the level (for example, see Table 5.5). Similar problems exist with regard to penalizing failed contractors (see subsection 5.4.5).

5.6 Summary

This Chapter reviewed the Chinese contract system currently applied to state enterprises. In section 2, it was indicated that the application of enterprise contract system was encouraged by the earlier success of the contracting system in the agricultural sector and in some pilot enterprises. The contract system is also regarded by Chinese authorities as a way of ameliorating problems with earlier reform schemes. As a result of the efforts of the central authority, the contract system soon became widespread and most prevailing scheme applied to the state industrial sector in 1987.

Section 3 explored the reasons for this popularity from a (Chinese) theoretical perspective. The contract system is believed to be based on principles which are favoured by Chinese authorities and theorists. First, the contract system can maintain public ownership while endowing the enterprise with vitality. Second, it separates ownership rights from management. Third, it can provide enterprises with incentives to improve economic efficiency by clearly specifying the responsibilities, rights, and privileges of both the state and enterprises.

Various aspects of current practice of the contract system were described in section 4. These aspects included the payment scheme to the State, determination of base figures and contract duration, the party that offers contracts, choice of contractors, financial incentives for the enterprise as a whole, rewards and penalties for managers, risk sharing, and investment and long-term constraints. The descriptions comprised of relevant policy regulations from the state, popular practical formulas, and survey data and cases for illustration.

In the final major section, we made some general observations on the overall situation of the Chinese contract system, based mainly on an intensive survey conducted at the end of 1987. The data shown that the implication of the contract system has been a result primarily of the initiative of Chinese central authority. It also indicated that enterprises with higher profitability and ability to compete were more ready to adopt the system than those weaker enterprises. This is consistent with the intuition that the expectations of enterprises with higher efficiency would be more easily met in the market and those of weaker enterprises would be met largely by the

government. Overall, the survey supports the view that the contract system has helped enterprises improve their economic performance. However, some problems have been identified associated with the current practice of the Chinese contract system. These problems occurred mainly in setting base contract figures, in constraining perceived short-term behaviour of contracted enterprises, and in honouring the contract commitments.

This Chapter concludes the descriptions of Chinese reward systems. The next Chapter will return to the relevant Western analyses we reviewed in Chapters 2 and 3. The main purpose of the next chapter will be to bring together the two main branches of literature (the bonus literature and agency literature) and to justify the agency approach to incentive problems in a centrally planned economy. The analysis of Chinese systems will be conducted in Chapters 8, 9 and 10, after theoretical and technical model-related discussions in Chapter 7.

APPENDIX 5-A

PROVISIONAL REGULATIONS ON THE CONTRACTED OPERATION RESPONSIBILITY SYSTEM FOR INDUSTRIAL ENTERPRISES OWNED BY THE WHOLE PEOPLE

Promulgated by the State Council on 27 February, 1988

Chapter 1 General Provisions

Article 1 The present Regulations are formulated with a view to developing and perfecting the contracted operation responsibility system for industrial enterprises owned by the whole people (hereinafter abbreviated to "enterprises"), to altering the operation system of enterprises, invigorating enterprises and increasing economic effectiveness.

Article 2 On the basis of unswerving adherence to the socialist system of ownership by the whole people, and in accordance with the principle of separating ownership and management, the contracted operation responsibility system shall define, by way of contracts of contracted operation, the relations between government and enterprises in terms of duties and rights. This system shall allow the enterprises to operate with autonomy, and to be solely responsible for any profits and losses.

Article 3 The contracted operation responsibility system shall be implemented in consideration of the interests of the state, the enterprises, the operators and the producers. It shall utilize the enthusiasm of enterprise operators and producers, tap the potential of enterprises, safeguard the profits turned over to the state, strengthen the self-developing power of enterprises and gradually improve the livelihood of workers.

Article 4 The contracted operation responsibility system shall be implemented in accordance with the principle of integrating duties, rights and profits. Autonomous operation and management authority shall be given to and accordingly implemented by the enterprises whose legal rights and privileges are protected.

Article 5 The contracted operation responsibility system shall be

implemented in accordance with the principles of guaranteeing a set base figure, ensuring payments to the state, retaining the extra profits and making up for the losses incurred, in order to define clearly the distribution relations between state and enterprises.

Article 6 In order to implement the contracted operation responsibility system, both parties to any contract shall abide by the laws, statutes and policies of the state, and shall accept the supervision of the relevant departments of the people's government.

Article 7 In order to implement the contracted operation responsibility system, the state auditing department and its appointed organizations shall audit the accounts of both parties to any contract and its enterprise operator.

Chapter 2 The Content and Form of the Contracted Operation Responsibility System

Article 8 The major contents of the contracted operation responsibility system: guarantee profit payments to the state, guarantee completion of technology transformation, link up gross payroll with economic effectiveness.

On the basis of the aforementioned contents, different enterprises may formulate other contract contents according to actual conditions.

Article 9 Profit payment to the state in respect of contracted operations shall be in the following forms:

- (1) turning over to the state a guaranteed amount proportional to profit;
- (2) turning over to the state a guaranteed base figure amount of profit, the remainder to be divided;
- (3) turning over to the state by enterprises making small profits a fixed amount of profit;
- (4) reducing losses (or compensating) for enterprises experiencing losses;
- (5) other forms approved by the state.

Article 10 The base-figure amount of profit turned over to the state shall generally be based upon the amount of profit turned over to the state the year before (for enterprises implementing the second phase of substituting surrendered profit with tax, this is the portion of income tax and regulatory tax paid according to the law

(applicable hereunder)).

Any enterprise that has experienced relatively large profit fluctuation because of the influence of objective factors may use as its base-figure the average amount of profit turned over to the state in the previous two to three years.

After the base-figure amount of profit to be turned over to the state is determined, an appropriate adjustment can be made with reference to the average capital and profit rate in a particular region or line of business.

The rate of increase for the guaranteed amount -- proportional to profit -- to be turned over to the state and the division of the remainder shall be set in accordance with the production potential of an enterprise, and the factor of technology transformation in relation to that enterprise.

Article 11 Profits shall be turned over to the state as follows: an enterprise shall pay tax according to the taxation law; where the tax paid exceeds the amount of profit turned over to the state as prescribed in the contract of contracted operation, the enterprises shall be reimbursed 80% of the extra amount each season by the finance department. The amount due shall be settled at year-end; more often in the form of reimbursement than compensation. Payment shall be guaranteed.

Article 12 Technology transformation projects shall be carried out in accordance with state property policies, market demands, technology transformation schemes and the economic conditions and technology level of the enterprises.

Article 13 The specific forms in which gross payroll is linked up with economic effectiveness shall be determined by state rules and the actual conditions of the enterprises.

Chapter 3 The Contract of Contracted Operation

Article 14 To implement the contracted operation responsibility system, the operator of any enterprise shall on behalf of the contractor sign a contract of contracted operation with the party that offers the contract.

The party that offers a contract shall be a relevant department designated by the people's government. A contractor shall be the enterprise that undertakes contracted operation.

Article 15 Both the contractor and the party that offers the contract in respect of any contracted operation, shall uphold the principles of equality, self-determination and consultation in making a contract of contracted operation.

Article 16 A contract of contracted operation shall generally include the following major terms:

- (1) form of contracted operation;
- (2) duration of contract;
- (3) amount of profit to be turned over to the state or amount of losses to be reduced;
- (4) state appointed schemes for supplies and for the manufacture of products;
- (5) quality of products and other major economic or technology targets;
- (6) projects of technology transformation and expansion and protection of state property;
- (7) use of retained profit, repayment of loans, handling of credits and debts effected before the contract comes into force;
- (8) rights and duties of both parties;
- (9) responsibility for any breach of contract;
- (10) reward and penalty for enterprise operator;
- (11) other matters as agreed by both parties to any contract.

Article 17 The duration of a contract shall not generally be less than three years.

Article 18 The contract of contracted operation is made in accordance with the law and is therefore legally binding. No party may of its own accord change or terminate any contract.

Article 19 Where the State Council has effected major changes in tax items, tax rates and prices of designated schemes products, the two parties to any contract may, in accordance with the rules of the State Council, change the contract of contracted operation after consultation.

The two parties to any contract may, after consultation, change the contract of contracted operation when faced with uncontrollable factors or when one party is unable to perform the obligations of the contract of contracted operation because of

outside factors and through no fault of its own.

Article 20 If a contractor is unable to fulfil a contract of contracted operation owing to his mismanagement, the party that offers the contract shall have the right to propose a termination of the contract of contracted operation.

If a contractor is unable to perform a contract of contracted operation because of any breach of agreement by the party that offers the contract, the contractor shall have the right to propose a termination of the contract of contracted operation.

Article 21 Any dispute that arises between the contractor and the party that offers the contract shall be settled through consultation. Where consultation has failed, both parties to the contract may, in accordance with the provisions of the contract of contracted operation, ask the administration department of industry and commerce for arbitration; they may also petition the people's court in accordance with the rules of the contract of contracted operation.

Chapter 4 The Rights and Duties of both Parties to a Contract of Contracted Operation

Article 22 The party that offers a contract shall have the right to inspect and examine the production and operation activities of the contractor in accordance with the rules of the contract of contracted operation.

The party that offers a contract shall, in accordance with the provisions of the contract of contracted operation, safeguard the legal rights and privileges of the contractor and the enterprise operator. The party that offers the contract shall also undertake to help the contractor overcome any difficulties in production and operation where it is within its authority to do so.

Article 23 A contractor enjoys autonomy in operation and management as guaranteed by the laws, statutes and policies of the state and the provisions of a contract of contracted operation.

A contractor shall, in accordance with a contract of contracted operation, complete the various projects.

Article 24 Where the party that offers a contract has not implemented the contract signed, and the contractor's performance of contract obligation is affected as a result, the party that offers the contract shall be responsible for the breach of

contract. The directly responsible person on the party that offers the contract shall be investigated and obliged to assume administrative and economic responsibility where severity justifies it.

Article 25 where a contractor is unable to complete the tasks of a contract of contracted operation, he shall be held responsible for the breach of contract. The enterprise operator shall be investigated and obliged to assume administrative and economic responsibility where severity justifies it.

Chapter 5 The Manager of an Enterprise

Article 26 The contracted operation responsibility system generally uses tender as a means of selecting enterprise operators or enterprise operating groups through competition. The selection of enterprise operators may also be made in accordance with any other means stipulated by the state.

Tenders may be invited from within the enterprise concerned or from among its trade. Where the right conditions are available, tenders may be invited through the society from a pool of talents. Tenders may be made by individuals, organizations or enterprise legal persons. Where the tender of an organization or an enterprise legal person becomes the successful tender, that organization or enterprise shall decide on the enterprise operator.

The state encourages enterprise legal persons to tender for other enterprise operations so as to speed up adjustments to be made to product structures and the structures of enterprise organizations.

Article 27 The various levels of the people's governments shall actively create conditions conducive to the gradual build-up of markets for contracted operations that provide information on tender exercises in respect of contracted operation enterprises and allow fair competition among enterprise operation talents.

Article 28 The tender committee (or team) organized by the party that offers a contract, with participation from the workers' representatives of the contractor enterprise, shall make a thorough evaluation of the tenderers, engage in public discourse, and choose the most qualified tenderer.

Article 29 An enterprise operator shall possess the following qualifications:

- (1) the qualification as a factory director (manager) as set by the state;
- (2) other qualifications as stipulated in the tender.

Article 30 An enterprise operator is the factory director (manager) and legal representative of an enterprise, and is completely responsible for that enterprise.

Article 31 An enterprise operator may hire, according to his needs and as prescribed by the relevant state rules, a number of people to form the leading body in an enterprise. When a contract is over, the original leading body of an enterprise shall be dissolved.

Article 32 An enterprise operator shall perform the duties prescribed by the contract of contracted operation. He shall, during the contract period, submit annual performance reports on the contracted operation to the party that offers the contract and to the workers' congress of the enterprise.

Article 33 The annual income of an enterprise operator may be one to three times higher than the annual income of a worker in the enterprise, depending on whether the contract of contracted operation is near completion. If an enterprise operator performs outstandingly, his income may even be suitable higher. The income of the other members of the leading body shall be lower than that of the enterprise operator.

Where a contract of contracted operation fails to reach its completion, the income of the enterprise operator shall be deducted to as low as half of his original salary. Other members of the leading body shall also assume corresponding economic responsibility.

Chapter 6 The Management of a Contracted Operation Enterprise

Article 34 Enterprises which implement the contracted operation responsibility system shall conduct trial runs with the system of separate capital accounts, whereby separating the state capital and enterprise capital and entering them into different accounts.

All fixed assets and cash flow owned by an enterprise before a contract comes into force shall be listed as state capital.

The portion of profit retained during a contract period as well as any fixed

assets and supplementary cash flow brought in by such retained profit shall be listed as enterprise capital.

Fixed assets bought with borrowed funds during the contract period which are repaid with retained profit, shall be listed as enterprise capital. If the loan is repaid before tax, the capital shall be converted into state capital and enterprise capital, in accordance with the proportion of profit distribution between the state and the enterprise before the contract comes into force.

The depreciated funds of fixed assets withdrawn during the contract period shall be listed separately as state capital or enterprise capital in accordance with the proportion of fixed assets in respect of state capital and enterprise capital.

Enterprise capital is of whole-people ownership.

Article 35 Enterprise capital shall be treated as risk funds for any losses incurred by a contracted operation. When the contract is over, the capital shall be injected into the enterprise capital of the next phase of contracted operation.

If an enterprise does not have enough profit to turn over the amount due to the state, it may make up the shortfall by using the retained profit of the enterprise that year; if this is not enough, it may use the enterprise capital.

Article 36 A contracted operation enterprise shall examine and ratify the proportion of retained profit distributed to production and development funds, welfare funds and reward funds. It shall also channel a certain sum of money from the welfare and reward funds into the housing system reform. Any additional retained profit after the contract period shall mostly be used as production and development funds.

Article 37 Repayment schedule of any loans obtained before the contract, loans that the state is responsible for, shall be stipulated in a contract of contracted operation. The loans shall be repaid in annual payments and the base-figure for contracted operation shall be adjusted in accordance with regulations. Any loans obtained after a contract comes into force shall in principle be paid back with enterprise capital.

Article 38 Contracted operation enterprises shall abide by the price policy of the state, and may not raise their prices directly or indirectly without authorization.

Where an enterprise has broken the law by setting its own prices, it shall be investigated and the enterprise operator may be obliged to assume economic responsibility in accordance with state rules.

Article 39 Contracted operation enterprises shall work toward the reform of internal leadership system at enterprises, and implement the factory director (manager) responsibility system.

Article 40 Contracted operation enterprises shall strengthen democratic management, develop fully the workers' congress system, tap fully the potential of labour unions and protect earnestly the democratic rights and privileges of workers.

Article 41 Contracted operation enterprises shall, in accordance with the principle of integrating responsibility, rights and profits, establish and develop the internal economic responsibility system of enterprises and improve their internal contract system.

Article 42 A contracted operation enterprise shall, in accordance with the principle of "to each according to his labour," decide for itself a wage scheme and a suitable distribution method to be adopted. It shall actively promote the piecework-based wage system and the set-amount wage system so as to link the income of labourers with actual output.

Chapter 7 Supplementary Provisions

Article 43 Enterprises owned by the whole people which are in the business of communications, construction, forestry, goods and materials, commerce or foreign trade shall refer to the present Regulations for the implementation of the contracted operation responsibility system.

The departments that carry out trade contracts and the listed enterprise organization contracts of state planning shall conduct their affairs according to state rules and shall not apply the present Regulations.

Article 44 The people's government of each province, autonomous region and municipality shall formulate implementation procedures in accordance with the present Regulations.

Article 45 The present Regulation becomes effective on 1 March 1988.

APPENDIX 5-B

A SAMPLE CONTRACT

In this appendix, we translate and present a contract between the government agency of Changzhou City, Jiangsu Province and the manager of Changzhou Plastic Machinery. The presentation is intended to retain the original text as close as possible but some tables are simplified. The form of contract is standardized within the City and the underlined text is absent and tables are blank before the contract is formulated. The Contract is as follows:

In order to further reforms at the enterprise level, improve enterprise management, tap all potentialities of enterprises, and guarantee a steady and continued increase in the national income and the ability of enterprise for self-development, Changzhou City Government has decided to institute the contract system at the Changzhou Plastic Machinery (CPM), in light of the principle that "enterprises contracts on a fixed basis of profit, guarantees the revenue for the State, retains the residual profit, or make up using the reserve fund in case of failing to meet the profit target", and according to the "Provisional Regulations concerning the contract system for the State Industrial Enterprises" issued by the State Council and Documents Nos. 83, 229 (1987) issued by the Changzhou City Government. Mr. W. Huang and Mr. R. Zhang are appointed as the deputies for the Government (Party A), and Mr. R. Dai is confirmed as the contractor of CPM (Party B). Having consulted with each other both Party A and Party B agree to sign this contract.

1. Formula and Duration of the Contract

Formula of the contract: the Enterprise should turn over a certain amount of profit-tax determined by a base amount and a fixed annual increase rate. The residual profits are retained by the enterprise.

Duration of the contract: four years (from 1st January 1987 to 31st December 1990).

2. Contents and Quotes of the Contract

2.1 The amount of profit-tax (including income tax, adjustment tax and a portion of after-tax-profit) to be turned over to the State (unit: ¥10,000):

The base amount (1986) is 313.

The annual rate of increase (ROI) is 3 percent.

The Realized Profit of the Base Year (1986)	The Base Amount for the Contract	Contracted Target Amount							
		1987		1988		1989		1990	
		base	ROI	base	ROI	base	ROI	base	ROI
313	313	322 ^a	3	332	3	342	3	352	3

^a $313 \times (1 + 3\%) = 322.39$.

2.2 The amount of profit to be used for repaying the technical innovation loans during the contract period (omitted).

2.3 Targets for technical innovation (unit: ¥10,000)

No.	The Name of Project	Investment Amount and Sources				Date of Completion
		Total	Loans	Self-financing	Others	
1	Equipment renewals	50	50			Dec. 1987
2	Project to be approved	600	300	300		1990

2.4 Increase in value of fixed assets^b (unit: ¥10,000)

Year	1986 (base year)	1987	1988	1989	1990
Original Value	691.72	957.12	1087.12	1207.12	1257
Net Value	548.99	684.00	814.00	904.00	924.00

^b Productive assets only.

2.5 Other Operational Targets

Year		1986 (base year)	1987	1988	1989	1990
New product develop- ment	Ratio of new product value		5%	10%	10%	10%
	Number of new product	1	2	1	1	1
Percentage of qualified products		98.5%	98.5%	98.5%	98.5%	98.5%
Energy and material consump- tion	Energy (ton /¥10,000 production value)	0.17	0.18	0.18	0.18	0.18
	Raw material (utilization ratio)		60%	60%	60%	60%
Upgrading of the enterprise			Provin- cial	Provin- cial	State second	State second
Safety in production		No fatal accident, no heavy equipment accident, no accident causing injury of more than three people, no fire disaster causing lose of more than ¥50,000.				

2.6 State Planned Input Allocations and Output Targets

Planned input allocations				Planned output targets			
Year	Input	Unit	Quantity	Year	Product	Unit	Quantity

3. The Duties and Rights of Both Parties to the Contract

Party A shall guarantee that the firm enjoys autonomy granted by the laws, statutes and policies of the state. It shall actively guide, support and help the firm to fulfil contracted operation targets. It shall also create a reasonably good external

environment, protect the legal rights and privileges of the firm, and supervise the productive and operational activities of the firm.

Party B shall organize the productive and operational activities of the firm in accordance with the laws, statutes and policies of the State. The behaviour of the firm shall accord with the interests of the State and demand of macro-economic control. It shall conscientiously accept the inspection and supervision of relevant government agencies. It shall, in accordance with the principle of integrating responsibility, rights and benefits, establish and perfect the internal economic responsibility system and develop an internal contracting system.

The contractor is the legal representative of the firm and enjoys all rights granted to a director by "Provisional Regulations Concerning the Work of Directors in State Industrial Enterprises". He has the right to lease or dispose idle assets of the firm, with the permission from Party A and provided that he can guarantee completeness and increases in value of the firm assets.

4. Performance Evaluation and Rewards and Penalties

4.1 It is the responsibility of the department in charge to evaluate the fulfilment of the various targets and quotas prescribed by the contract.

4.2 When Party B has fulfilled the profit-tax payment target, the extra amount shall be reimbursed to the firm by the city finance department. Party B shall distribute the retained profit according to the following:

Retainable Profit (extra-target)		Distribution of retained profit	
Scale	Percentage	Production development fund	Welfare and bonus fund
	100 %	80 %	20 %

4.3 If Party B fails to generate enough profit to turn over the amount due to the state, it shall make up the shortfall by using the retained profit in that year; if this is not enough, it shall use the enterprise fund or treat the shortfall according to the methods stipulated by the government. A penalty equal to 2‰ of amount due shall be levied if Party B fails to turn over the amount due in time.

4.4 If Party B fulfils the profit-tax payment target but fails to fulfil the targets for technical innovation, increase in value of fixed assets, new product development, product quality, reduction in energy and material consumption, upgrading of the enterprise, and safety in production, the retainable profit is subject to deduction of 1 percent to 3 percent for each unfulfilled target.

4.5 The rewards and penalties to the contractor shall be implemented according to the relevant stipulations and supplementary provisions of No.[1987]97 Document of Changzhou City Government.

5. Change and Termination of the Contract

5.1 No party may of its own accord change or terminate the contract after it takes effect.

5.2 Where the State Council has effected major changes duo to policy changes in tax items, tax rates and prices of state planned products, the two parties may change and adjust relevant targets after consultation. Revised targets take effect after public notarization.

5.3 When Party B is unable to fulfil the contract due to uncontrollable or unforeseen factors, Party A may terminate the contract after auditing and confirmation of the Public Auditing Department and a public notary.

5.4 If the contractor is unable to fulfil the contract owing to his mismanagement, Party A shall have the right to propose a termination of the contract.

If the contractor is unable to fulfil the contract because of any breach of agreement by Party A, the contractor shall have the right to propose a termination of the contract.

5.5 Changes and termination of the contract shall report to relevant departments after a public notarization.

6. Supplementary Articles

6.1 The contractor will become the legal representative of the firm when the contract becomes effective. He shall continue to fulfil the economic contracts entered by the firm before this contract after checking and identification.

6.2 This contract becomes effective once signed by Party A and Party B and

notarized by a public notary.

6.3 This contract has sixteen copies. Party A and Party B hold a copy each, and the third copy is kept by the public notary. The other copies shall be sent to: the City Tax Bureau, the City Labour Bureau, the City Planning Committee, the City Committee of Economic System Reform, the Cadre Division of the City Economic Commission, the City Office for Implementing the Director Responsibility System, the City Auditing Bureau, the City Office for Plastics Industry ("Department in Charge"), the City People's Bank, the City Industrial and Commercial Bank, the City Construction Bank, the City Bank of China, the City Bank of Communication.

Representative of the party
that offers the Contract:

(signature)

Representative of the contractor
party:

(signature)

Date: 25 September 1987

CHAPTER 6

AGENCY AND CENTRALLY PLANNED FIRMS

6.1 Introduction

Two parts of this thesis have been presented so far. In Chapters 2 and 3, we reviewed the literature on managerial motivation in a centrally planned economy ("bonus literature") and work on agency research respectively. In Chapters 4 and 5, the main Chinese reward systems applied to state enterprises were presented and the main features and problems associated with the systems were highlighted. These two parts have been presented in such a way that they appear remotely related: in literature review the Chinese reward systems were not given specific consideration while in system description agency models and other analytical tools were not explicitly used. As a result, relevance and connections between the two parts became blurred.

It is our aim to place the Chinese reward systems into a properly designed analytical framework and to analyze them in a systematic and critical way. However, mainly due to perceptible disparities between Western theoretical developments and Chinese practice, the existing literature does not provide a ready-to-use framework, which can be used to analyze the Chinese reward systems in a sensible way. This prompts a further analysis of the literature in order to tailor a framework to suit our specific analytical purposes and objective. This is the main purpose of this Chapter.

In attempt to develop an analytical framework, we shall first of all take a closer look at the literature reviewed in Chapters 2 and 3 by comparing the two studies. This comparison is intended to generate some common points and differences between the two studies and to justify our agency approach to Chinese reward systems. This justification will continue to section 3, where we look at some more recent research on incentive problems in a centrally planned economy using explicitly

the agency approach. Section 4 will take us closer to the theme of the Chapter: agency relevance to Chinese state enterprises. In that section, Granick's(1990) agency analysis of Chinese state enterprises will be critically reviewed. Along with a summary of the main contents of the Chapter, some further discussions on Granick's agency model will be undertaken and our use of agency concepts will be defined in the last section.

6.2 The Bonus Model vs. the Principal-Agent Model

In this section, we bring together the two studies that were reviewed separately in Chapters 2 and 3, the bonus literature and agency study. Both studies embody a wide range of models covering various topics. In the following chapters, we shall concentrate two specific models. In the bonus literature, we shall focus on the New Soviet Incentive Model (NSIM), which we shall refer to as "the bonus model". In agency literature, we shall put emphasis on the basic principal-agent model as defined in Chapter 3. In this section, we shall first make a simple, direct comparison between the bonus model and the principal-agent model. Common points and differences between the two models will be highlighted. Then we shall examine the information aspect of the bonus model from the agency perspective. Finally, the ratchet effects in the bonus literature will be reappraised from agency point of view. These later two subsections are supposed to demonstrate the view that the bonus model and agency are compatible and the agency approach may provide some insights into incentive problems in a centrally planned economy.

6.2.1 A Comparison

Western study on the managerial incentive problem in a centrally planned economy was largely prompted by the former Soviet and East European reforms of the 1960s and 1970s. This literature, named as the "bonus" literature by Laffont and Maskin (1982) and reviewed in Chapter 2, provides some basic ideas concerning the treatment of the Chinese case. Its perceived "spirit of a principal-agent model" (Granick, 1990) also encourages us to use the principal-agent model in a more explicit

way in this thesis. Before we do this, we first consider the similarities and the differences between the bonus models and the principal-agent model. This comparison may provide some justification for the general agency approach adopted in this thesis.

6.2.1.1 Common elements of models.

Table 6.1 (p.204) lists the basic elements of the bonus model and of the basic principal-agent model. By looking at the table, it is not difficult to discover the common or similar points and differences between the two models. Five common assumptions are present. (1) Two individuals are involved in the two-person game: the principal (the planner) and the agent (the firm manager). (2) Both the individuals are assumed to act in a self-interest fashion. They aim to maximize their own utility or expected utility over a certain period of time. (3) There exists a non-coincidence of objectives. Furthermore, the fulfilment of the principal's objective function is dependent on agent's action or/and information. These two conditions create incentive problems for the principal. (4) There exists asymmetric information distribution between the principal and the agent. Normally, the agent is assumed to hold more information concerning his production function. Moreover, the agent's action or certain level can not be perfectly observed by the principal. The latter has to rely on some observable but imperfect indicator(s) as a variable(s) in the reward function. (5) Interaction between the two players is essential for incentives to be meaningful. Both parties are assumed to be rational and behave in a responsive, economically sensible manner. In game theoretical language, one player would choose his or her best response to the conceived best action of the other player. In other words, it is assumed that there is always a best solution to the problem in equilibrium.

The basic game structure in the both settings are also similar. The principal is normally the first mover. She designs the reward function, determines the values of its parameters, and offers the contract to the agent. In the bonus literature, one can regard the planner-manager relationship as a specific case of the principal-agent model, as the planner is also the system designer and her welfare depends on the action of the manager. However, it should not be inferred from this specific case that the principal is always superior and the agent inferior. In general principal-agent models, suffice it to see the both individuals are equal in moral and legal sense, therefore precluding any forcing elements (note that a "forcing contract" is a different

TABLE 6.1 ELEMENT OF THE BONUS MODEL AND OF THE PRINCIPAL-AGENT MODEL: A COMPARISON^a

	The Bonus Model	The Principal-Agent Model
Assumptions of the basic model	<ol style="list-style-type: none"> two self-interested individuals: the planner and the manager; both are expected utility maximizers non-coincidence of objectives information asymmetry effort aversion on the part of the manager imperfect observation of effort 	<ol style="list-style-type: none"> two self-interested individuals: the principal and the agent; both are expected utility maximizers non-coincidence of objectives information asymmetry effort aversion on the part of the agent imperfect observation of effort risk preferences
The basic model:	rewards for the manager depend on target selection and output	in moral hazard model rewards depend on outcome
1. reward function		for the principal: $U_p[q(e,\theta)-w(q(e,\theta))]$
2. utility functions ^b	for the manager: $U[B(\bar{q},\hat{q},q(e,\theta)),e]$	for the agent: $U_A[w(q(e,\theta)),e]$
3. planner's (principal's) problem	to design function B in order to elicit correct information and encourage exact target fulfilment	to choose a reward function in order to induce a level of effort from the agent that maximizes the principal's utility
4. the studied model ^c	<p>the (New Soviet Incentive Model)</p> $B = \begin{cases} \bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \\ \bar{B} + \beta(\hat{q} - \bar{q}) + \gamma(q - \hat{q}) & \text{if } q < \hat{q} \end{cases}$	<p>the Moral hazard model</p> $\text{Max } EU_p[q(e,\theta) - w(q(e,\theta))]$ $\text{st. } EU_A(w(q(e^*,\theta)), e) \geq \bar{U}_A$ $e = \underset{e'}{\text{argmax}} EU_A(w(q(e',\theta)), e')$
Game structure and timing	<ol style="list-style-type: none"> the planner makes first move--chooses a bonus function and offers a tentative target \bar{q} the manager responds by choosing a target and reporting \hat{q} the manager chooses a level of effort to achieve \hat{q} actual outcome q is observed and bonus is determined; the manager is rewarded or penalized 	<ol style="list-style-type: none"> the principal makes first move -- chooses and offers a reward scheme the agent responds by choosing a level of effort e outcome q is observed and the agent is rewarded

(continued)

- Note:
- Only the moral hazard model is considered where the principal-agent model is concerned.
 - The notations used in the table are the same as those in Chapters 2 and 3.
 - The New soviet Incentive Model is a solution to the planner's problem while the moral hazard model is presentation of the problem itself.

concept¹) caused by inequality in the two individuals' status. In the real world, however, it is hardly the case that the both parties are equal in status, especially in a centrally planned economy. Both the bonus model and the agency model do not accommodate this element in their analyses. This aspect of the "stylized" models may make the both models less than close to the practical world.

The timing in both games are identical Fig.6.1 illustrates the basic structure

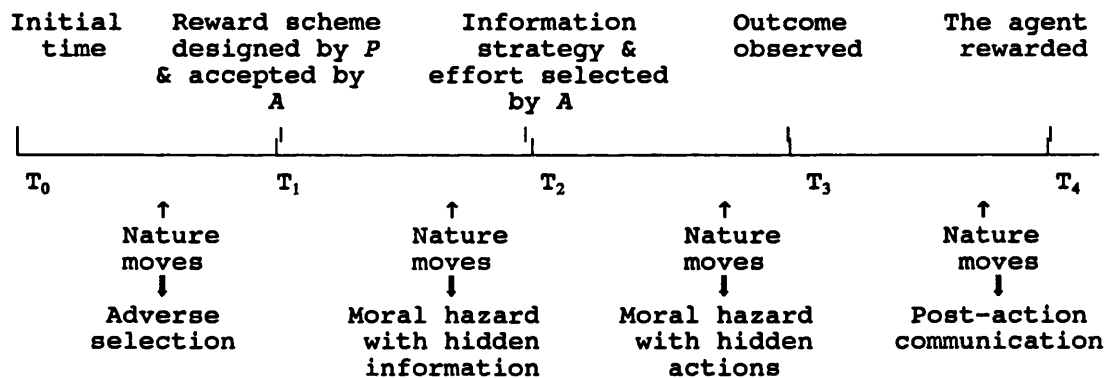


Fig. 6.1 Move of Nature and Agency Problems

and timing of games. In each case, at time T_1 the principal (P) offers the agent a contract or a menu of reward schemes, which the agent accepts or rejects (in the case of menu, he chooses a scheme). If the contract is attractive enough and the agent accepts it, he then decides on his information strategy and/or a level of effort to put into the production process, at time T_2 . When this process ends and the outcome is generated (at time T_3), the agent is rewarded according to a predefined reward

¹The "force" in a forcing contract in agency comes from the strength of incentives provided by the contract, not from superior moral, economic, or legal status of the principal.

function, which generally depends at least partly on the outcome (at time T_4). During the game, Nature makes a move at certain point and this move introduces additional uncertainty and a number of incentive problems resulting from information asymmetry into the game. Sometimes, Nature makes a move after the agent has chosen the level of effort (between T_2 and T_3). In this case, perfect observation on the agent's action cannot be made by the principal because of the interruption of Nature; Information about the agent's action is asymmetrical. Sometimes, the agent moves after Nature (between T_1 and T_2). In this case, the agent may hold private information about the move of Nature, which is not observed by the principal. The agent's choice of action may have been based on this private information. The former is termed moral hazard with hidden actions and the latter moral hazard with hidden information (Rasmusen, 1989). There are also cases where Nature moves even before the contract is offered (between T_0 and T_1). This creates the adverse selection problem for the principal (see also Chapter 3). It is also possible for Nature to move after the outcome has been observed but before the agent is rewarded. This gives rise to the problem of post-action communication. If Nature makes moves during contract period as well as before the contract, a more complicated problem combining moral hazard and adverse selection is created. In general, all these types of problems may be present in the two branches of literature in question.

Another similarity between the two studies is that both static (one period) and dynamic (multiperiod) models have been considered, and dynamic considerations have been one of the major issues in the bonus literature. Both the basic models are, however, concerned with the one-period problem.

6.2.1.2 Differences.

One way to look at the bonus model is to regard it as a specific application of the agency model. The difficulty with this view is that the majority of the contributions to the bonus study did not make use, or to say the least, did not make explicit use, of the agency achievements. One impression which can be got from the Literature is that they are parallel but separate studies conducted by two groups of

writers.² Another plausible reason for the differences between the two studies may be due to time gap. A major part of the bonus literature was published in 1970s while the agency research only came into the limelight around the late of 1970s.

1) Different emphases

If we consider the differences between the two studies, the first that may be noted should be their different emphases. As the information requirements of the central planner are regarded as a priority in designing an incentive scheme in a centrally planned economy, the bonus model has put much emphasis on truthful information elicitation and target setting. The literature has so concentrated on the revelation problem that may authors seem to have take the positive value of the Soviet reform as granted and "proceeded to study more detailed features of the scheme, such as the conditions under which plant managers will report their information truthfully (in terms of setting targets equal to expected output) and the effects of changes in scheme parameters in managerial target setting behaviour" (Holmstrom, 1982). As a result of this concentration, other important aspects of the New soviet Incentive Model (NSIM) have been given less attention. One of the important aspects, the motivational properties of the NSIM, for example, were largely ignored. The variables of effort and risk preference, which are central in the principal-agent model, were only casually treated in the bonus literature.

The principal-agent research, on the other hand, has been dealing with agency problems arising from information asymmetry combined with the agent's work (effort)-aversion and normally risk aversion. In particular, moral hazard problems resulting from imperfect observations of agent's action are extensively studied in the principal-agent model. Moreover, risk-sharing issues also received great attention in this model. In the presence of agent work-aversion and risk-aversion, the emphasis of principal-agent model is put on the design of the optimal scheme which allows the

²As noted in chapter 3, some writers including B. Holmstrom (1982) and R. Rees (1985) have been engaged in both studies. But by and large, writers in the bonus literature have been those specialized in the Soviet and East European study and Central planning economics, while authors of the agency theory include a wider sphere of people engaged in micro-economics, organizational study and management study.

principal to induce desirable level of effort from the agent. In achieving this, the agency model assumes rationality on the both parties: the agent weights higher utility from reward against disutility with higher level of effort, and the principal has to strike a balance between providing sufficient incentives and optimal risk-sharing. Elements like effort variation and risk preference are therefore extensively analyzed in the P-A model. Research on the problem of information elicitation on the other hand has been greatly suppressed by the discovery of "the revelation principle", which allows researchers concentrate on only truth-telling schemes and design reward schemes accordingly.

2) Different orientations and ranges

The orientation of the bonus model is very specific. In particular, the analyses have centred around the NSIM and tested its properties in terms of revelation ability and the target setting behaviour on the part of the manager. Therefore, the bonus model basically deals with the practice and model-testing. It is also specializing in the specific setting of the planner-manager relationship.

The principal-agent model is different in that it is more theory-oriented and general. It is intended to formally model the underlying economic environment in order to understand how the design of the employment relationship affects the efficiency loss from agency problems (Baiman, 1990). This model-building orientation has led researchers to focus on internal consistency and optimal solutions (in the Pareto sense) rather than to bother about specific practice. The range of problems covered in this literature are much wider than the bonus model. An example is that the role and value of information of all types have been studied extensively in agency research, while the bonus model has concentrated on pre-effort information revelation.

3) Weakness of the bonus model

The concentration on accurate forecasts of the bonus model may be traced back to the "Socialist Controversy" commencing in 1920s (for details, see section 2.2 of Chapter 2). Throughout the controversy, possibility of economic calculations in a centrally planned economy has been challenged by questions such as whether or not the planner can obtain necessary and accurate information to implement the calculations. The New Soviet Incentive Model provided a good case for analysis along

these lines. While this study has generated a great deal of commentaries and analyses of the properties of the New Soviet Incentive Model, some important elements are missing if seen from the agency perspective. Examples of such elements include more precise definitions of the utility functions of both parties, risk preferences, the motivational properties of the NSIM, and the role and value of post-target-setting information and post-effort information. In these areas, the achievements of agency research may help. More important is that using agency framework may generate new perspectives on the NSIM and enable us to gain more insight into the information and motivational problems in the planner-manager relationship. This is essentially why we wish to apply agency approach to the analysis of Chinese reward systems in the later part of this thesis.

There are already some papers in the literature that use this approach to analyze the no-longer-new Soviet Incentive Model. In the following two sub-sections, we review two such analyses, which demonstrate that agency perspective can further our understanding of the NSIM.

6.2.2 Direct Revelation and the NSIM

In this sub-section, we first take a closer look at the revelation principle developed in agency and then relate it to the New Soviet Incentive Model, which was intended to mainly induce managers to set targets at desirable levels. This is equivalent to asking managers to reveal their production potential based on their private information. The presentation will show that the revelation principle helps the understanding of information property of the NSIM.

The consideration of information revelation is common to the bonus model and the principal-agent model. But they seem to have considered this in different ways. In agency, when the agent possesses some private information prior to choosing an action, which would change the principal's expectation if the principal knew it, the problem of moral hazard with hidden information arises; when this happens before the contract is offered, the problem of adverse selection is present.³ In both

³This definition is consistent with that in chapter 3. In many papers, as indicated in chapter 3, moral hazard with hidden information is termed adverse selection (for

situations, if the principal desires, she may construct the contract in such a way that it induces the truthful revelation from the agent. This is the core of the revelation principle. This principle allows us to confine our attention to those contracts which induce the agent to reveal the truth, or those direct revelation mechanisms. This situation conforms to the New Soviet Incentive Model, where the planner is assumed to prefer and try to obtain true potential of firms. In the bonus model, the revelation principle was not used, presumably due to the unavailability of the principle at the beginning of the model. Now, we attempt to apply the revelation principle in the bonus context.

We first construct a setting in which the revelation principle works and which is relevant to the bonus environment. Suppose that the agent has some private information on the production capacity \tilde{q} , which the principal wishes to obtain. After the agent reveals this information by announcing a self-selected target \hat{q} he will put into effort $e(\hat{q})$ and try to achieve it. When actual output q is realised, the agent will be awarded with $B(q)$. Suppose the main objective of the principal is to get as accurate report as possible from the agent, and only two possible values of \tilde{q} can be reported, \tilde{q}_L or \tilde{q}_H with $\tilde{q}_L < \tilde{q}_H$. To provide the agent with incentives to report a true \tilde{q} , the risk-neutral principal has to ensure that at the optimum the agent is no worse off when reporting the true \tilde{q} than when lying. Suppose again that at the first instance when \tilde{q}_L is true but the agent can get a higher utility u_2 by falsely reporting \tilde{q}_H , while when \tilde{q}_H is true he finds it is better to report \tilde{q}_L and get a u_1 . According to the revelation principle, the principal can then design a contract which awards the agent u_2 if he reports \tilde{q}_L and u_1 when he reports \tilde{q}_H . This being the case, the agent will find it optimal for him to tell the truth if it previously was optimal to lie. The new contract can be constructed by solving the principal's following problem:

$$\text{Max } EU_p[q(e_p, \tilde{q}_j) - B_j], \quad (6-1)$$

$$\text{subject to } u_1(B_j) - u_2(e_j) \geq \bar{U}_A, \quad (6-2)$$

example, Rees, 1985). It does not matter, however, as long as we know the problems being considered. In a strict sense, the problem we consider in this sub-section is the hidden information type.

$$\text{and } u_1(B_j) - u_2(e_j) \geq u_1(B_i) - u_2(e_i) \quad (i, j=L, H \quad i \neq j), \quad (6-3)$$

where $e_j = e(\bar{q}_j)$, which is the level of effort that fulfils the chosen target \bar{q}_j , $B_j = B(\bar{q}_j)$, which is the reward to the agent when he chooses \bar{q}_j as the target, and \bar{U}_A is the agent's reservation utility.

The presence of (6-3) clearly indicates the incentive consideration for truthful reporting. To facilitate understanding of (6-3), we can rewrite the agent's utility function $u_1(B_j) - u_2(e_j)$ as $u(B_j) - Z(q_j, \bar{q}_j)$, where $Z(q_j, \bar{q}_j)$ is the value of the disutility incurred by the agent when he produces output q when $\bar{q} = \bar{q}_j$. It is assumed that for all values of \bar{q} and for all $q > 0$, $Z_q(q, \bar{q}) > 0$, $Z_{qq}(q, \bar{q}) > 0$, and $Z_{\bar{q}\bar{q}}(q, \bar{q}) < 0$. This assumption suggests that in the high state of \bar{q} the agent is more productive and his disutility from additional effort increases less rapidly than in the low state of \bar{q} .

This simplified model is analyzed in a number of articles, including Sappington (1984), Rees (1985), and Rasmusen (1989). The main properties of the optimal solution can be presented as

$$u(B_H^*) - Z(q_H^*, \bar{q}_H) > u(B_L^*) - Z(q_L^*, \bar{q}_L) = \bar{U}_A, \quad (6-4)$$

and is illustrated in Fig. 6.2.

In Fig. 6.2 \bar{q}_L and \bar{q}_H refer to indifference curves of the agent in different states. Their differing slopes suggest that in different states the agent has different degrees of productivity and his disutility from additional effort increases with different speeds. As the principal prefers low B to the agent, she would like to hold the agent to the latter's reservation utility as in the case of \bar{q}_L . Compromise has to be made in the case of \bar{q}_H . If the principal offers the contract $B(q_L^*, B_L^*)$ when the agent reports \bar{q}_L and $D(q_H^*, B_H^*)$ when \bar{q}_H is reported, the agent will always report \bar{q}_L even if \bar{q}_H is true since B is strictly better than points on the \bar{q}_H curve and D is strictly worse than points on the \bar{q}_L curve. To induce the agent to report \bar{q}_H when $\bar{q} = \bar{q}_H$, the principal can find a point $C(q_H^*, B_H^*)$ on \bar{q}_H , which passes through $A(q_L^*, B_L^*)$. At C ,

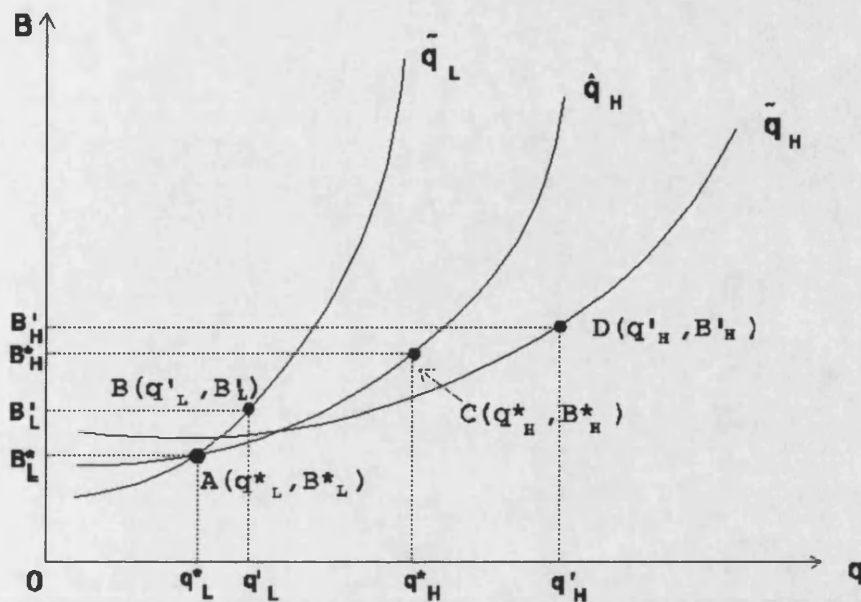


Fig. 6.2 A Truth Revelation Scheme

the agent is indifferent between reporting \tilde{q}_H or \tilde{q}_L when \tilde{q}_H is true and he then will tell the truth; when \tilde{q}_L is true he will report \tilde{q}_L since C is still below the \tilde{q}_L curve.

The above analysis shows the second-best nature of the revelation scheme. Compared with the situation in which the principal knows which \tilde{q} is true, the agent may gain more and the principal may pay more. This is especially true when \tilde{q} takes a high value: $\tilde{q} = \tilde{q}_H$ (see Expression (6-4)). The gains to the agent may be seen as the rents he can derive from his private information, while the costs to the principal as the incentive costs for obtaining this information.

Now let us look at the New Soviet Incentive Model presented by (2-18) below.

$$B = \begin{cases} \bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \\ \bar{B} + \beta(\hat{q} - \bar{q}) + \delta(q - \hat{q}) & \text{if } q < \hat{q} \end{cases}, \quad (2-18)$$

$(0 < \alpha < \beta < \delta)$

Rees (1985) examines the NSIM in agency context. While he agrees with Weitzman (1976) in that with properly assigned values of α , β , and δ , the NSIM will induce truthful reporting of target \hat{q} from the manager, he points out that the importance of a correct β should not be ignored. The relation between α , β and δ ($0 < \alpha < \beta < \delta$) is

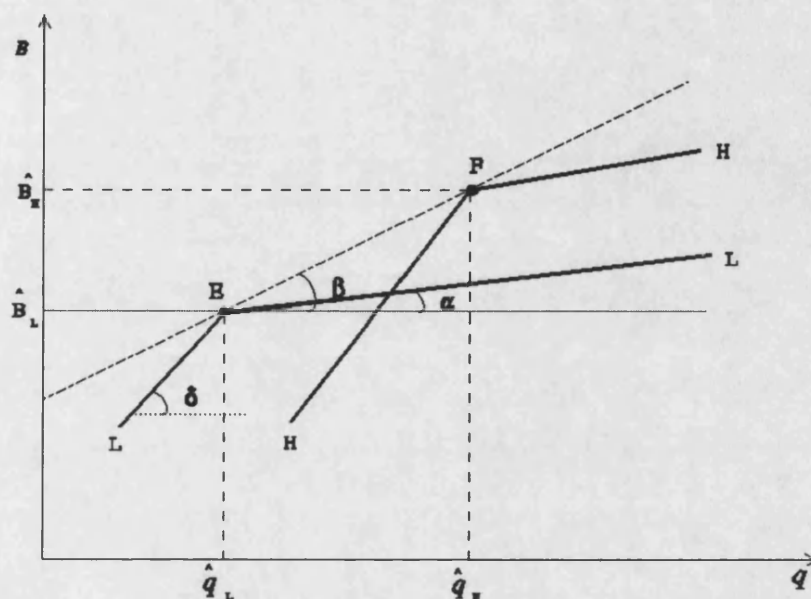


Fig. 6.3 Target Selection in the NSIM

not sufficient to guarantee truthful revelation of the value of \hat{q} . Only a value of β as defined by

$$\beta = (B_H^* - B_L^*) / (q_H^* - q_L^*) \quad (6-5)$$

can do this. In Fig. 6.3, lines *H* and *L* represent bonus lines when $q = q_H$ and $q = q_L$ respectively. Points \hat{q}_H and \hat{q}_L represent respectively the true targets in the case of high and low states. Points *E* and *F* in Fig. 6.3 should correspond to points *A* and *C* in Fig. 6.2 respectively. If $F(\hat{q}_H, \hat{B}_H)$ locates above \hat{q}_L , the true value of \hat{q}_L will never be reported. If *F* located below \hat{q}_H , then \hat{q}_H will not be proposed even it is true. Only when β takes the value determined by (6-5), can *E* and *F* be located at right places that induce honest target selection.

The Weitzman's argument that the NSIM can solve the incentive problem and lead the manager to propose his true productive potential were based on some assumptions. The first is that the manager chooses a target based on his knowledge that he will achieve the target with certainty, i.e., there is no uncertainty after he chooses the target. The second assumption is that there is no effort consideration

involved in the model. If the manager chooses a target, he will achieve it without making more (or less) efforts than usual. Similarly, there is no disutility associated with effort. The difference between Rees (1985) and Weitzman (1976) came from effort variations.

In the case of variable effort and disutility of effort, the manager will weight utility of higher bonus and disutility of higher level of effort. At the point $q=\hat{q}$, the expected marginal disutility of just achieving a higher target should equal the increase in B due to a marginal increase in the exactly achieved target. This is actually shown in (6-5), which specifies that the marginal utility of the manager from choosing a higher target should be taken into account when β is set. As Rees (1985) puts it, if the value of β correctly reflects the income - effort preference of the manager, then indeed the NSIM does induce truthful revelation of productive capacity.

From the agency perspective, the informational advantages of the NSIM over the old scheme, in which the manager was not allowed to choose target, are obvious. Any scheme which leads the manager to communicate his private information will provide valuable signals about production potential (Holmstrom, 1982). The second best nature of the NSIM and the value of communication are further proved by Strong and Walker (1987): "the expected payoff of the principal when communication is possible is never less than his expected utility when communication is not possible and never more than his expected utility when the pre-effort information is observed publicly". This result provides a rationale for the participative budgeting process, which, as will be shown in later chapters, was also present in the pre-reform Chinese reward systems.

6.2.3 Motivation and the Ratchet Effects

In this sub-section, we present another example of agency analysis of the NSIM. Besides the informational properties, the other issue related to the NSIM that has been extensively discussed in the bonus literature is the existence of ratchet effects. Most authors saw the ratchet as to have negative effects on managerial motivation (see section 2.6 of Chapter 2). The possibility of ratchet effects is reexamined by Holmstrom (1982) using the principal-agent model. He provides some

rationale for the planner's use of a revision procedure and argues that the ratchet does not necessarily have adverse motivational effects.

The argument against the ratchet principle in the bonus model is based on the observation that the target for a later period will be moved up according to the current performance and therefore the manager is discouraged from achieving high performance in the current period. If possible revisions of the future target are not reflected in the reward for the current period, the enterprise will simply trade-off between having a higher reward in the current period and a possible higher target in the future. A result of this trade-off is holding back of current performance.

Holmstrom (1982) shows that under the NSIM, it is possible for the planner to use the ratchet to stimulate current performance by committing herself to giving a current reward for raising the future target. This can be done by defining the lump-sum bonus \bar{B}^{t+1} in period $t+1$ as a linearly increasing function of the tentative target \bar{q}^{t+1} for that period, for example,

$$\bar{B}^{t+1} = \bar{B}^t + \gamma(\bar{q}^{t+1} - \bar{q}^t), \quad (6-6)$$

where \bar{q}^{t+1} and \bar{B}^{t+1} are the tentative target and the associated base bonus for the period $t+1$, and \bar{q}^{t+1} is determined using the ratchet:

$$\bar{q}^{t+1} = \xi(q^t - \bar{q}^t) + \bar{q}^t. \quad (6-7)$$

Assume the manager is risk-neutral and has no time preference for payments. If the parameters in (6-6) and (6-7) are set such that $\gamma = \beta$ (see the previous subsection for a discussion on β) and $\xi = 1$, it can be shown that the NSIM with the ratchet dominates a fixed target scheme (Holmstrom, 1982).⁴

⁴Holmstrom uses in the proof a social objective function in the form of $W(q) = G(q) - V(q)$, where $G(q)$ is value of output and $V(q)$ is firm cost of production (effort of the firm). His proof shows that the firm's choice of \hat{q} and q under the NSIM with a $\beta = (\alpha + G'(\bar{q}))/2$ will lead to a Pareto improvement in both the firm's and social welfare. For details, see Holmstrom (1982), pp.141-144. There is a simpler way to see that the ratchet effect presented in (6-6) and (6-7) does not affect the firm's current performance. Rewriting (6-6) with $\gamma = \beta$ results in

The use of the ratchet by the central planner has been claimed to be due to information asymmetry. Because reporting a single target is a very narrow channel for communication, the past performance of the firm serves a useful purpose in that it may convey some signals regarding to the firm's real capacity. It therefore becomes a reasonable base for revisions. The bonus model, as Holmstrom (1982) points out, tends to have emphasized the negative effects of the ratchet. In the NSIM, target delegation may not only have information revelation implications as discussed in the previous sub-section, it may also have motivational advantages over the old scheme. These results should be very helpful to understanding the Chinese reward systems, which resembled in many ways their Soviet prototype in terms of use of the ratchet.

This agency analysis of the ratchet effect demonstrates the use of the agency model in analysing the motivational problem in a centrally planned economy. In the following section, we continue this theme and apply the first-best technique in agency to the motivation problem in a CPE.

6.3 The First-best Solution to the Managerial Motivation Problem in A CPE

As stated earlier in this Chapter, the bonus model has placed emphasis on the information elicitation problem, which has since the beginning of the "Socialist Controversy" attracted a great deal of attention in economics of central planning. This elicitation-oriented study left much room for later suggesting a study of the motivational problem (or in agency terms, the problem of moral hazard), since "problems of motivation appear most prominently in centralized economies" (Holmstrom, 1982). In the previous section, a brief review of Holmstrom's (1982) analysis of the New Soviet Incentive Model, especially of its ratchet effects and

$$\bar{B}^{t+1} = \bar{B}^t + \beta(\bar{q}^{t+1} - \bar{q}^t), \quad (6-8)$$

which is similar to (2-16). Combining (6-8) and (2-16) results in

$$\bar{B}^{t+1} = \bar{B}^t + \beta(\hat{q}^{t+1} - \bar{q}^t), \quad (6-9)$$

which indicates that \bar{B}^{t+1} and therefore B^{t+1} are in effect independent of \bar{q}^{t+1} .

delegation design, led to a conclusion that differs from the usual point of view in the bonus model. It was shown that use of revision rules (the ratchet) outperforms no revision. In this section, we continue with the motivation theme but will extend the scope to a general planner-manager setting in a centrally planned economy. Our attention in this section will be focused on the problem of moral hazard, a motivational problem resulting from the planner's inability to perfectly observe the manager's action. This problem is addressed in a series of recent articles in the *Journal of Comparative Economics*,⁵ which represent a new agency approach to motivational problems in a centralized economy.

The JCE articles can be seen as attempts to introduce the agency model into the area of centrally planned economics. The discussion was initiated by Liu's (1986) initial attempt to use the principal-agent model in his analysis of optimal target-setting in a decentralized planning environment. And therefore, the discussion focused on "optimal target-setting under moral hazard" or "optimal incentive schemes with targets", as it was recognized that "incentive schemes in socialist centrally planned economies typically include a target" (Brown, Miller & Thornton, 1987).

Certain common assumptions were made, explicitly or implicitly, in the series of articles. They include: (1) The utility maximizer assumption. Both the planner and manager are assumed to be expected utility maximizers. This is a basic assumption in agency model. Its validity in the Chinese environment is a question we shall examine in the next Chapter 8. In the literature, as in a typical agency model, it is assumed that the planner seeks to maximize expected monetary output less payment to the manager and the manager chooses effort to maximize his expected utility of money income minus the disutility of effort. For analytical convenience, it is also customary to assume that the utility function of the manager is additively separable with one term of utility as a positive argument and the other of disutility negative

⁵These include Liu (1986), Osband (1987), Brown, Miller and Thornton (1987), and Liu (1987). The theme of the articles centres on the possibility of the first best solution to the moral hazard problem with target setting. More recently, several articles by Chinese authors in the same journal further investigate the theme. These later articles will be considered when we model the Chinese reward systems later in the thesis.

argument. This assumption differs from the bonus model in two aspects. First, with regard to the planner's utility, the bonus model usually did not consider explicitly the planner's utility function. It can only be inferred from the bonus model that the planner is trying to maximize the output and accuracy of plan fulfilment. Second, the manager's effort and disutility of effort were not included in the basic bonus analysis.⁶

(2) Principal's risk neutrality assumption. The manager is normally assumed to be risk averse, as long as his personal income is made directly dependent on the outcome of his action. Outside the scope of this thesis, it should be recognized that inducing an appropriate managerial attitude toward risk is indeed a difficult part of the incentive problem faced by the planner⁷. Principal's risk neutrality, on the other hand, is more straightforward. As Osband (1987) noted, this assumption departs from Mirrlees's (1974) assumption that the government formally shares the same risk-averse utility function as the agent. "But this government is dealing simultaneously with many similar agents, each with the same risk-averse utility ranking and each facing a similar independent identically distributed (i.i.d) disturbance. The randomness 'cancels out' in aggregate and the government behaves as if it were risk neutral"(Osband, 1987). This pooling effect was remarked earlier by Arrow (1971) and Bergson (1978), who pointed out: "Among other things, gains and losses from the actions of any particular public enterprise will often be sufficiently small relatively to the community's income ...". It seems reasonable to expect this assumption to be universally applicable to all governments, be it in a welfare economy or in a centrally

⁶Here we have to be careful when we point out the difference, since the effort element did enter into some bonus models (see section 2.5 of chapter 2). But in the basic model described by Bennett (1989), managerial effort was assumed to be constant, the objective for the manager being simply to maximize $UB(\hat{q}, q)$ (p.82).

⁷"Given the possibility of fixing policy on dismissals on the one hand and on rewards on the other, it should be feasible to establish a climate in which the managers evaluate risks in whatever is considered to be the proper manner". (Bergson, 1966) For resource allocation to be Pareto efficient, it is argued that public-enterprise managers must be induced to maximize expected returns (Arrow, 1971; Bergson, 1978). As in a typical principal-agent setting, risk-sharing and incentive problems arise when managers are risk-averse maximizers of their own expected utilities.

planned socialist economy. It is equally applicable to the Chinese case.

Other common assumptions in the JCE model include: (3) outcome is the only observable indicator of unobservable level of effort. In this setting, full information is not available because of the absence of direct observation of effort. The first-best solution in its original sense is therefore not available. The moral hazard problem is present. (4) The monotonic likelihood ratio property (MLRP) is also assumed. With this assumption, increases in effort shift the distribution of output to the right. In other words, a greater output is always indicative of greater effort exerted by the manager. "This property is a natural one to assume" (Tirole, 1988) when using the principal-agent model. It rules out cases where output is such a noisy indicator of effort that normal conditional relationship between output and effort can not be established. (5) The manager is assumed to have a reservation utility. This assumption is common in the principal-agent model and was retained in the JCE analyses. It implies that if the manager cannot earn or is not offered an expected utility of which the minimum reaches a certain level, he will take alternative employment. Again, this assumption will be examined in our model in Chapter 8.

The JCE model is presented as follows.⁸ The agent manager has an additively separable utility function $U_A = u(w) - Z(e)$ with $u'(w) > 0$ and $Z'(e) > 0$. Utility from a wage (w) and disutility of effort (e) are the two components. The managerial effort results in output q , which is not a deterministic function of e (due to production uncertainty) but a random variable with probability density $f(q, e)$ and cumulative density $F(q, e)$. The distribution of q is such that $q \in (a(e), b(e))$ where $a(e)$ is the lowest possible level of output and $a'(e) > 0$, $b(e)$ is the highest possible level of output and $b'(e) > 0$, and $f(a(e), e) = f(b(e), e) = 0$ for all e . This implies that an increase in e shifts the distribution of q to the right in the sense of first-order stochastic dominance and therefore $F_e(q, e) \leq 0$ with strict inequality for at least some q . $F(q, e)$ is known to both the manager and the planner.

The risk-neutral planner is to choose the compensation scheme to maximize her expected utility, which is expected output less payment to the manager. The

⁸For the sake of consistency, the notations are altered here to be comparable to those used in the previous models in chapters 2 and 3.

manager has a reservation utility \bar{U}_A . The compensation scheme takes a form that contains a target (\hat{q}): the manager gets a constant reward \hat{B} for output under the target; otherwise the reward is a monotone-increasing function of q , $w(q)$.

The planner's problem can be formulated as

$$\max_{\hat{B}, \hat{q}, w, e} \int_{a(e)}^{b(e)} [q - \hat{B}] f(q, e) dq - \int_{\hat{q}}^{b(e)} [w(q) - \hat{B}] f(q, e) dq, \quad (6-10)$$

$$\text{subject to } \int_{\hat{q}}^{b(e)} [u(w(q)) - u(\hat{B})] f(q, e) dq \geq \bar{U}_A - u(\hat{B}) + Z(e), \quad (6-11)$$

$$\int_{\hat{q}}^{b(e)} [u(w(q)) - u(\hat{B})] f(q, e) dq = Z'(e), \quad (6-12)$$

$$\text{and } w(\hat{q}) \geq \hat{B}, \quad (6-13)$$

$$w'(q) \geq 0. \quad (6-13')$$

Constraint (6-11) represents the participation constraint in the principal-agent model,⁹ while constraint (6-12) specifies the decision rule for the manager: to increase effort until the expected marginal utility of income equals the marginal disutility of effort. Constraint (6-13) indicates the minimum income level at the target and constraint (6-13') is symbolization of the monotone-increasing nature of $w(q)$. Both (6-13) and (6-13') are derived from the form of compensation scheme. Osband (1987) proves that (6-13') can be obviated by the monotonic likelihood ratio property (MLRP) assumption and (6-13) ceases to be binding when the existence of the interior solution is not considered. In this case, the planner's problem specified by (6-10) - (6-13') becomes a general principal's problem and the target-constrained sharing rule becomes the general sharing rule (see expression (3-23) in Chapter 3).

The main arguments in the JCE discussion centred around the possibility of a first-best Pareto-optimal solution to the planner's problem. It is the view of Osband, and Brown and others that a first-best full information solution is possible under

⁹Note that the original form of (6-11) is

$$\int_{a(e)}^{\hat{q}} u(\hat{B}) - Z(e) + \int_{\hat{q}}^{b(e)} [u(w(q)) - u(\hat{B})] f(q, e) dq$$

certain conditions. Brown and others (1987) argued that when the manager's effort is not directly observable, typically only second-best contracts exist; but when effort affects the lower endpoint of the output distribution, the planners can observe effort indirectly for some states of nature. They modified Liu (1986)'s assumption regarding first-order stochastic dominance of the distribution on q so that increases in effort shift the support of the output distribution to the right. By setting the target equal to the lower endpoint that results from the optimal effort level, the planner can infer from achieved target the level of effort that the manager has exerted. Thus, a certain form of forcing contract which is close to the first-best full information solution, is achievable. Their conclusion was that "a first-best Pareto-optimal sharing rule thus includes a target if the level of production for a given level of inputs is bounded from below and if the minimal level of output increases as effort increases" (Brown, et al., 1987).

If the planner decides that e^* is the optimal level of effort and if effort affects the endpoints of the distribution, then the planner can induce e^* by offering the manager the following form of incentive scheme:

$$w(q) = \begin{cases} w^* & \text{if } q \geq a(e^*) \\ \underline{B} & \text{if } q < a(e^*) \end{cases} \quad (6-14)$$

That is, the planner sets the target at the lower endpoint given e^* , $a(e^*)$ and pays the manager a w^* when the target is fulfilled or a \underline{B} otherwise. If the payment scheme is bounded by $-Z'(e)/F_e(a(e^*), e)$ from above and unbounded from below,¹⁰ w^* and \underline{B} are specified as

$$w^*(q) = u^{-1}(\bar{U}_A + Z(e^*)), \quad (6-15)$$

$$\text{and } \underline{B} \in u(w^*) - u(\hat{B}) < \sup_{e < e^*} [-Z'(e)/F_e(a(e^*), e)]. \quad (6-16)$$

With this scheme, when $e \geq e^*$, the manager's expected utility will be

¹⁰If the utility function is bounded from below, the manager may have an effective limited liability constraint, and thus only second-best is possible (Sappington, 1983).

$$u(w^*) \int_{a(e)}^{b(e)} f(q,e) dq - Z(e) = u(w^*) - Z(e), \quad (6-17)$$

which decreases as e increases due to the fixed payment w^* . The manager will therefore be reluctant to put in more effort than e^* . When $e < e^*$, the manager's expected utility will be

$$u(B)F(a(e^*),e) + u(w^*)(1 - F(a(e^*),e)) - Z(e), \quad (6-18)$$

and his marginal expected utility will be

$$[u(B) - u(w^*)]F_e(a(e^*),e) - Z'(e), \quad (6-19)$$

which exceeds zero with condition (6-16). Therefore, the manager will be willing to expand his effort until e^* is reached. The scheme (w^*, e^*) thus represents the first-best contract for the both parties.

A similar idea was suggested by Osband (1987), who used the term "speaking softly but carrying a big stick" (SSCBS) to describe the above optimal policy. He demonstrated that if penalties are unbounded and the manager is risk averse, the planners can approach the first-best full information solution by pursuing a SSCBS policy: offer a constant payment under normal conditions, but impose a severe punishment for extremely unlikely low outcomes. This is implemented by setting targets at infinitesimally low levels, but threatening the manager with disaster-like penalties for failure to meet them. As under this policy, the manager can guarantee an expected utility equal to his reservation level by exerting the first-best effort, the penalty is applied with zero probability.

Liu (1986, 1987), however, concentrated on second-best schemes instead of first-best. He argued that while first-best solutions are theoretically possible and more efficient, they are not practically feasible because of constraints and other considerations and do not accord with empirical observations in real-world socialist

economics.¹¹ One of the most palatable explanations is that unbounded penalties, a core condition in the first-best world, may not be credible, due to bankruptcy, and limited-liability. Liu (1987) also pointed out that because targets serve not only the purpose of inducing optimal effort from the manager but also the purpose of resource allocation, setting targets substantially low may conflict with their second role.

The JCE discussion intended to address the managerial motivation problem in a CPE in the agency framework. In particular, it examined the moral hazard problem with the planner-manager relationship. The problem is "simply a variant of the classic 'principal-and-agent' situation of stochastic choice theory and has a familiar and fairly obvious kind of solution" (Bergson, 1978). The first-best forcing contract solution examined in the JCE is quite primitive. The idea of using target as a yardstick for precise identification of the level of effort seems straightforward. Moreover, whether or not target fulfilment allows the planner to achieve the first-best full information solution really depends on certain conditions such as risk aversion of the manager and unbounded penalties. In a sense, while the findings brought agency solutions into the incentive study of central planning, they did not go far from the basic principal-agent model.

An issue that was not made clear in the JCE model is the determination of optimal level of effort e^* , which, according to the model, should be set equal to the target and imposed on the manager. In the basic principal-agent model, e^* can be chosen by the agent by solving his self-selection maximization problem given the principal's choice of the incentive scheme. In the JCE model, e^* is determined exogenously by the planner and then imposed on the manager via the forcing contract. How does the planner decide on e^* ? A obvious answer is to solve the principal's problems under perfect observation of effort and obtain the first-best effort level. In the JCE model, the target is set at the minimum output that would be produced by the manager if he exerted the optimal level of effort. But how does the planner get the latter information?

¹¹Liu pointed out, for example, that if a first-best scheme were implemented, it would be impossible, or virtually impossible, for a socialist manager to fall short of the stipulated targets. This has certainly not been the case in the real world.

Clearly, the JCE model focused on moral hazard exclusively in assuming that the manager and the planner have perfect information on production. In particular, the planner is assumed to have full information about production function, productivity, feasible production levels of the firm, and probability distribution of output. This seems less realistic in the central planning environment, where information asymmetry is a typical problem for the planner. Due to this information asymmetry, the first-best solution is normally not available. In the Chinese environment, the remoteness of the planner from the actual production sites means that there typically exist information asymmetry. Agents typically know more about their production environment and technology than their principal does, though the principal may know more about what she wants to achieve and what should be done to achieve it. In fact, the New Soviet Incentive Model was designed to elicit private information from well-informed managers. Similar schemes did exist in China. Because of this consideration, we believe that the first-best approach as the JCE model suggested would not be relevant to our analysis of Chinese systems. This point will be further examined in Chapter 9 in the context of Chinese reform schemes. In the literature, there is one piece of work that is highly relevant to our analysis, though. That is David Granick's analysis of Chinese state enterprises. In the following section, we shall critically review this analysis.

6.4 Granick's Treatment of Chinese State Enterprises

In his monograph on Chinese state enterprises, Granick (1990) undertakes a unique analysis of the peculiarities of the operation of Chinese state owned industrial enterprises based on a set of survey data collected between 1982 and 1985. As far as this thesis is concerned, the uniqueness of his analysis has two aspects: First, his agency treatment of the state-enterprise relationship, and second, the incorporation of the sample data in the analysis as a major source of assumptions. These features render his work worthwhile considering separately in this section. In this section, the main elements of our interest in Granick's analysis are first outlined. The elements to be considered include: 1) the institutional and political origin of Granick's version of principal-agent relationship in a CPE; 2) his property rights version of agency

relationship, which is quite unusual because of its departure from the principal-agent model reviewed in Chapter 3; 3) his assertion about Chinese principals and agents; 4) an agency model derived from the property rights perspective; and 5) his analysis of the incentive system applied to Chinese state enterprises. Following the description, we shall raise some criticisms of these elements.

6.4.1 Elements of Granick's Analysis

1. Institutional Origin of Principal-agent Relationship

Granick sees that a principal-agent relationship exists in a centrally planned economy and suggests that this relationship can be traced to a political science model of the Soviet economy. In this model, the centre decides on the establishment and changes institutions; it makes all economic policies and chooses appropriate mechanisms to implement these policies (including incentive mechanisms). In making those choices, the centre considers not only its utility function, which it seeks to maximize, but also some expected economic reactions of other members of society. Of particular interest here are two elements: first, the analysis treats the centre as a single entity ("homogeneous rather than composed of interest groups") having a single utility function; second, it considers that the centre gives explicit consideration in its decisions to the expected responses of the other members of society in pure economic terms. "In this analysis, a homogeneous centre is treated as the 'principal' and all others in society are considered as 'agents'" (p.21). These two elements, maximization of utility function and consideration of the expected responses of agents in the centre's decisions, are the same as those in a conventional principle-agent model.

According to Granick, due to the difference in their relative power, the principal acts as the Stackelberg leader as she determines the institutional environment within which the agent makes his own decisions. On the other hand, the agent acts as the Stackelberg follower as it takes the environment as given and unchallengeable and reacts to the given conditions in terms of maximizing his own utility within the bounds of conditions (p.21).

This principal-agent model, as Granick points out, originates from political science related to policy-making in the Soviet Union, which regards major decisions

in the Soviet Union as representing the results of interaction among special interest groups (p.21). When applied to the economy of the Soviet Union, the above model "can be interpreted as yielding a principal-agent model in the determination of institutions and incentive system" (p.22). In this regard, the bonus model reviewed earlier is "very much in the spirit of a principal-agent model" (p.21), since in the bonus model, two elements are present. First, the higher authority (the planner) must attempt to motivate rather than to instruct subordinates (managers) to act in a fashion which she desires; such motivation consists of a package of rewards and punishments which depend upon economic results. Second, the expected reactions of agents are only economic rather than political.

2. The property rights version of the agency model

Applying the above principal-agent model to the Chinese environment yields Granick's property rights version of agency model. One of the basic hypothesis in Granick (1990) is that all Chinese principals and agents are organizations rather than individuals and that principals are distinguished from agents by the fact that the former enjoy property rights, while the latter do not (p.32). It is property rights that establish the status of principal and allow the principal to be the game leader. Clearly, this version of principal-agent model stems from the political science model mentioned just now, which differentiates the parties by their relative power in policy-making.

As Granick himself pointed out, this version of principal-agent model is different from the "normal" principal-agent model, which "is used to handle problems of the possession by the agent of private information which the principal can obtain only at prohibitively high transaction costs" (Note 2 of Chapter 2, p.283). The departure can be explained by his understanding that the existence of private information is not an intrinsic part of the agency model and therefore not considered relevant to his use of the model (ibid.). It should be emphasized here that the entire analytical framework of Granick was based on this understanding of the principal-agent model, the validity of which will be considered later.

3. According to the above definition of principal and agent and Granick's assertion about ownership of property rights in China, principals in China include not only the central government, but also regional governments at the provincial,

municipal, and county levels. These regional government units, which are intermediate in hierarchical level between the centre and the enterprise, are not regarded simply as agents of the central government because of the perceived existence of property rights held by these units, which constraint the centre against treating them similarly to enterprises. On the other hand, agents were considered to include not only state enterprises, but also intermediate entities which do not enjoy property rights, such as central ministries, regional industrial bureaus and administrative corporations (pp.22-23, 32). State enterprises, whose property rights are assumed to be held jointly by different levels of government, are normally subject to control of a number of principals (multi-principals hypothesis). Implied is that a principal has a number of agents under its control.

4. According to Granick, the property rights of principals consist of three parts: the rights to the use of the physical output (P_o), to the financial cash flow (P_f) produced by an agent, and to the utilization without payment of the work force of the agent (P_w). The first and second rights ($P_o + P_f$) were thought to be of prime importance. There exist a set of instruments available to the principals to realize their property rights, including directions or resources given to agents. The instruments available to a given principal with regard to a specific agent are a function of the property rights that it possesses in the agent. A simplified model (one principal - one agent) can then be presented as follows

The principal's problem is to choose V_p so as to

$$\underset{V_p}{\text{maximize}} W(y_p), \quad (6-20)$$

$$\text{subject to } y_p \leq y(V_A), \quad (6-21)$$

$$V_A = V_A^*[V_p], \quad (6-22)$$

where V_p , V_A are respectively the vectors of instruments available to the principal and the vector of actions that are chosen from by the agent as a result of responding to the principal's choice of V_p . $W(\bullet)$ represents the principal's welfare function. V_A^* is the vector of actions taken by the agent to maximize his own utility subject to the

constraints imposed upon him by the principal. y_p is the portion of final output of the agent which contributes to the principal's welfare; and y is total output produced by the agent using V_A/V_P .

5. In the vector of instruments available to the principal V_p , an incentive mechanism should be included. In the specific area of incentives, which is one of our concerns, Granick examined the motivations of the top manager of an enterprise and enterprise as a whole. His assumption was that Chinese top managers of medium and large state-owned enterprises "either have not been in a position to maximize their own personal welfare through strategies affecting enterprise performance or, if they have been able to do so, this phenomenon would not be statistically identifiable in comparison with maximization of the average welfare of the employees of their enterprise"(p.186). As for the evaluation and reward system, his findings resulted from the analysis of the sample data¹² were:

It seems reasonable to hypothesize that the performance of state-owned enterprises was being evaluated by supervisory authorities during the reform years and that rewards were correlated with this evaluation. But all attempts

¹²Granick's test involved a series of regressions using a number of predefined "control variables" and nine independent variables. The control variables included:

YRSEC: A set of dummy variables that distinguish between organizations producing consumer goods and those producing producer goods, and that combine this sectoral distinction with temporal distinction for each individual year of 1980-82.

HIER: A set of dummy variables distinguishing among the enterprises according to the hierarchic level of their direct supervisory body.

POP: A set of dummy variables that describe the population size of the city in which the enterprise is located or headquartered.

PROVST: A single variable that is an index of the average wage in all state enterprises in 1983 in individual provinces.

The independent variables included: Profits/Personnel, Profits/Capital, Profits/Sales "Cash Flow"/Personnel, "Cash Flow"/Capital, "Cash Flow"/Sales, Profits as Percentage of Final Plan, Output Value as Percentage of Final Plan, and whether or not a national award was won.

Five dependent variables were regressed against combinations of the above independent variables. They were: average earnings of the enterprise as a percentage of the average in all Chinese state industry in the same year (EARNAVCHIIND); a form of this adjusted for growth in the labour force (EARNADJ); average bonuses + subsidies paid during the year (BONUS); and changes between years in EARNAVCHIIND and in BONUS for a given enterprise. Regressions were limited to the years 1979-82.

to measure such evaluation by objective standards, whether these were profit ratios or plan fulfilment ratios, failed. (pp.186-187)

According to Granick, the "irrationalities" of current pricing systems can help explain the lack of confidence in profit-related indicators as reliable standards of performance evaluation. However, the weak link between the rewards and degree of plan fulfilment, as discovered in the analysis, cannot be easily explained. We shall return to this point in Chapter 8 when defining our assumptions with regard to Chinese reward systems.

6.4.2 Criticisms of Granick's Model

The above summary of some of the basic ideas of our interest provides a good starting point for our analysis of Chinese reward systems. Particularly enlightening is the general agency approach Granick has taken in treating the relationship between the state and state enterprises. Nevertheless, it is also felt that some of his assumptions and arguments are worth further considerations.

First of all, while Granick's principal-agent perspective of the government's control over enterprises provides some insights into the relationships between the state and enterprises, between central government and regional governments and between the centre and its representative organs, one may feel less comfortable with his departure from traditional principal-agent definition. In broad sense, the agency relationship exists wherever an individual hires the other individual, whose choice of actions and/or communication strategy affects the welfare of the both parties. "The problem acquires interest only when there is uncertainty at some point and, in particular, when the information available to the two participants is unequal" (Arrow, 1985). Indeed, this information asymmetry and related moral hazard problems have been central issues in traditional principal-agent literature. Compared with the broad definition, Granick's property-rights perspective may seem very narrow. In his model, it was relative power that determined who was the principal and who was the agent. This definition may conflict with the original agency concept, which is of a purely economic concept in which both parties are equal and economic men. For modelling purpose, in our view, suffice it to assume that the relationship between Chinese government and state enterprises resembles the agency relationship in a broad

sense.

Granick's focus on property-rights excluded the information issue, which we believe is central to incentive problems. From the pure property rights perspective, it may be unnecessary to use the agency model at all. On the other hand, incentive problems resulted from information asymmetry cannot be satisfactorily explained and solved solely from the property-rights perspective, since property rights generally do not deal with uncertainty and information.

Secondly, central to Granick's analysis is his hypothesis that regional governments hold property rights to some state enterprises jointly with the central government. This regional property-rights hypothesis may, to a certain extent, be open to question. In analysing Chinese state enterprises, two basic types should be distinguished from the point of view of property rights ownership: national state enterprises, which are owned exclusively by the central government, and regional state enterprises, which are owned by the regional governments according to their locations. The ownership over, and control of, a number of enterprises have changed from time to time largely at the central government's will¹³. But there seem to exist few cases where an enterprise is jointly owned by the central and local governments. This is why, in our opinion, regional property rights are not recognized as "factually existing" in China. However, multilevel supervision does exist. It is indeed "very common in China for medium-sized and large state-owned enterprises to be under the authority of more than one higher body".(p.25) This multilevel supervision can be explained by the fact that all state enterprises (whether national or regional) are subject to both industrial and administrative controls (see Introduction). In many cases of regional state enterprises, an enterprise is subject to not only control of the regional government (by location), but also direction of the corresponding ministry (by industry); not only commands from planning department, but also the supervision of financial, personnel, supply, environmental, ... departments (by function). What the term "multiheadedness" refers to in China is the multilevel and multi-department

¹³As indicated in Granick's review of history of property rights over state-owned enterprises (pp.39-44), as decentralization took place, some enterprises were "transferred" to local governments, while during periods of more centralized control, they were "reclaimed" by the centre.

supervision due to factors of geographical location and industrial attachment and uncoordinated government functional departments. It is hardly convincing to link the privilege of supervising the enterprise to the ownership over the enterprise. The case studies by Granick himself provide no strong support for his hypothesis stated at the beginning of this paragraph (three out of nine multilevel supervision cases were claimed to be strongly supporting the hypothesis, one weakly confirming, two weakly conflicting, one strongly refuting, two irrelevant). The implications of this criticism for our agency assumptions of Chinese state enterprises are treated in Chapter 8.

Thirdly, Granick's failure to include analysis of the contract system (described in Chapter 5 and analyzed in Chapter 9 and 10), which in our view marks a substantial improvement of the reward system, may make his analysis out of date. The book was published in 1990, when the contractual responsibility system had become the most widely used system across China, Granick mentioned the system in the introduction but doubted its significance: "... Yet contractual responsibility should be seen, in my view, as no more than a variant on the shift from profit sharing to income tax; its expansion may be a result of disillusionment with the slowness with which taxation has in reality become different from profit sharing" (p.5). Nevertheless, as will be seen later, the contract system can be said to represent a remarkable step forward in the separation of ownership from control, and therefore to have significant incentive implications in agency sense. Certain features of the system, for example, possible existence of a separate manager's (management) utility function, deserve close examination. Despite this, Granick's presentation and analysis of the case studies provide a unique, valuable and informative discussion of Chinese state enterprises.

Finally, Granick's analysis of the incentive issue at the enterprise level provides some interesting results for example, enterprise-oriented incentives, loose connection between monetary rewards and plan fulfilment and profits. However, some important elements, which may have effects on the analytical results, are missing. Basically, his analysis in the area of incentives involved identification of the relation (via regressions) between certain items of monetary incentives and some predefined standards. This testing may need more elegant modelling. In the area of incentives, it appears appropriate to take some more elements, such as risk-preference, utility

function, and communication, into consideration, at least in the agency context. Attempts will be made in our later analysis to consider these elements.

6.5 Summary

In this Chapter, we brought together two main studies relevant to our later analysis of Chinese reward systems: the bonus literature and agency theory. In section 6.2, we first compared the two studies in a straight forward manner. The main elements of the two studies were listed and their common points were identified. Being economic analyses of similar incentive problems, the bonus model and agency model have a lot of similarities, including their basic assumptions and the use of marginal approach. However, they have different emphases. As the information needs of the planner are regarded as a top priority in a centrally planned economy, the bonus literature has put much emphasis on the information elicitation problem. Analysing the informational properties of the New Soviet Incentive Model has been the theme of this literature. On the other hand, the agency model is developed as a general analytical framework for incentive problems arising from information asymmetry between two contracting parties. The principal-agent models emphasize internal consistency and optimal contract design, therefore embody a larger set of incentive settings than the NSIM-oriented bonus study. In principle, agency study enables almost all incentive problems within an organisation to be analyzed in a consistent framework. The optimum-targeted agency research has been so far, however, largely restricted to highly stylised and simplified models.

Despite its immaturity, agency research provides certain useful tools and concepts which can enhance our understanding and analysis of incentive problems in a CPE. This was demonstrated in subsections 6.2.2 and 6.2.3, where we reviewed analyses of the NSIM using the agency perspective. Rees' (1985) analysis of the informational properties of the NSIM was accompanied by his model of adverse selection. Holmstrom's (1982) results on the ratchet and delegation embodied in the NSIM was supported by his agency model of the planner-manager relationship in a CPE. Both of the analyses have suggested insights into the NSIM.

In section 6.3, several JCE papers engaged in an agency study of the moral

hazard problem in a socialist economy were reviewed. The theme of the JCE discussion was the properties of optimal incentive schemes with targets. In particular, the papers examined possibility of the first-best solution to the planner's problem of optimal target-setting under moral hazard. Based on some common assumptions and the same model, different conclusions were reached. The "yes" papers argued that when effort affects the support of the output distribution, it is possible for the planner to infer the level of the manager's effort. By setting the target equal to the lower endpoint of optimal output level, the planner can achieve the first-best by adopting a forcing contract. The feasibility of so doing was challenged by Liu (1987), who argued that unbounded penalties and informational role of the targets prevent the planner from setting the targets according to the first-best rules. The JCE discussion did not address many particularities of incentive problems in a CPE, but it did bring the problems into the limelight in agency research.

Granick's agency treatment of Chinese state enterprises certainly brought us closer to the theme of our analysis. The main elements of this treatment were reviewed in section 6.4, where we focused on the conceptual and structural rather than technical aspects of his analysis. Granick's analytical framework was constructed on the basis of his observations of the peculiarities of the operation of Chinese state industrial enterprises. The main elements included: 1) the institutional or political origin of the principal-agent relationship; 2) a property rights perspective on the agency model; 3) the definitions of the Chinese principals and agents; 4) a basic model of the principal's problem; and 5) observations on incentives at the enterprise level.

Granick's Chinese principal-agent model deviates from the traditional agency model reviewed in Chapter 3, and the departure was not fully justified. Since we are going to use the agency approach, this prompts us to define our use of agency concepts here. First, the agency concept to be used to consider Chinese reward systems is not that which Granick calls property-rights approach. Instead, the concept is used in a general and traditional sense: an agency relationship exists wherever one individual's action affects his own welfare and that of another individual, who hires the former to fulfil certain task(s) and prescribes payoff function for the former. When applied to the direct state-enterprise coupling, the agency model normally casts

the state (or government, planner, authorities) as the principal and the enterprise as the agent. This simplified model can be easily justified. However, when more sophisticated models are considered, hierarchical relations between different levels of government and government agencies may present problems. In dealing with the situation, Granick made a clear distinction between the principal and the agent using his ownership standard: "It is ownership over property rights that allows the principal to establish rules governing the reward to the agent ..." (p.32). In addition to the central government, regional governments at the provincial, municipal, and county levels, which are hypothesized to hold property rights, became principals, and intermediate government bodies such as ministries, industrial bureaus and corporations were treated as agents. This treatment is valid only when property rights and government power are identical, which may be not true in certain cases. For example, national or regional industrial bureaus, which were regarded by Granick as agents, can sign contracts with or set sharing rules for their subordinate enterprises, though they are not assumed to hold any property rights to the enterprises. In a decentralized environment, it is quite normal for lower levels of governments and other government agents to make certain decisions and act as representatives of the top-level authority. In this setting, it seems more convincing to regard these entities as principals of enterprises as well as agents of the central government. Granick's denial of a such treatment was based on his strongly maintained hypothesis that regional levels of government hold property rights which act as constraints on their relationships with higher levels (p.60). While whether or not those regional governments hold property rights deserves more examinations, it is perhaps doubtful to use the notion of property rights to entitle regional levels of government "principals" in relation with the central government. Similarly, the assumption that the enterprises have no property rights of their own may need reexamination under the contract system, because the contracted enterprises are entitled to accumulate their own capital (property) in contrast with state capital.

The second issue is also related to the principal-agent setting. In order to simplify the analysis so that more attention can be paid to informational and incentive issues, it is generally assumed that relationship between the state and the enterprise is, when applicable, a one-to-one principal-agent relationship. Implicit in this

assumption are: 1. All higher levels of authority, including regional and industrial, are treated as the enterprise's principals. When faced with an enterprise, they are assumed to be representing the state interests in contrast to the enterprise's interests. Hierarchical relations among principals are not considered. 2. Both the principal and agent are, as in Granick (1990), normally organizations rather than individuals. When dealing with the state (principal), the enterprise has a single utility function and that of manager is taken as being representative. In cases where the manager may have different utility function from that of the enterprise as a whole, separate consideration will be given to the manager. 3. The fact that the enterprise may have multiple principals has a great impact on incentive properties and enterprise's strategies and should therefore be subject to a separate examination. But when not indicated, the one-to-one relationship between the State and the enterprise is assumed.

The above-defined agency relationship between the State and the enterprise is clearly greatly simplified. It will serve as the starting point for our modelling attempt in the following chapter. In due course, we shall consider relaxing some of the assumptions and examine the implications of so doing.

CHAPTER 7
INCENTIVES, RESOURCE ALLOCATION,
AND INFORMATION ASYMMETRY

7.1 Introduction

In this Chapter, we attempt to present formal models which can be used as benchmark models in the analysis of Chinese reward systems. The idea is that we build models in a specific setting which is relevant to the Chinese environment and use these models as normative models (or ideal models) to examine the relevant properties of Chinese reward systems. The characteristics of this setting will be shortly defined. The models we shall present are largely based on existing models in the agency literature. What we are going to do is present these models within a pre-defined setting in a systematic manner and where necessary refine and adapt them to our setting. The models have been developed in the agency context and many of them represent up-to-date developments of agency research. In this sense, this Chapter can be seen as an extension of Chapter 3, where the basic agency model and concepts were reviewed. In this Chapter, however, we have a clear orientation. That is, all the models considered in this Chapter have relevance to the Chinese systems, though the relevance will not be explicitly stated in many cases. Basically two types of problems will be considered. In the major part of this Chapter we consider the planner's problem of allocating centrally controlled resources to better-informed managers, who possess private information on the productivity of their own firms. We shall also consider the problem of pure moral hazard with many agents.

In the context of resource allocation, if for some reason(s), the managers are indifferent towards central allocations to them, the planner can then ask the managers to report their productivity information and solve the allocation problem under complete information. In such a case, the managers have no incentive to lie and the planner can simply choose the optimal allocation based on information from firms.

Similarly, if there is no divergence of preferences or differences in interests between the planner and managers, incentives are not needed for managers to report truthfully their productivity. Problems arise when moral hazard is present, where effort generates disutility to the agent and is not observable by the planner. Here, the manager can produce the same output with less managerial effort if he is allocated more resources. Typically, this type of setting arises under conditions of asymmetric information and divergency of preferences (Harris, Kriebel and Raviv, 1982). This problem of resource allocation under asymmetric information and divergency of preferences combines the problems of moral hazard and of information revelation in the principal-agent framework.¹ This problem characterizes both a centrally planned economy in which information structure is decentralized and a decentralized Western firm with multiple divisions. Basically, the problem involves two aspects which conflict each other: delegation of decision making in order to exploit the relevant information and provision of incentives to the managers to make effort decisions that are optimal to the whole economy (the planner). A desirable mechanism should resolve the tradeoff between the two aspects optimally.

In the area of resource allocation involving asymmetric information and effort incentives, there is a branch of literature that has developed within the agency framework. Earlier contributions such as Groves (1973), Groves (1976), Loeb and Magat (1978), and Groves and Loeb (1979), concentrated on the aspect of asymmetric information. Eliciting information for the purpose of resource allocation from divisions within a decentralized firm or individual firms within a CPE was the main concern.² More recent papers have addressed a full version of the problem, ie. the

¹Due to confusion in the concept of adverse selection (see chapter 3), we would rather use the term information revelation or information elicitation in place of adverse selection or moral hazard with hidden information, while moral hazard is referred to as moral hazard with hidden action in the Ramusen (1989) sense.

²Information elicitation was the main topic of the bonus literature too. In a broad sense, the bonus literature belongs to the this class of literature. However, information was elicited in the bonus literature for the purpose of plan target setting, not for the purpose of resource allocation. If the firm's target selection can change the capital allocation made by the planner, the New Soviet Incentive Model loses its information advantage and may induce the manage to report falsely (see Loeb and

problem that includes both asymmetric information and effort incentives. They include Harris, Kriebel and Raviv (1982), Cohen and Loeb (1984), Amershi and Cheng (1990), and Banker and Datar (1992). Some other papers have considered the problem but not in the context of resource allocation. Examples include Laffort and Tirole (1986), Picard (1987), Melumad and Reichelstein (1987), Guesnerie, Picard and Rey (1988), Gietzmann and Selby (1992), and Zou (1992b).

The model we shall build is based on the following general characteristics of the environment in which the principal (the planner) and the agents (the firm managers) operate. This setting is meant to describe the general features of the Chinese environment. But for the purpose of distinction from "real" Chinese reward systems, we use generalized terms "the planner" and "the manager" or "managers" and do not indicate specifically its Chinese contents.

a) In a centrally planned economy, the authority of decision-making is centrally held by the planner, who makes major decisions as to production and resource allocation and designs information and reward systems. This decision-making centralization is accompanied with information decentralization in that the information required for the decision-making by the planner is largely held by individual firms and has to be gathered by the planner.³ Centralization of decision-making does not mean that firms have no freedom of choice at all. The firm has at least two important decisions to make in the centralization context: the message to send to the planner during the budget-setting (planning) process and the effort level to exert during the

Magat, 1978a,b).

³The term "decentralization" or "centralization" is often used in an ambiguous way in the literature. In the agency context, Amershi and Cheng (1990) provide a definition: "A firm is decentralized if, by delegating the decision-making authority, the delegator (principal) incurs nonzero incentive (agency) costs to compel, in equilibrium, the delegates (agents) to implement their delegated tasks according to the operating rules specified by the delegator. Otherwise, the firm is centralized" (P.67). From the authors' statement that "decentralization can be identified with conditions under which a firm cannot achieve a first-best solution" to its agency problem, it can be deduced that decentralization is really linked with information asymmetry, or information decentralization. In certain circumstances, where information asymmetry is prevailing, the principal may or may not choose to delegate the decision-making authority.

production process. The first decision, i.e., the resource strategy, is embedded in the information decentralization statement, whereas the second, i.e., the effort selection, signals the presence of moral hazard due to the planner's inability to observe effort and enforce a specific level of effort from the firm.

b) Both the planner and the manager act in a self-interested fashion. In the agency language, they are both expected utility maximizers. The planner's utility is reflected in her objective to maximize total (gross or net) output value produced by all firms using available resources in a specific period of time. The manager is assumed to be an expected-reward maximizer. The rewards from the planner, in both material and non-material forms, represent the main part of the manager's utility function. The disutility of effort in relation to the rewards may also enter the manager's utility function as a negative term.

c) Information decentralization in a) implies that there exists informational asymmetry between the planner and managers of individual firms, primarily due to the limitation on the planner's ability to observe the manager's action and collect all information needed for planning. The manager, being closer to the technology and operation of his firm, knows more details about the exact productivity of the firm, than the planner. However, he does not possess the same information about the other firms, with which his firm competes for centrally supplied resource from the planner. On the other hand, the planner has information of the same level concerning the productivity of all firms under her jurisdiction.

d) The production environment in which firms operate is basically stochastic. The uncertainty related to the production process is reflected by the probability distribution of the productivity parameter of a specific firm, which is affected by state of environment. The output of the firm is produced by combining two inputs: a centrally allocated resource and the firm's effort. The two inputs are substitutable: to produce a specified quantity (or value) of output as allocations increase (decrease), lower (higher) levels of effort are required. The productivity parameter reported by a firm to the planner affects the central allocations to the firm and therefore the level of effort the firm chooses.

e) The managers and the planner can commit themselves to an established relationship between them. Once a contract is agreed upon, the manager cannot quit

due to high costs of leaving the firm and impossibility of seeking alternative employment. This consideration is highly relevant to our Chinese environment. This specification is equivalent to the postcontract private information situation specified by Banker and Datar (1992). The post contract private information assumption is in contrast to a pre-contract private information assumption, when each manager can quit after receiving private information. This is a usual assumption with adverse selection.

These general assumptions will be assumed to be valid throughout the analysis in this Chapter. Some more specific assumptions will be made during the modelling process in the following section, where we shall describe the basic model, which represents a general model of central planning and resource allocation. Section 7.3 derives some optimal mechanisms within the Nash equilibrium framework. Section 7.4 will examine the Groves mechanism under the dominant equilibrium conditions. There we shall show the limitations of the Groves mechanism and justify our Nash approach. In section 7.5, we shall briefly consider the problem of pure moral hazard (effort inducement) in the multi-agent setting. In this context, we shall focus on the concept of relative performance evaluation, which is considered relevant to the Chinese environment. Conclusions are summarised in section 7.6.

7.2 The Basic Model of the Planner's Problems

In this section, we develop a basic model of the planner's problems of allocating resources to many effort-averse, better-informed managers (firms). The planner's problem is two-fold: She first of all has to obtain information from firms to facilitate her allocation decision; Secondly she would like to motivate firms to exert desirable level of effort in the production process. Typically, this sort of problem combines the problems of adverse selection and moral hazard.

Our basic model embodies the basic assumptions and contains the essential features of the planner's problem described in the previous section. In this model, following Harris et al (1982), we only consider a linear structure resulting from three important simplifying assumptions. First it is assumed that the output of the firm is produced, if appropriate, from the intermediate products using a fixed proportions technology. Second, the output is produced using a linear production technology. And

third, firm managers have linear preferences, indicating that they are risk neutral. This linear structure is obviously very simplistic but it enables us to derive some simple but indicative results.

In the model, we consider a centrally planned economy headed by a central planner (P) and consists of N firms indexed $i = 1, \dots, N$. One of the roles played by the planner is to allocate a centrally controlled resource K to the firms. The amount of K is assumed to be fixed and K is assumed to be readily available. Each firm produces q_i , $i=1, \dots, N$, by combining the centrally allocated resource k_i and its own effort e_i .⁴ The output q_i is affected by the productivity θ_i of firm i . The production function for firm i , $i=1, \dots, N$, is then given by

$$q_i = e_i + k_i \theta_i \quad e_i \geq 0, k_i \geq 0. \quad (7-1)$$

Note that in (7-1) θ_i is not a function of e_i or k_i . It is a pre-effort selection parameter observed by the manager only. Moreover, the two elements e_i and k_i are separable, signalling the linear technology.

With respect to the information structure, we assume that the two parameters in the production function (7-1), e_i and θ_i , are known only to the firm manager i . Central allocations and outputs are observable to all firms and the planner. Routinely in the principal-agent framework, it is assumed that the planner and all firm managers share common belief about joint probability distribution of θ_i , $i=1, \dots, N$, at the time of contracting. Production function and utility functions of all parties are known to all.

With respect to the utility functions, we assume that each firm manager is an expected reward maximizer. He has disutility for effort, and is risk neutral in

⁴The model only considers a planner with many parallel, independent managers who produce the same product for the planner. In Harris et al. (1982), there exist a division $i=0$ which produces the resource, and N independent divisions $i=1, \dots, N$, which produce an intermediate product using the resource produced by division 0. The final output is calculated by converting the intermediate product at a fixed proportion. In Banker and Datar (1992), managers have different functions with N production managers and a sale manager (indexed by $(N+1)$). The Banker & Datar model is appropriate to a divisionalized firm while our model is shaped to a centrally planned economy, in which the planner takes all products at a fixed prices.

rewards. It is also assumed that the utility function of the firm manager is separable in reward and effort. This allows us to unite the managers' utility function as:

$$U_i(B_i, e_i) = B_i - Z_i(e_i), \quad (7-2)$$

where U_i is the utility function for firm manager i . B_i and $Z_i(e_i)$ represent the rewards to manager i (or speaking precisely, the utility derived from the rewards) and disutility of effort occurred to him in gaining B_i . We assume that the minimum utility for each manager is zero:

$$\bar{U}_i(B_i, e_i) = 0. \quad (7-3)$$

The disutility function $Z_i(e_i)$ has the following characteristics: $Z_i'(e_i) > 0$ and $Z_i''(e_i) > 0$ for any level of $e_i \geq 0$.

The planner is assumed to seek to maximize her net revenue, which is the gross revenues generated by all firms $R(\cdot)$ minus the costs. Since all products are "sold" to the planner at a fixed price, the gross revenue that the planner gains is a linear function of the total outputs of all firms. The gross revenue can then be taken as the linear value transformation of the outputs. This transformation allows us to write all elements in the utility function in the value terms. The costs to the planner include the cost of allocated resource $C(\cdot)$ and rewards paid to firms $(\sum_{i=1}^N B_i(\cdot))$. We

may therefore write the utility function for the planner as⁵

⁵In both Harris et al. (1982) and Amersh and Cheng (1990), the objective of the planner is set to be minimizing the cost of producing a given output, which is the sum of the last two terms of the right-hand side of (7-4). The justification is that cost minimization is a necessary condition for profit maximization and the behaviour of the planner with respect to the market for her output is not important. This treatment appears appealing in the Chinese environment since market and pricing has been less important than in the West. However, for the sake of consistency, we use net-revenue maximization as the planner's objective.

$$U_P(q_i, k_i, e_i) = R\left(\sum_{i=1}^N q_i\right) - C\left(\sum_{i=1}^N k_i\right) - \sum_{i=1}^N B_i(\cdot), \quad (7-4)$$

where R is gross revenues from all firms $R=R_1+\dots R_N$ and $R_i=aq_i$, where a is the price for the single output q .

With regard to the game structure and the sequence of moves, we assume that the planner deals with N managers simultaneously but independently. Information flows between the planner and individual managers. There are no information exchanges among managers, hence no collusion by managers coordinating their message strategies (Fig.7.1). This no-collusion assumption is important for the working of the revelation principle, which we shall use to further our analysis.

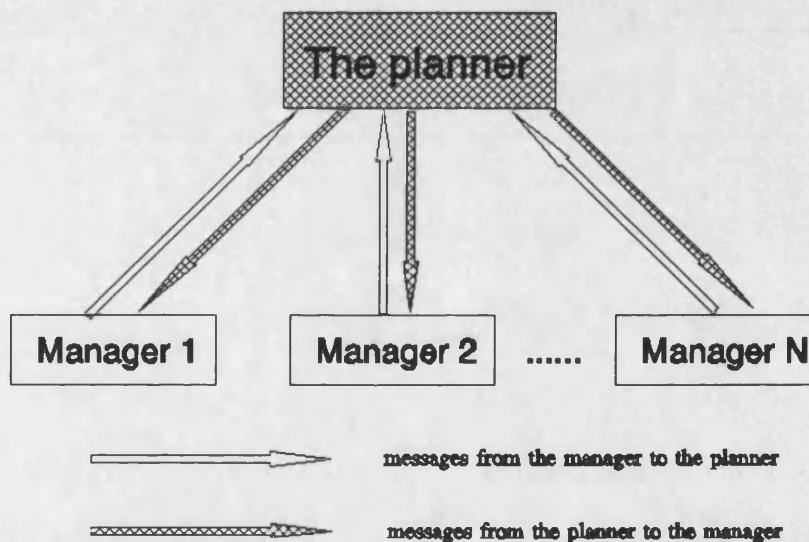


Fig.7.1 Information Structure

The game starts with the first move of the planner, who announces the resource allocation and coordination mechanism and offers contracts to firm managers. In accepting the contracts, the managers commit themselves to the contracts even after they have later observed private productivity information. After contracting, managers observe their private productivity parameters and choose message strategies according to the contracts and the rule of individual rationality. After receiving messages from managers, the planner allocates resource in accordance

with the mechanism. Each manager then chooses a level of effort to produce output. Again, the choice is made based on the rule of maximization of the manager's

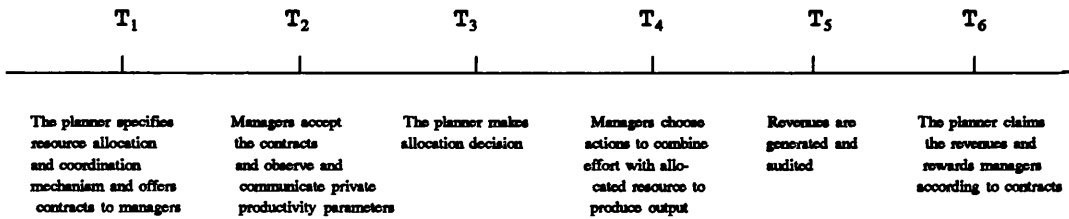


Fig.7.2 Time Order of Events

expected utility. Finally, output is produced and revenues are generated. The planner claims the revenues and managers are paid according to the prespecified formula (Fig.7.2). This is basically a two-round game, in which managers have to make two decisions concerning message strategy and action strategy at T₂ and T₄ respectively. The main role of the planner is to specify the resource allocation and incentive mechanism. Other actions that the planner has to take (make allocation decisions and reward managers) are based on the prespecified mechanism (rules of the game). The managers' decisions are also controlled by this mechanism.

In the rest of this section, we consider the full information version of the basic model. Modifications will be made to the model as we introduce more elements in the following sections.

If the planner could obtain full information about the parameters θ_i and/or the effort level e_i , the problem of designing optimal mechanism would be simple. For example, when θ_i is known to the planner, the planner's problem becomes that of choosing optimal k_i and e_i for each firm according to its θ_i , $i=1, \dots, N$. The planner's problem can be formulated as

$$\underset{k, e}{\text{maximize}} E \left[R \left(\sum_{i=1}^N q_i(k_i, e_i, \theta_i) \right) - C \left(\sum_{i=1}^N k_i(\theta_i) \right) - \sum_{i=1}^N B_i(e_i) \right], \quad (7-5)$$

$$\text{subject to } E[B_i(e_i) - Z_i(e_i)] \geq 0 \quad i=1, \dots, N, \quad (7-6)$$

where the expectations are taken over all θ_i , $i=1, \dots, N$. The maximization problem expressed by (7-5) represents the planner's desire to maximize the expected net revenue based on the probability distribution over all θ_i , $i=1, \dots, N$. Expression (7-6) represents the individual rationality constraint, which specifies that the expected utility for managers should be no less than zero, the reservation utility of managers. When the manager's effort can be observed by the planner, the manager is only rewarded with the minimum utility level $\bar{U}=0$.⁶ Constraint (7-6) is therefore strictly binding. Hence,

$$E(B_i(e_i)) = E(Z_i(e_i)) \quad i=1, \dots, N. \quad (7-7)$$

The planner's maximization problem in this case can be rewritten as

$$\text{maximize } E \left[R \left(\sum_{i=1}^N q_i(k_i, e_i, \theta_i) \right) - C \left(\sum_{i=1}^N k_i(\theta_i) \right) - \sum_{i=1}^N Z_i(e_i) \right], \quad (7-8)$$

where the expectations are taken over all θ_i , $i=1, \dots, N$. (7-8) has a very straightforward economic meanings. Maximizing (7-8) requires the expression

$$\pi = R \left(\sum_{i=1}^N q_i(k_i, e_i, \theta_i) \right) - C \left(\sum_{i=1}^N k_i(\theta_i) \right) - \sum_{i=1}^N Z_i(e_i), \quad (7-9)$$

to be maximized for each realization of θ_i . A simplified expression of the first order conditions can be presented as follows:

$$\frac{\partial \pi}{\partial k} = R' - C' = 0, \quad (7-10)$$

$$\text{and } \frac{\partial \pi}{\partial e} = R' - Z' = 0. \quad (7-11)$$

⁶Letting $\bar{U}=0$ does not mean that the managers are paid nothing. It simply indicates that the utility gains by the managers from rewards equals the disutility of effort. In the linear and deterministic case, $B(e) = Z(e)$ or $u(B(e)) = Z(e)$. The basic pay is determined by the level of disutility of effort.

Both (7-10) and (7-11) are specific cases of the generic marginal rule, which specifies that marginal output equates to marginal cost of inputs.

If we refer to the resource allocation that satisfies (7-8) as the first-best allocation, some basic results can be obtained. The implementation of the optimal mechanism for the known θ_i requires that simultaneously

- 1) An amount k_i^* of the resource is allocated to firm i ;
- 2) Firm manager i is required to provide a first-best level of effort e_i^* ; and
- 3) Firm manager i is rewarded with B_i^* when the output $q_i^* = e_i^* + k_i^* \theta_i$ is produced.

This first-best situation contains two basic steps. The first is that the planner solves her maximization problem based on the values of θ_i . This step would result in the optimum values of k_i and e_i , represented by k_i^* and e_i^* respectively. The second step involves a forcing contract. Since the first-best values of k_i^* , e_i^* and θ_i are already known to the planner, she can enforce the first-best level of effort e_i^* by adopting a forcing contract. Therefore, there does not exist an incentive problem in this situation. In the following section, we shall relax the full-information assumption and introduce the incentive problem into the basic model.

7.3 An Optimal Incentive Mechanism with Nash Equilibrium

In this section, we introduce the incentive problem into the basic model developed in the previous section. This problem results from the relaxation of the assumption that the planner is fully informed. Specifically, the productivity parameter θ and the manager's effort level e are asymmetrically known only to the manager concerned. In this situation, the planner has to establish a mechanism to elicit the productivity information from firm managers, in addition to motivate managers to exert desirable level of effort. Before deriving an optimal mechanism implementable to the problem, we first define some concepts useful to the analysis.

7.3.1 A Direct Coordination Mechanism

In the general principal-agent framework, a principle has been established which asserts that there is no loss of generality in assuming that the principal should structure her incentive system so that all agents will be willing to reveal all of their information to her honestly (Myerson, 1982). This principle, usually referred to as the revelation principle (briefly reviewed in Chapter 3), allows us to concentrate, without any loss of generality, on truth-telling mechanisms. Along this line, we consider the concept of direct coordination mechanism or direct revelation mechanism.

Let the vector $(m_i(\theta_i), e_i(\hat{m}))$ denote the set of strategies for manager i , $i=1, \dots, N$, where $m_i(\theta_i)$ represents the manager's message strategy and $e_i(\hat{m})$ his effort decision. Furthermore, we specify that the manager's private information about θ is drawn from a set of possible productivity parameters: $\theta \in \Theta = [\underline{\theta}, \bar{\theta}]$ for $i=1, \dots, N$. Similarly, we let A denote the set of possible actions or decisions on effort level which the manager can make: $e \in A = [\underline{e}, \bar{e}]$ for $i=1, \dots, N$. In the two-round game described in the previous section, the planner first announces the coordination mechanism and asks managers to report their productivity parameters. On receiving the messages from managers, the planner makes allocation decisions. Each manager then chooses an effort level to solve his own maximization problem.

By the revelation principle, the planner can limit her choice of mechanisms to the class of truth-eliciting mechanisms, or direct mechanisms. Following Myerson (1982), we define a direct mechanism as a mechanism in which each manager is asked to report a m from the set Θ . Moreover, in a direct mechanism, the truth-telling behaviour of each manager forms a Nash equilibrium.⁷ In the context of resource allocation, once the messages are sent from manager, the planner will send

⁷In a multi-agent game in which agents compete each other, there exist subgames among agents. A Nash equilibrium implies that there exists an optimal choice for each agent on the assumption that other agents make similar choices. Being weaker than the concept of dominant equilibrium, in which the optimal choice of one agent is independent of the choices of other agents, a Nash equilibrium is applicable to a broader and more general class of agency problems.

each manager a suggested action (effort level) $\hat{e} \in A$. Therefore, we can get the following definition in this specific context:

Definition 1 *A mechanism is direct if and only if $m_i = \theta_i$ and $e_i = \hat{e}_i$, $i = 1, \dots, N$.*

With a direct mechanism, the decision function for the planner is characterized by the probability function $D(k_i, \hat{e}_i | m_i), i = 1, \dots, N$, where D is the planner's probability of making allocation decision k_i and recommending \hat{e}_i to each manager i if each manager i reports m_i .

7.3.2 An Incentive Compatible Mechanism

The concept of a direct mechanism allows us to restrict our attention to mechanisms in which truth-telling is an equilibrium strategy. Formally, truth-telling forms an equilibrium if and only if, for each manager i , it is optimal for manager i to declare $m_i(\theta_i) = \theta_i$, given that other managers behave in the same way. Similarly, with regard to the aspect of action (effort) choice, an equilibrium is formed if, for each manager i , it is optimal to choose the action that the planner recommends (to obey the planner's desire): $e_i = \hat{e}_i$. By combining the two aspects of truth-telling and obedient behaviour (congruent behaviour), we get a definition of Bayesian incentive compatibility:

Definition 2 *A direct mechanism is Bayesian incentive compatible if and only if, for each manager i the truth-telling and obedient strategies ($m_i = \theta_i$, $e_i = \hat{e}_i$) form a Nash equilibrium.*

It is optimal for manager i to declare the true θ_i if and only if his expected utility is higher when he declares his true θ_i than when he does otherwise. In other words, a truth-telling strategy is optimal if it satisfies the following self-selection constraint:

$$E[B_i(\cdot) - Z_i(\cdot) | \theta_i, m_i] \geq E[B_i(\cdot) - Z_i(\cdot) | \theta_i, \tilde{m}_i], \quad (7-12)$$

where expectations are taken over all possible parameters (productivity, message and effort strategies) of all other managers than i conditional on θ_i and manager i 's message m_i or \tilde{m}_i . $\tilde{m}_i = \tilde{m}_i(\theta_i)$ denotes all other possible messages about θ_i that i may

send to the planner than the message about the true θ_i .

During the second stage of the game, when manager i has received an allocation and a suggested action from the planner, he makes a second choice of the effort level to maximize his expected utility on the basis of all given parameters: messages sent by managers m_{-i} (other managers than manager i), his own θ_i , and allocations k_{-i} . Here, it is optimal for manager i to obey (choose) the planner's recommendation on \hat{e}_i , $e_i = \hat{e}_i$, only if \hat{e}_i satisfies the following self-selection constraint:

$$e_i = \hat{e}_i \in \operatorname{argmax} E[B_i(\cdot) - Z_i(\cdot) | m_{-i}, \theta_i, k_{-i}] \quad \forall i, \quad (7-13)$$

where expectations are taken over all possible action choices of the other managers, m_{-i} and k_{-i} in (7-13) represent messages sent by all other managers (excluding i) to the planner and allocations made by the planner to all other managers (excluding i):

$$m_{-i} = (m_1, \dots, m_{i-1}, m_{i+1}, \dots, m_N), \quad k_{-i} = (k_1, \dots, k_{i-1}, k_{i+1}, \dots, k_N).$$

7.3.3 A General Model of Incentive Compatible Mechanism

Having defined the concept of incentive compatibility in the context of resource allocation, we can now construct a general model of a coordination mechanism in the presence of information asymmetry. The planner's problem is to design a B_i system in order to:

$$\operatorname{maximize} E[R(\cdot) - C(\cdot) - \sum_{i=1}^N B_i(\cdot)], \quad (7-14)$$

$$\operatorname{subject to} E[B_i(\cdot) - Z_i(\cdot)] \geq 0, \quad (7-15)$$

$$E[B_i(\cdot) - Z_i(\cdot) | \theta_i, m_i] \geq E[B_i(\cdot) - Z_i(\cdot) | \theta_i, \tilde{m}_i], \quad (7-12)$$

$$\hat{e}_i \in \operatorname{argmax} E[B_i(\cdot) - Z_i(\cdot) | m_{-i}, \theta_i, k_{-i}], \quad (7-13)$$

$$\operatorname{and} \sum_{i=1}^N k_i \leq K, \quad (7-16)$$

$$\forall \theta \in \Theta, i=1, \dots, N.$$

Constraints (7-12) and (7-13) are the incentive compatibility conditions derived in the previous subsection. They reflect the restriction that θ_i and $e_i(\theta_i)$ are manager i 's private decision variables due to asymmetric information. They also specify manager i 's self-selection decision rules when he determines his message and action strategies. Constraint (7-16) is added to reflect the resource availability constraint due to the fixed amount of available resource. If (7-16) were not binding, i.e., there is no limits for available resource at existing prices, the planner could deal with managers individually without overall coordination since an overallocation of resource to one of these managers would not require an under-allocation to another. As a result, the amount of resource allocated to any one manager would depend only on his productivity (Harris, et al. 1982). In the above model, however, the amount of resource allocated to any one manager affects the maximum amount which could be allocated to the others. The allocation to any manager will therefore depend on the productivity parameters of all managers. Therefore, in making allocation decisions, the planner has to take into account information from all managers.

A mechanism characterized by (7-12) - (7-16) contains the truth-telling and congruent strategies of managers. In particular, (7-12) and (7-13) characterize a communication equilibrium (CE) (Forges, 1986; Myerson, 1986). The core of a communication equilibrium is that given that all the managers have reported honestly and would choose the recommended effort levels, no manager can gain from not reporting honestly and not choosing the effort level recommended to him by the planner.

7.3.4 An Optimal Incentive Mechanism

The general model developed in the previous subsection presents a class of typical coordination problems with information elicitation and effort enforcement. A number of recent articles have analyzed the model and offered some solutions (see for example, Guesnerie, et al, 1989; Picard and Rey, 1990; McAfee and McMillan, 1991; Zou, 1992b). Because of the intricacy of the model, it is a normal practice to impose some additional restrictive and simplifying assumptions to the model. To make the results traceable and easy to interpret, we make following additional assumptions:

A1: $q_i(\theta_i) = e_i(\theta_i) + k_i\theta_i \quad \forall i$, which indicates that the output deterministically depends on effort and productivity without disturbance of an additional random variable. Alternatively, we can interpret this assumption as that θ_i includes the disturbance.

A2: For all $\theta \in \Theta$ and i , $j_i'(\theta_i) \leq 1$, where $j_i(\theta_i) = (1 - F_i(\theta_i))/f_i(\theta_i)$, $F_i(\theta_i)$ and $f_i(\theta_i)$ denote cumulative distribution and density functions of θ respectively. $j_i(\theta_i)$, normally termed the "hazard rate condition" (Holmstrom, 1984; Zou, 1992a), is a technical assumption, "Although it is difficult to find straightforward interpretations for this assumption, a class of interesting distributions do meet this requirement, including the uniform distribution" (Zou, 1992a).

A3: For all $\theta \in \Theta$, $e \in A$, and i , $Z_{i[e\theta]} < 0$, $Z_{i[ee\theta]} \leq 0$ and $Z_{i[e\theta\theta]} \geq 0$, where the subscript in the brackets means derivative with respect to the elements in the brackets. $Z_{i[e\theta]} < 0$ says that for one unit increase in the level of effort, the more efficient manager (with higher θ) requires a smaller increase in reward to maintain the same level of utility than the less efficient manager (with lower θ). $Z_{i[ee\theta]} \leq 0$ means that as level of effort increases the differences indicated by $Z_{i[e\theta]} < 0$ become more significant. $Z_{i[e\theta\theta]} \geq 0$ indicates that these differences become less significant as productivity level increases.

Furthermore, we simplify the expression of the planner's utility function expressed by (7-5) by merging the first two elements into

Π , i.e., $\Pi = R\left(\sum_{i=1}^N q_i\right) - C\left(\sum_{i=1}^N k_i\right)$. The planner's utility function can then be stated as

$\Pi - \sum_{i=1}^N B_i(e_i(\theta_i), \theta_i)$. We also drop the constraint (7-16) in the following analysis, as

it is reflected in the Nash equilibrium framework of the model. Thus, we consider the solution to the following problem. The planner is to design a mechanism $(B, e) = [(B_1(q_1, \theta_1), e_1(\theta_1)), \dots, (B_N(q_N, \theta_N), e_N(\theta_N))]$ so as to

$$\text{maximize } E[\Pi(e(\theta)) - \sum_{i=1}^N B_i(e_i(\theta_i), \theta_i)] \quad \text{for all } i, \quad (7-17)$$

subject to (7-15), (7-12) and (7-13). The expectations in (7-17) are taken over all possible $\theta_i \in \Theta_i$.

Before we derive the optimal solution to the above problem, we first try to derive the optimal incentive mechanism under the simplified assumption that the manager's effort levels are perfectly observable. This is a pure adverse selection setting, which was considered in Chapter 6 (see expressions (6-1) - (6-4)). For convenience of comparison and tracing, we present the solution in general terms here.⁸

If the effort level of each manager is observable, it can be enforced by the planner. The deterministic relationship between output and effort, according to *AI*, points to the irrelevance of effort (e) to the problem. However, since optimal level of e depends on the value of θ , the element of e still enters the model. The planner's problem is to define an incentive mechanism $(B(\theta), e(\theta))$, where $e(\theta)$ is enforceable, to

$$\text{maximize } E[\Pi(e(\theta)) - \sum_{i=1}^N B_i(\theta_i)], \quad (7-18)$$

$$\text{Subject to } E[B_i(\theta_i) - Z_i(e_i(\theta_i), \theta_i)] \geq 0, \quad (7-19)$$

$$\text{and } m_i = \theta_i \in \underset{\hat{\theta}}{\text{argmax}} E[B_i(\hat{\theta}_i, \theta_{-i}) - Z_i(e_i(\hat{\theta}_i, \theta_{-i}), \theta_i)], \quad (7-20)$$

$$\forall \theta_i \in \Theta_i, i = 1, \dots, N.$$

The expectations in (7-19) are taken over all θ_i and those in (7-20) are taken over θ_{-i} . (7-20) embodies the communication equilibrium, which requires that given that all the other managers report their true productivity, no manager should have incentives to misreport his productivity. It also means that the communication is public and once

⁸Recall that in chapter 6, the model only contained two possible values of θ , denoted by \tilde{q}_L and \tilde{q}_H . Here the values of θ are drawn from $[\underline{\theta}, \bar{\theta}]$ and the model is therefore more general than that analyzed in chapter 6.

a manager has reported his productivity, this information becomes public knowledge.

We write the maximand in (7-20) as μ :

$$\mu_i(\hat{\theta}_i, \theta_i) = E[B_i(\hat{\theta}_i, \theta_{-i}) - Z_i(e_i(\hat{\theta}_i, \theta_{-i}), \theta_i)]. \quad (7-21)$$

The first-order condition of (7-21) is

$$\mu_{i[\hat{\theta}_i]}(\hat{\theta}_i, \theta_i) |_{\hat{\theta}_i = \theta_i} = \int_{\theta_{-i}} [B_{i[\hat{\theta}_i]}(\theta) - Z_{i[e]}(e_i(\theta), \theta_i) e_{i[\hat{\theta}_i]}] dF_{-i}(\theta_{-i}) = 0 \quad (7-22)$$

$$\forall \theta_i \in \Theta_i, i=1, \dots, N,$$

where the element in subscript brackets denotes the partial derivative with respect to that element only. (7-22) implies

$$\mu'_i(\theta_i) = - \int_{\theta_i} Z_{i[e]}(e_i(\theta), \theta_i) dF_{-i}(\theta_{-i}), \quad \forall \theta_i \in \Theta_i, i=1, \dots, N, \quad (7-23)$$

which means that a marginal increase in the manager's utility for an increase in productivity equals to the marginal disutility of effort (since the manager can reduce his effort by an amount equal to the increase in productivity). This implies that the managers' optimal utility is an increasing function of productivity.

As the planner's utility decreases with μ , we can replace (7-19) with

$$\mu_i(\theta_i) = 0 \quad i=1, \dots, N. \quad (7-24)$$

The planner's problem can then be simplified as to

$$\underset{\mu, e}{\text{maximize}} \int_{\theta} [\Pi(e(\theta)) - \sum_{i=1}^N [\mu_i(\theta_i) + Z_i(e_i(\theta), \theta_i)]] dF(\theta), \quad (7-25)$$

subject to (7-23) and (7-24). Proposition 1 below states the optimal solution to this adverse selection problem. Proposition 2 states the optimal solution to the above problem in addition to the effort enforcement consideration. These two propositions are adapted from Zou (1992b) and a full proof of the propositions can be found in the Appendix To Zou (1992a). Following the propositions, we shall discuss these

proposition and draw some conclusions with regard to the theoretical solutions to the planner's problem stated in the first section of this Chapter.

Proposition 1 Under A1-A3, there exists a unique optimal solution to the problem (7-23) - (7-25): $(\bar{\mu}_i(\theta), \bar{e}_i(\theta))$, which satisfies for all $\theta \in \Theta$ and $i=1, \dots, N$,

$$\Pi_{e_i}(\bar{e}_i(\theta)) - Z_{\bar{e}_i}(\bar{e}_i(\theta), \theta_i) + j_i(\theta_i) Z_{\bar{e}_i}(\bar{e}_i(\theta), \theta_i) = 0, \quad (7-26)$$

$$\text{and } \bar{\mu}_i(\theta_i) = - \int_{\bar{\theta}_i}^{\theta_i} \int_{\bar{\theta}_{-i}}^{\theta_{-i}} Z_{\bar{e}_i}(\bar{e}_i(\bar{\theta}), \bar{\theta}_i) dF_{-i}(\bar{\theta}_{-i}) d\bar{\theta}. \quad (7-27)$$

According to (7-21), we get

$$\bar{B}_i(\theta_i) = \bar{\mu}_i(\theta_i) + Z_i(\bar{e}_i(\theta), \theta_i). \quad (7-28)$$

Proposition 2 Under A1-A3, there exists an optimal solution to the problem (7-23) - (7-25): $(B^*(\Pi, \theta), e^*(\theta))$, which satisfies $e^*(\theta) = \bar{e}_i(\theta)$ and

$$B_i^*(\Pi, \theta) = \bar{B}_i(\theta) + D_i(\theta) [\Pi - \Pi(\bar{e}_i(\theta))], \quad (7-29)$$

where $D_i(\theta) = Z_{\bar{e}_i}(\bar{e}_i(\theta), \theta_i) / \Pi_{e_i}(\bar{e}_i(\theta))$ and $(\bar{B}_i(\theta), \bar{e}_i(\theta))$ satisfies, for all $\theta \in \Theta$ and $i=1, \dots, N$, (7-26), (7-27) and (7-28).

The above solution in Proposition 2 represents the optimal incentive contract in the presence of the following conditions. The planner wishes to obtain productivity information in order to make allocation decisions and to motivate risk-neutral, effort-averse managers to exert desirable effort level derived from the allocation decisions. The solution was obtained within the Nash equilibrium framework and based on the revelation principle. Some observations can be made on the solution. First of all, according to (7-29), in the optimal incentive contract for each manager the payment to the firm manager is a linear function of Π , the gross profit for the planner. This result is consistent with Laffort and Tirole's (1986) conclusion that the optimal

allocation can be implemented by a linear incentive scheme.⁹ The linearity indicates that the optimal solution is relatively simple despite of its incentive nature. The optimal contract can be decomposed into a fixed-reward contract $\tilde{B}_i(\theta)$ and a profit-sharing contract. The two components have simple interpretations too. The fixed fee $\tilde{B}_i(\theta)$, according to (7-28), is the sum of two elements, $\tilde{\mu}_i(\theta_i)$ and $Z_i(\tilde{e}_i(\theta), \theta_i)$. $\tilde{\mu}_i(\theta_i)$ can be simply interpreted as manager i 's information rents from possessing θ_i and this amount is the minimum that is required to guarantee that manager i will tell the truth. Z_i is the basic compensation for the manager's disutility of exerting the effort that is recommended by the planner when he reports θ_i . The incentive nature of the contract is represented by the variable portion $D_i(\theta)[\Pi - \Pi(\tilde{e}(\theta))]$, which is a simple profit-sharing (strictly above-budget profit-sharing) scheme that is intended to motivate the manager to increase his level of effort.

Secondly, the optimal reward function is a budget-based mechanism. The reward function in (7-29) can be interpreted as a bonus-penalty reward scheme, including a fixed fee $\tilde{B}_i(\theta)$ and a variable portion $[\Pi - \Pi(\tilde{e}(\theta))]$ with a coefficient $D_i(\theta)$. The variable portion is the difference between realized gross profit and expected (budget) gross profit by the planner using the desired level of effort ($\tilde{e}(\theta)$).

Thirdly, the slope D_i reflects the power of incentives. From (7-26), D_i lies between 0 and 1. The higher D_i is, the higher is the incentive power of the contract. When $D_i=1$, i.e., $\Pi_{e_i}(\tilde{e}(\theta)) = Z_{i|e_i}(\tilde{e}_i(\theta), \theta_i)$, or $j_i(\theta_i)Z_{i|e\theta_i}(\tilde{e}_i(\theta), \theta_i) = 0, \forall \theta_i, i$, the first-best allocation can be achieved. The presence of the element j_i in (7-26) signals the second-best nature of the mechanism. This element may be loosely interpreted as extra marginal cost for the planner to induce manager i to increase effort, owing to the incentive compatibility constraint imposed by effort-self-selection.

Fourthly, from (7-27) we can see that managers, except for those whose productivity is the lowest, enjoy a strictly positive utility level $\tilde{\mu}_i$, which adds to the

⁹The Groves mechanism (to be reviewed in the next section) also contains a linear reward function. Banker and Datar (1992) derive a modified Groves mechanism based on the concept of the dominant strategy equilibrium, which is also a linear function.

base fixed fee in (7-28). The inclusion of $\tilde{\mu}_i$ in \tilde{B} indicates, again, the second-best nature of the scheme. Under the first-best scheme, the planner can extract all the manager's information rents.

Lastly, to implement the optimal mechanism (B^*, e^*) , the planner is i) to ask the manager i to report his productivity θ_i , ii) to make decisions on allocation, decide on e^* and to require the manager to produce $q^*(e^*)$, and iii) to reward the manager according to B^* . In the equilibrium where all the managers report honestly their productivity information θ and choose the recommended effort level \tilde{e} , the payment to manager i is $\tilde{B}_i(\theta)$ and the utility of manager i is $\tilde{\mu}_i(\theta_i)$.

Note that the scheme $(\tilde{B}(\theta), \tilde{e}(\theta))$ is basically a pure adverse-selection solution. The implication is that under risk neutrality moral hazard can be completely eliminated at no cost using a properly designed contract¹⁰ (Laffont & Tirole, 1986; Picard, 1987; Zou, 1992a; Zou, 1992b). This can be easily seen in (7-29). According to (7-29), when the manager chooses effort $\tilde{e}(\theta)$, he will simply get $\tilde{B}(\theta)$. The mechanism $(B^*(\Pi, \theta), e^*(\theta))$ would induce the managers to report truthfully and obey the planner's recommendation on e . If, however, we allow risk aversion on the part of the manager, the above solution will incur the planner moral hazard cost since it imposes unavoidable risks on the manager. In this situation, the planner has an additional problem of balancing providing the manager incentives to work harder and reducing the risk premium paid to the manager for risk sharing. Optimal incentive

¹⁰It is customary in the models of adverse selection and mixed models involving adverse selection, to assume risk neutrality on the part of the agent. Under risk neutrality on the part of the manager, moral hazard can be solved by linking the reward to the manager and the observed outcome without worrying about risk burdens for the manager. Therefore risk neutrality allows study of adverse selection without getting into intricacy of moral hazard cost. A standard method that has been developed in this context is to use the revelation principle to transform the problem into a manageable programme where an optimal direct mechanism may be developed (Baron and Myerson, 1982; Guesnerie and Laffont, 1984; Laffont and Tirole, 1986, 1987). Adverse selection under risk aversion was examined by Zou (1992b), who extended the standard principal-agent model and derived optimal threat-based incentive mechanisms under simultaneous moral hazard and adverse selection.

contracts under moral hazard and risk aversion are complex and non-robust (Laffort & Tirole, 1986). In the presence of adverse selection, the problem gets more complicated. Nevertheless, we can derive an indicative and intuitive result. That is, the coefficient in (7-29) increases with the degree of risk aversion (*ibid.*). The explanation is simple: additional incentive should be provided to compensate the manager for the risks he bears.

The model and solution we presented in sections 7.2 to 7.3 represent a typical planner's problem of resource allocation in the presence of information asymmetry and effort aversion on the part of firm managers. This problem, in its original form, can be very complex and intricate, especially when subgames among managers and risk preferences are allowed to enter the model. Present research in this area has not advanced to the stage so that it allows us to make use of readily available "standard solutions" to the problem. It is usual in the literature to examine stylized models accompanied by a number of assumptions. The model considered in the previous sections is not an exception. Those assumptions, restrictive, simplifying or technical in nature, effectively restrict our model to a particular environment. The solution to the model may, as a result, be case-specific and condition-dependent. In particular, it was developed along the line of revelation principle and within the framework of Nash equilibrium. In essence, it belongs to a class of "knife-edge" incentive mechanisms (Laffort & Tirole, 1986). However, the implications of the solution may appear more useful than the solution of technical form itself. They will be used in a later chapter to examine the pre-reform Chinese system, which is believed to fit generally in the environment we considered in the previous sections. In the next section, we consider the Groves mechanism developed in a similar environment of resource allocation and information asymmetry. Despite its theoretical merits, we shall show that it is not very useful for our purpose due to its limitations.

7.4 The Groves Mechanism and Resource Allocation

The models considered in the previous sections were built in the framework of Nash equilibrium, which implies that one agent makes his truth-telling decision on the assumption that other agents do the same. In this section, we relax this assumption

and consider the solution concept within the dominant strategy equilibrium framework, which specifies the strategy of one agent regardless of the strategy pursued by the others. This concept is much stronger than the Nash equilibrium and effectively decouples the agent's decision making into a set of single-person choice settings (Amershi and Cheng, 1990). Within the dominant strategy framework, the much-discussed Groves Mechanism provides a solution to the principal's problem of information elicitation and optimal resource allocation. This section focuses on the properties and limitations of the Groves Mechanism. Its applicability to the Chinese setting will also be considered.

7.4.1 The Groves Mechanism

The well-known Groves Mechanism was developed by Groves (1973) based on the team model. Team theory was pioneered by Marschak and Radner (1972). It assumes a common preference function or utility function for all members of the team. Because there is no conflict of interest, which is a basic cause of incentive problems, no incentive problem presents in the team model. A team decision problem can be described as a multi-person joint decision problem in which the decision makers are motivated by a common objective but have different information sets available. The problem for the organization designer is then to select an optimal information system so as to enable decision makers to elicit or acquire information necessary for maximization decision-making. It is in all members' interest to provide information through observation and communication; designing an appropriate information structure to facilitate such observation and communication and making good use of available information in decision-making are the main concern in team theory.

This common-interest motivated model apparently has its limits in applying it to the real-world organizational settings, in which conflict of interests often exists among different groups of members. Here, it is worthwhile mentioning that the Chinese authorities prior to the recent reform made great efforts in urging the coincidence of interests of the state, collectives (firms) and of individuals. From the perspective of team theory, these efforts may be seen as to seek to align the interest

of the state with that of firms in order to eliminate the incentive problem in information system. These efforts, did work, to a certain extent, in appealing people to sacrifice their own interest for "the glorious cause of communism" (Zhang, 1990) and therefore be willing to cooperate with the authorities, especially during the 1950s and early 1960s, when the people in China were much more supportive and loyal to the authorities. However, as will be analyzed in Chapter 8, despite the authorities' efforts, self-interest has been a dominant pattern of behaviour in China. The team model therefore loses its general relevance to our Chinese analysis. But again, it helps to explain the more cooperative behaviour of Chinese firms with higher authorities during certain periods.

Groves (1973) extended the team model to a general organization setting, in which conflict of interest exists and the incentive problem therefore presents. His discussion shows that in an organization in which the payoff function reflects only the goals or preferences of the organization's leader, it is possible, under certain assumptions, for the leader to select compensation rules that can induce other members to behave as if they were members of a team, i.e., to send optimal information and make optimal decisions from the point of view of the organization objective. Moreover, these rules do not require the leader to possess any additional information or even have knowledge of the true accuracy or completeness of his information. This preference-revelation incentive scheme, normally termed as "the Groves Mechanism", provides an alternative truth-telling scheme, which is optimal under a particular set of assumptions.

The setting Groves considered is similar to that of section 1 of this Chapter. The planner is to allocate total amount of resource available in the economy \bar{K} to the firms $1, \dots, N$, and \bar{k}_i : represents firm i 's allocated resource from the planner. When the firm's effort level is not considered as a decision variable, each firm produces an output q_i according to a production function $q_i(k_i, \theta_i)$, where θ denotes a stochastic variable for which the density function is known to the firm in advance but not to the planner. The planner's problem is assumed to be to allocate resource to maximize the sum of expected outputs, basing her calculations on the expected production functions reported by the firms ($q_i^*(\cdot)$). That is, the planner chooses $\bar{k}_1, \bar{k}_2, \dots, \bar{k}_N$ such that $\bar{k}_1,$

$\bar{k}_2, \dots, \bar{k}_N$

$$\text{maximize } \sum_{i=1}^N q_i^*(\bar{k}_i), \quad (7-30)$$

$$\text{subject to } \sum_{i=1}^N \bar{k}_i \leq \bar{K},$$

$$\text{and } \bar{k}_i \geq 0 \quad (i=1, 2, \dots, N).$$

What the planner needs is an optimal control mechanism that can induce firms to reveal true information about their θ s or their production function q s. Once the planner obtains the information she may allocate the resource in the way that maximizes the overall efficiency (in the model, the sum of outputs). This control mechanism contains two aspects:

a) there exists a best message from each firm regardless of messages from other Managers. By "best" it means that the message maximizes the firm's performance indicator;

b) the planner's decision rule should be that the planner uses the information from firms to maximize the overall efficiency and the rule is made known to the public.

Combining these two aspects, we can presume that if firms send their true production functions and if the planner uses the decision rule described above, the overall economic efficiency (the sum of outputs) will be maximized. One particular control mechanism (or performance indicator) has been considered by a number of writers including Groves (1973), Loeb and Magat (1978), and Groves and Loeb (1979):

$$B_i = q_i(\bar{k}_i) + \sum_{j \neq i} q_j^*(\bar{k}_j) - A_i \quad (i=1, \dots, N), \quad (7-31)$$

where B_i is reward to firm i and A_i is a constant set by the planner independently of the firm's report $q_i^*(\bar{k}_i)$ or its actual output. The first two items in the right-hand side of (7-31) represent respectively i 's actual output and the sum of estimated outputs of

all other firms conditional on their levels of resource allocation and their reported production functions.

The performance indicators in the form of (7-31) imply that if firms attempt to maximize their Groves indicators, then:

- i) Each firm will attempt to maximize its actual output because of the linear relation between the indicator and the actual output (q_i).
- ii) Each firm's reward is dependent of other firms' messages via the second term of (7-31). This term provides a measure of the opportunity cost of the communicated information from all the firms.
- iii) Each firm's reward is independent of the actual outputs of the other firms.

The Groves mechanism presented by (7-31) is thus argued to possess a desirable informational property: it provides the firms with incentives to report honestly their production functions. Since the term A_i in (7-31) has no incentive implications, the firm's problem with (7-31) is to choose a output forecast q_i^* and an actual output level q_i to maximize B_i . When manager i does send a true forecast to the planner, i.e., $q_i^*(\cdot) = q_i(\cdot)$, from (7-31) it can be noted that the planner is actually

trying to maximize the manager's objective function $[q_i(\bar{k}_i) + \sum_{j \neq i} q_j^*(\bar{k}_j)]$. Thus, given

the messages from other managers, if manager i reports truthfully the planner will allocate resource such that the expected value of B_i is maximized. Manager i therefore does report truthfully. If $q_i^*(\cdot) = q_i(\cdot)$, then

$$q_i^*(\bar{k}_i) + \sum_{j \neq i} q_j^*(\bar{k}_j) = \sum_i q_i^*(\bar{k}_i) = q_i(\bar{k}_i) + \sum_{j \neq i} q_j^*(\bar{k}_j).$$

Each manager is thus best off sending the true estimates no matter what reports made by other managers are. The same argument applies to other managers. all managers will then report truthfully. In other words, the mechanism (7-31) works by making coincident the objective functions of the planner and of managers. In this setting, sending truthful forecasts forms a dominant strategy equilibrium for all managers.

7.4.2 Limitations of the Groves Mechanism

The Groves Mechanism is based on an important assumption regarding to managerial effort, that is, managerial effort does not affect output or generate disutility for managers. If effort enters the model as a variable, and as a result the objective functions of the planner and of the manager no longer coincide, the Groves Mechanism in the form of (7-31) will be no longer optimal (Miller and Murrell, 1981). To see this point, suppose that managers select message strategy about q^* and the level of effort e to maximize the value of the separable function $B-Z(e)$ where Z is disutility of effort. This utility function of the manager differs from that assumed in the Groves Mechanism, where the manager wishes to maximize the reward B only. If the planner does not know the utility function of managers, or, specifically, the disutility of effort $Z(e)$ for the manager, she has to obtain this information since $Z(e)$ will affect the manager's production decisions, and therefore the planner's allocation decision. Managers will thus be asked to send message $m(e)$ concerning their $Z(e)$, in addition to the production message q^* as before. The optimal bonus scheme would depend on both the message and observable output $q(e, \bar{k})$. In particular, it should satisfy the following condition:

$$B_i(m_i^*(e_i^*), q_i(e_i^*, \bar{k}_i)) - Z_i(e_i^*) > B_i(m_i(\bar{e}_i), q_i(\bar{e}_i, \bar{k}_i)) - Z_i(\bar{e}_i) \\ \text{for all } \bar{e}_i < e_i^*, \quad (7-32)$$

where e_i^* and m_i^* are optimal level of effort and message for manager i respectively. \bar{k}_i is the output-maximizing allocation. Since the message contains information about $Z_i(e_i)$, and the planner knows e_i^* from the message, (7-32) can be written as

$$B_i(m_i^*(e_i^*), q_i(e_i^*, \bar{k}_i)) - m_i^*(e_i^*) > B_i(m_i^*(\bar{e}_i), q_i(\bar{e}_i, \bar{k}_i)) - m_i^*(\bar{e}_i) \\ \text{for all } \bar{e}_i < e_i^*. \quad (7-33)$$

Given that (7-33) must hold at $\bar{e}_i=0$, (7-33) can be written as

$$B_i(m_i^*(e_i^*), q_i(e_i^*, \bar{k}_i)) - m_i^*(e_i^*) > B_i(m_i^*(0), q_i(0, \bar{k}_i)) - m_i^*(0). \quad (7-34)$$

Rewriting (7-34) results in

$$B_i(m_i^*(e_i^*), q_i(e_i^*, \bar{k}_i)) = m_i^*(e_i^*) + \pi e_i^* + B_i(m_i^*(0), q_i(0, \bar{k}_i)) - m_i^*(0) \quad (7-35)$$

where $\pi > 0$. If the manager sends a biased message m_i^+ instead of m_i^* , where

$$m_i^+(e_i) = m_i^*(e_i) + \phi e_i \quad \text{for } \phi > \pi,$$

the bonus for manager i would be set at the level

$$B_i(m_i^+(e_i^*), q_i(e_i^*, \bar{k}_i)) > m_i^+(e_i^*) + B_i(m_i^+(0), q_i(0, \bar{k}_i)) - m_i^+(0), \quad (7-36)$$

which is clearly larger than the presumed optimal bonus with optimal message m_i^* defined in (7-35) (Miller and Murrell, 1981).

The above illustration shows that if the planner uses only a bonus function to elicit information, it is possible for managers to obtain a bonus of any given size by sending an arbitrary production-function message and by exaggerating the disutility of effort (Miller and Murrell, 1981). This analysis was based on the assumption that the utility function of the manager is not known to the planner. If this assumption is relaxed and the analysis is amended so that the planner knows the manager's utility function and regards this utility as a cost, an optimal scheme is still available. Conn (1982) and Cohen and Loeb (1984) derived a similar scheme under these conditions which takes effort as a variable and include the manager's disutility of effort into the maximand for the planner. For example, in Cohen and Loeb (1984) model, the planner's problem was formulated as to

$$\underset{e, \bar{k}}{\text{maximize}} \sum_{i=1}^N q_i(\bar{k}_i, e_i) - c\left(\sum_{j=1}^N \bar{k}_j\right) - \sum_{i=1}^N Z_i(e_i), \quad (7-37)$$

and manager i 's problem is to select message and effort strategies (m_i^*, e_i^*) to maximize his utility function:

$$U_i(m_i, e_i) = q_i(\bar{k}_i(m), e_i) + \sum_{j \neq i} m_j(\bar{k}_j(m)) - c \left(\sum_{j=1}^N \bar{k}_j(m) \right) - A_i - Z_i(e_i). \quad (7-38)$$

It was proved that under this definition, the dominant strategy for manager i exists and is to report $m_i^*(\bar{k}_i)$:

$$m_i^*(\bar{k}_i) = \underset{e_i}{\text{maximize}} \quad q_i(\bar{k}_i, e_i) - Z_i(e_i) = q_i(\bar{k}_i, e_i^*(\bar{k}_i)) - Z_i(e_i^*(\bar{k}_i)),$$

where $e_i^*(\bar{k}_i)$ is optimal level of effort for any allocation \bar{k}_i to manager i and is defined by

$$e_i^*(\bar{k}_i) = \underset{e_i}{\text{argmax}} [q_i(\bar{k}_i, e_i) - Z_i(e_i)].$$

This approach is adopted and furthered recently by Cohen and Loeb (1988), Amershi and Cheng (1990), and Banker and Datar (1992) in the context of resource allocation. Banker and Datar (1992) derive a modified Groves scheme, under which there exist a dominant strategy equilibrium for each manager. The equilibrium solution implies that the best message for the i th manager is to report truthfully its productivity parameter and choose the best effort level, given the allocations, regardless of the message and effort levels of the other managers. The solution can be interpreted as that the reward function for each manager is independent of its message choice, and the incentives are such that the consequent utility maximization by each manager corresponds exactly to the planner's full information maximization problem, in which the utility function of the planner includes rewards to managers (hence disutility of effort) as a negative term.

The basic idea behind the Groves-type analysis is to design a reward function for managers so that utility functions of the planner and of managers become identical. The dominant strategy concept implies that the multi-firm allocation can be decomposed into a single-firm problem. Theoretically, the Groves-type mechanisms possess certain attractive properties, which make the first-best full information solution available in the complex multi-firm allocation settings where information asymmetry is present. However, this analysis is conducted under a number of

restrictive assumptions (some of them were also stated at the beginning of this Chapter). Among those are the assumption that each firm produces only one product, the absence of risk aversion, the assumption of postcontract private information, and exclusion of collusion among firms (Banker and Datar, 1992). These assumptions restrict the model to a very stylized setting. The risk-neutrality assumption, for example, disables the Groves-type mechanisms in more general settings where managers (agents) are risk-averse. Because the manager's reward depends not only on the particular realization of its own productivity parameter but also on the similar realizations of the other firms, this increased risk imposed by the scheme will make the scheme unacceptable to risk-averse managers without additional compensation. Unfortunately, the basic nature of the Groves-type mechanisms does not allow the model to be extended to accommodate risk aversion.

Another problem with the (modified) Groves mechanism rests on the problem of budget balancing (Holmstrom, 1979). The possibility exists that the production and utility functions according to the Mechanism is such that the sum of rewards exceeds the sum of outputs in the solution (Murrell and Miller, 1984; Bennett, 1989. p.106). This ex ante budget balancing problem may render the scheme infeasible.

Finally, the information-gathering and computational process required for the Groves mechanism is cumbersome and costly, further limiting the practicality of the scheme (Kaplan, 1982, p.621). In particular, the Groves mechanism can only be used in a rigorous resource allocation setting, in which precise planning, calculations, and information transmission are required. A most troublesome problem is that the procedure may involve the transmission of messages which are multi-dimensional, function rather than single values of choices. This information gets more complicated when the managers are asked to reveal their utility function, production function, and effort intensity simultaneously. In fact, the interactive procedure may become impracticable because of this complexity (Bennett, 1989, pp.35-37).

7.4.3 The Groves Mechanism and the Chinese Problem

These limitations prompt the consideration of applicability of the Groves type mechanism to the analysis of Chinese reward systems. As will be fully presented in

Chapter 8, the Chinese central planning system was born weak and has never covered the whole range of the economy (Granick, 1990, p.73; Richman, 1969, pp.719-720). Central resource allocation in China has been similarly inaccurate and loose.¹¹ In making up the deficiency and weakness of central allocations, there have existed a number of extra-plan and market-like mechanisms and other loopholes. Examples of these are sale-exhibitions, promotion of self-sufficient industrialization (Byrd, 1991, p.44), holding "reserve stocks" and even "commodity banks" held by local authorities or groups of firms (Richman, 1969, pp.1719-720).

The characteristics of the Chinese central planning and resource allocation system can be argued to render Groves-type mechanisms inappropriate to the analysis of the Chinese system. The intuition is that the Groves mechanism requires relatively restrictive assumptions, accurate calculations, and full allocations of resource, while the Chinese system does not conform to these requirements. This is why we set up in the earlier sections a less rigorous, more flexible framework for the purpose of our analysis. In this context, Conn (1982) was right in saying that there is no one general optimal scheme and different schemes work better under different circumstances. "It seems worth focusing research on second-best schemes, trading off, for example, aims related to an optimal or consistent allocation of resources, administrative simplicity, the distribution of bonus income and the sharing of risk" (Bennett, 1989, p.10).

7.5 Effort Incentives Scheme with Multiple Agents

The previous sections focused on the problem of information elicitation in the resource allocation context. The model considered in sections 7.2 and 7.3 was built on the assumption that both pre-decision information asymmetry and imperfect

¹¹Central resource allocation in China should be taken as equivalent to central allocation of major products and raw materials, since allocation of capital appear less significant in the economy where many important products are not available in the markets (or there exist no such markets). Large financial allocations and annual production targets, have always been accompanied by, though often not sufficient, allocations of materials.

observation are present and the principal planner is faced with a dual problem of information revelation and effort inducement. However, the problem of effort inducement (moral hazard) was much deemphasized by assuming the risk-neutrality of agent managers (firms). The rationale of so doing is based on the hypothesis that information revelation is given priority by the planner when designing the reward system because of the preconceived value of the information from firms for central planning, resource allocation, and coordination. The Groves Mechanism considered in section 7.4 represents a specific class of incentive schemes which are intended to induce truth-telling behaviour of firms. Risk-sharing was ruled out in all those schemes due to the assumption of risk neutrality.

In this section, we relax the risk-neutrality assumption and return to the "standard" moral hazard setting in which the principal's problem is to combat shirking or cheating behaviour of the agent resulting from the unobservability of the agent's effort. The risk-aversion of the agent complicates the issue by making the principal trade off between providing effort incentives and sheltering the agent from risks. In order to concentrate on the issue of moral hazard without going into the intricacy of simultaneous adverse selection and moral hazard with risk averse agents,¹² we drop the information elicitation issue related to central planning and resource allocation.¹³ Other assumptions of the setting used in the previous sections are retained. In particular, the model below considers a risk-neutral planner with many risk-averse firms, whose effort levels cannot be perfectly derived from their outputs by the planner due to randomness in outputs caused by stochastic factors. In

¹²There are few papers dealing with the problem in the literature, presumably due to the difficulties. Zou (1992b) examined the incentive issue in a principal-agent environment with simultaneous moral hazard and adverse selection and a risk-averse agent. He derived a threat-based incentive mechanism, which, under certain conditions, approximate an optimal solution derived under pure adverse selection. The mechanism, however, tends to be environment-specific (with movable support of the distribution of output) and is an extension of the Osband - Brown threat scheme (reviewed in chapter 6).

¹³This will significantly simplify the analysis. It is also justifiable, as will be seen in chapter 9, in the reform years in China, where the importance of central planning and allocations has been greatly decreased.

this context, the use of relative performance schemes has been recommended by researchers (Baiman and Demski, 1980; Lazear and Rosen, 1981; Holmstrom, 1982; Nalebuff and Stiglitz, 1983; Green and Stokey, 1983; Mookherjee, 1984; Antle and Smith, 1986). In the model below, we extend the result to a setting where there exist plan targets, which may serve as standards for performance evaluation.

7.5.1 Relative Performance Evaluation: The Model

Moral hazard problems arise in the multi-agent case from two main causes: the free-rider problem and uncertainty. In the former case, agents can cheat (eg. supply low levels of effort without being identified) if joint output is the only observable indicator of inputs. This can occur even if there is no uncertainty in output, because of difficulties in separating inputs from different agents. However, this free-rider problem can occur only when more than one agent produce a common output. Holmstrom (1982) shows that this problem can largely be resolved by introducing a principal into the setting, whose primary role is to break the budget-balancing constraint and to enforce penalties or to finance bonuses. In the case of uncertainty, the problem of moral hazard becomes apparent if agents are risk averse, because of the simultaneous presence of noisy output (used as the indicator of agents' effort) and the consideration of risk-sharing. This applies to both situations in which output of agents is joint or separate. In consideration of applicability to the Chinese firms, we consider in the following analysis only the case of uncertainty and separate output. Information asymmetry in this situation is reflected in the planner's disability to observe directly and perfectly the level of effort of the manager.

As in the previous models, there are a risk-neutral planner and N risk-averse managers (firms) in the model. To simplify the model, we assume that all managers are identical in that they have the same utility function and the same reservation utility \bar{U} . We also assume the managers produce the same single product (this assumption will be dropped later) with the production function being

$$q_i = q(e_i, \theta_i) \quad i = 1, \dots, N, \quad (7-39)$$

where e_i is action (effort level) of the i th manager and θ_i a random variable for the

*i*th firm.¹⁴ There exists for each manager a finite set of possible actions A , which depending on the realization of θ , results in a finite set of possible outputs Q . The outputs q_i are the only observable factors. Let $F(q_i, e_i)$ denote the conditional distribution function of q_i given e_i , with a continuous density function $f(q_i, e_i)$, which is positive everywhere and continuously differentiable in e_i , for all i .

The planner's utility function is the total outputs net of the rewards to managers:¹⁵

$$U_p(q_i, e_i) = \sum_{i=1}^N (q_i(e_i, \theta_i) - B_i(q_i)). \quad (7-40)$$

The utility function for managers is presented as

$$U_i(q_i, e_i) = u_i(B_i(q_i)) - Z_i(e_i) \quad i=1, \dots, N, \quad (7-41)$$

where B_i is output-based reward to *i*th manager, u_i the utility derived from B_i , and Z_i is disutility of *i*'s effort. Each manager is risk and effort-averse, therefore $u_i(\cdot)$ is increasing and concave and $Z_i(\cdot)$ is increasing.

The planner's problem can be stated in a general principal-agent form as to design the reward function $B_i(q)$ to

¹⁴In Holmstrom (1982), Nalebuff and Stiglitz (1983), and Green and Stokey (1983), the production function takes the form of $q_i = q(e_i, \theta, \varepsilon_i)$, where θ is a common shock whose realization is observed by all managers before their own action decision, and ε_i is an individualized shock specific to each manager, distributed independently across different managers and realized after managers' action (effort) decisions. In our model, θ_i may or may not be independently distributed, subject to further specifications.

¹⁵The q_i 's here are in monetary terms whereas the q_i 's in an earlier model (7-4) were in physical terms. $\sum_i q_i$ in (7-40) is equivalent to $R(\cdot)$ in (7-4) since

$R(\cdot) = a \sum_i q_i$ in (7-4). Another difference between the two models is the term $C(\cdot)$, the cost of resource. Here we exclude this term as we drop the allocation consideration.

$$\text{maximize}_{B_i(q), e} \int \sum_i (q_i(e_i, \theta_i) - B_i(q)) f(q, e) dq, \quad (7-42)$$

$$\text{subject to } \int u_i(B_i(q)) f(q, e) dq - Z_i(e_i) \geq \bar{U} \quad i=1, \dots, N, \quad (7-43)$$

$$\text{and } e_i \in \underset{\bar{e}_i}{\text{argmax}} \int u_i(B_i(q)) f(q, \bar{e}_i, e_{-i}) dq - Z_i(\bar{e}_i) \quad i=1, \dots, N. \quad (7-44)$$

This statement is basically a simple extension of that with a single agent. Condition (7-44) implies that e_i is a Nash equilibrium, which satisfies the condition for Pareto optimality. This means that e_i should be a best response for manager i to the other managers' choices of e given the reward scheme $B_i(\cdot)$. This Nash solution implies the assumption that the managers behave non-cooperatively and do not collude in their play with the planner (Baiman and Demski (1980) note that if collusion is allowed the multi-agent model would be reduced to the basic principal-agent model). Moreover, strict concavity of managers' utility function implies that there is no randomization in the managers' subgames.

In the first-best situation where the planner can observe effort levels of managers, forcing contracts can be adopted by the planner to force managers to choose whatever level of effort desired by the planner. Mookherjee (1984) stated that under the assumptions i) for possible reward $B \in [\underline{B}, \bar{B}]$, if $u = u(B)$ and $e \in A$ minimizes $Z(e)$ over A , then $u - Z(e) < \bar{U}$; ii) for any $e \in A$ there exists $B \in [\underline{B}, \bar{B}]$ such that $u(B) - Z(e) = \bar{U}$, the following contract can achieve the first-best efficiency:

$$B_i(e_i) = \begin{cases} u^{-1}(\bar{U} + Z(e_i^*)) & \text{if } e_i \geq e_i^* \\ \underline{B} & \text{if } e_i < e_i^* \end{cases}, \quad (7-45)$$

where e_i^* is the first-best effort level for manager i and \underline{B} is the lower bound of reward function B . Under contract (7-45), manager i can be guaranteed to get the reservation utility if he chooses any feasible action $e_i \geq e_i^*$; his disutility from exerting e_i^* will also be compensated for. If lower level of effort than e_i^* is observed, the

cheating behaviour of the manager will be punished by being paid a \underline{B} . Note that the reward scheme (7-45) is quite similar to the penalty (threat-based) scheme proposed by Osband (1987) and Brown et al. (1987), which was reviewed in Chapter 6. The contract (7-45) treats managers individually by basing their rewards on their own effort levels. It therefore reduces to the basic one-to-one principal-agent model.

When the direct observation of effort is not possible, we return to the second-best situation, where the planner has to base the payments to managers on their outputs. In the multi-agent setting, research has established under what condition(s) independent contracts or relative performance (competition)-based contracts are optimal (Holmstrom, 1982; Gjesdal, 1982). The concept of informativeness (Holmstrom, 1979) and the generalized concept of the sufficient statistic (Holmstrom, 1982) are the basic tools in this context.¹⁶

Definition 3 A function $T_i(q)$ is sufficient for q with respect to e_i , if $f_i(q_i, e_i)$ takes the form of

$$f(q, e_i) = h_i(q, e_i) p_i(T_i(q), e_i), \quad \forall e_i \in A \quad (7-46)$$

where $h_i(\cdot) \geq 0$, $p_i(\cdot) \geq 0$. (Holmstrom, 1982).

By applying this concept of sufficient statistic to the setting defined at the beginning of the sub-section, we can easily derive the condition under which it is desirable to have the reward function B_i depend on the vector of outputs $q = (q_1, \dots, q_N)$ rather than on q_i alone.

Proposition 3 It is optimal to have manager i 's reward functions depend on i 's output alone if and only if θ_i 's are independent; Conversely, it is optimal to have manager i 's reward function depend on relative performance based on the vector of outputs $q = (q_1, \dots, q_N)$ if and only if θ_i 's are interdependent.

¹⁶The concept of informativeness was developed in the context of comparison of different information systems (for details, see chapter 3). The concept of sufficient statistic is a similar concept generalized in the multi-agent setting. We mention both of them here for the sake of traceability. The sufficient statistic is used in the following text.

Proof:¹⁷ The independence of θ_i 's implies the independence and separability of q_i 's and f_i 's:

$$q(e, \theta) = \sum_{i=1}^N q_i(e_i, \theta_i), \quad f(q, e) = \prod_{i=1}^N f_i(q_i, e_i).$$

From (7-46) it is known that $T_i(q) = q_i$ is sufficient for q with respect to e_i . When $T_i(q) = q_i$ is a sufficient statistic of q with respect to e_i , Holmstrom (1982)'s Theorem 5 provides that the manager i will have the same expected utility while the planner will be no worse off with a $B_i(q_i)$ than with a $B_i(T_i(q))$.

The second part of Proposition 3 can be proved with the aid of Holmstrom (1982)'s Theorem 6, which states that if $T_i(q)$ is insufficient for q , a scheme $\hat{B}_i(q)$ can yield a strict Pareto improvement over $B_i(T_i(q))$. The proof of the second part of Proposition 3 can then be reduced to proving that $t_i(q)$ is insufficient for q when θ_i 's are not independent. This can be conducted in a two-manager setting where $i=1,2$. Let $S(\cdot)$ be the joint distribution of q_1 and q_2 conditional on e_1 . In equilibrium, the value of e_2 can be inferred, θ_2 can then be taken as the stand-in for q_2 :

$$S(q_1, q_2, e_1) = S(q_1, \theta_2, e_1).$$

Writing $S(q_1, \theta_2, e_1)$ as $L(y_1(e_1, q_1), \theta_2)$, where $L(\theta_1, \theta_2)$ is the joint distribution of (θ_1, θ_2) , we have

$$\frac{S_{e_1}(q_1, \theta_2, e_1)}{S(q_1, \theta_2, e_1)} = \frac{L_1(y_1(e_1, q_1), \theta_2)}{L(y_1(e_1, q_1), \theta_2)} \frac{\partial y_1(e_1, q_1)}{\partial e_1}.$$

Clearly, L_1/L depends on θ_2 . According to the concept of globally sufficient statistic (Holmstrom, 1982), $T_i(q)$ is insufficient for q_i .

The intuition from Proposition 3 is simple to understand. When managers'

¹⁷Proposition 3 is basically a restatement of Theorem 7 in Holmstrom (1982), which in turn is a generalization of Proposition 2.1 in Baiman and Demski (1980). The proof here relies on Holmstrom (1982) and Mookherjee (1984). It is presented here for the sake of completeness.

production environments are not related, ie., they do not have common uncertainty factors effecting their production, the use of any other variable in the reward function would only add random noise and result in suboptimality. On the other hand, if the environments are related in some way, managers' outputs can convey information about not only their own action but also that of others. Basing one manager's compensation upon peer performance would enable the planner to gain additional information about the manager's action. In the extreme case where managers' outputs are completely dependent and the planner is able to elicit the information about θ_i from q_j , $i \neq j$, the first-best results can in theory be, achieved by using relative performance evaluation, since this case is equivalent to the first-best situation in which the effort level of the manager can be perfectly observed.

7.5.2 Target-based Tournament

When it is established that a tournament is desirable, a question remains as to how to construct a relative performance based tournament. There are two main arrangements which have been studied in the literature: rank-order tournaments and average-performance-based tournaments. In this subsection, we briefly look at the properties of these schemes and develop a target-based tournament, which is highly relevant in the centrally planned environment.

In a rank-order tournament managers are rewarded solely on their performance rank. This rank is simply a mapping of the managers' outputs $q = (q_1, \dots, q_N)$ into the statistic $T(q) = (r_1(q), \dots, r_N(q))$, where $r_i(q)$ is the rank order of manager i . This statistic $T(q)$ is then matched to a vector of rewards $B(T(q)) = (B_1, \dots, B_N)$, where $B_1 \geq \dots \geq B_N$ if $r_1(q) \geq \dots \geq r_N(q)$. The manager with the highest output (ranked the first) gets the highest reward B_1 , the second gets B_2 , and the last gets B_N . A rank-order tournament is one way to use relative performance as a source of information about e_i . When the managers' outputs are related, rank-order tournaments should perform better than individual contracts (Lazear and Rosen, 1981).

A rank-order tournament helps the planner to identify effort-exerting or effort-sparing managers in a relative way. Mookherjee (1984) proved that the condition for the optimality of rank order tournaments is that the outputs of different managers

communicate information about managerial efforts only through their ordinal rankings. The circumstances may in reality be limited where statistical information about efforts can only be provided by ordinal comparisons instead of by cardinal comparisons in "real" output terms. If performance levels can be measured cardinally, rank-order tournaments may be informationally quite wasteful (Holmstrom, 1982) and therefore dominated by other arrangements that meet the sufficient statistic condition. However, rank-order tournaments may have their relative advantages over other schemes under certain circumstances. One of these circumstances is when the output is very complex so that only ordinal comparisons are possible (ibid.). This points to the situation in which the output is in a composite form of various indicators instead of a single form, that is, $q = \sum_K \alpha_k q_k$, where q_k is the indicator of output k and α_k the

weight assigned to k . This composite output indicator may be preferred by the planner if she wishes to see some balanced outcome to be achieved. The relevance of this argument will be further discussed in the Chinese context in Chapter 9.

In the area of relative performance evaluation, average-performance based tournaments were rationalized by Holmstrom (1982) using the sufficient statistic condition. It was suggested that sometimes an aggregate measure like the weighted average of peer performance will capture all the relevant information about the common uncertainty. In technical terms, this amounts to provide a rationale for a scheme like $B_i(q_i, \bar{q})$, where \bar{q} may be of form $\bar{q} = \sum_i \alpha_i q_i$ in which α_i is weights

assigned to q_i , and the values of α_i 's can be assigned so as to reflect different scales of different firms and information values of different q_i 's. Clearly, the normal distribution of the uncertainty parameter θ_i is the underlying sufficient assumption for the weighted average to stand.

The idea of this average-based tournament model is to use aggregate information to filter away certain common uncertainties, on the assumption that average performance level reflects the effects of common uncertainties, because of their normal distributions. Adapting this average-based model in the central planning context results in a similar but more relevant model, target-based tournament model. In the central planning environment, once the targets are fixed, firm managers are

assumed to try to fulfil the targets with the production function $q_i = D(e_i) + \theta_i$, where $e_i \geq 0$, $D'(e) > 0$, $D''(e) < 0$. The intuition is that if the targets \hat{q}_i are set or selected on the basis of average expectation of output, target fulfilment $(q_i - \hat{q}_i)$ itself could serve a useful purpose in signalling the effort level of manager i without comparison. This requires that $T(q_i, \hat{q}_i)$ be sufficient for q with respect to e , or equivalently, \hat{q} be \bar{q} in the previous paragraph. If θ_i 's are not independent, target setting should take into account the possible value of the common disturbance, for example, $\hat{q}_i = \bar{q}_i + \bar{\theta}$, where \bar{q}_i is estimated or expected output for i without considering the common disturbance and $\bar{\theta}$ is the estimated value of the common disturbance. If however, the value of $\bar{\theta}$ could be obtained by the planner ex ante, there would not be need for tournament at all, and indeed, in this case adopting a forcing contract would enable the planner to achieve the first-best efficiency.

An alternative is to use target fulfilment in a tournament, ie. the contracts are of the form $B_i((q_i - \hat{q}_i), (q_{-i} - \hat{q}_{-i}))$. Specifically, using the average degree of target

fulfilment $\bar{q} = \sum_{i=1}^N (q_i / \hat{q}_i - 1) / N$ in the contracts $B_i((q_i - \hat{q}_i), \bar{q})$ is a simple extension of

Holmstrom's average performance theorem. The rationale for this target-based tournament is that if there exists a common shock θ or individual shocks θ_i that are interdependent, average fulfilment of target will sufficiently signal the effect of θ or θ_i 's. From this signal, the planner should be better informed about effort levels of individual managers.

Compared with the single-agent settings, the planner has two advantages in terms of information revelation about managers' effort decisions. The first advantage is that when the number of managers is large the planner would be able to infer the disturbances from the independent signals provided by q_i 's even if the disturbances are independent (Holmstrom, 1982). Secondly, when the planner-manager relationship is repeated, historical performance provides additional information concerning the disturbance faced by a specific manager. These two advantages are relevant to our Chinese problem, since the Chinese planner normally deals with a number of similar firms and their relationship is relatively long. We shall return to this point when

analysing the Chinese reform schemes in Chapter 9.

The general principle for the use of relative performance evaluation is that it allow the planner to observe or infer the disturbances or noises and remove it from the manager's responsibility. This principle is therefore generally consistent with the responsibility accounting. Outwardly, using peer performance in evaluating a manager's performance seems to conflict with the principle of controllability, which states that a manager should be responsible only for his controllable elements. The intention of including uncontrollable elements in relative performance evaluation, however, is exactly to obtain information about those uncontrollable disturbances and then remove them from the manager's responsibility. The use of relative performance evaluation can thus be justified in the presence of common shock or large number of agents, even within the notion of controllability.

7.6 Summary

In this Chapter we have looked at various models designed in a specific central resource allocation environment. These models are supposed to represent general models of central planning, based on which models resembling more precisely the relevant Chinese systems are built. The general assumptions made in the first section set up the basic characteristics of the central planning environment for this Chapter. Basically, they are some basic agency assumptions adapted to the planner - manager relationship.

The basic model was presented in section 7.2. In this model, the planner deals with N managers simultaneously and independently. The planner uses information about productivity parameters of individual managers and makes the allocation decision and recommends effort levels to managers. The planner's problem is expressed as to maximize her utility function, defined as the net total output, subject to the participation constraint on the part of managers. In the full information version of the basic model, it was shown that the first-best allocation can be achieved. The full information assumption was relaxed in section 7.3, where incentive problem arose because information on productivity and (or) managers' effort levels are not known

to the planner at the beginning of the game. Based on the direct revelation principle, we derived an optimal incentive mechanism in which the truth-telling and obedient strategies form a Nash equilibrium. The optimal incentive mechanism has some interesting properties. Firstly, it is a linear function of the gross outcome for the planner; Secondly, it is a budget-based; Thirdly, it is a bonus-penalty reward scheme, including a fixed fee and a portion variable with the budget variance; Fourthly, it is a second-best solution to the planner's problem in that the planner has to pay managers rents from possessing private information and provide managers with effort incentives.

In section 7.4 we examined the famous Groves Mechanism in the context of resource allocation. The Mechanism was developed in the dominant strategy equilibrium framework. It is argued to be able to elicit the truth-telling behaviour of managers by making coincident the objective functions of the planner and of managers. Despite this theoretically desirable property, the Groves Mechanism has some serious limitations, which restrict its usage. These limitations include exclusion of managerial effort in the model, problem of budget balancing, and requirement for precise planning, calculations, and information transmission. Because of the limitations and the characteristics of the Chinese planning system, we argued that the Groves-type mechanisms are inappropriate to the analysis of Chinese systems.

In the last major section, we focused on the problem of effort inducement (moral hazard) by relaxing the risk neutrality assumption. The model there considers a risk-neutral planner with many risk-averse managers, whose effort levels cannot be perfectly derived from their outputs by the planner due to randomness in outputs caused by stochastic environment. The use of relative performance evaluation was rationalized using Holmstrom's notion of informativeness. Different types of tournaments were considered. Holmstrom's average-performance-based tournament was imported in the central planning environment and target-based-tournament was developed. Target fulfilment of different managers can be used by the planner to detect common uncertainty faced by the managers and this information enables the planner to reward managers more precisely.

In following chapters, we shall first present systematically general assumptions made in the Chinese setting, by examining relevant elements of the models considered

in the Chapter. Then Chinese reward systems will be modelled and analyzed along the lines drawn in this Chapter.

CHAPTER 8
AN ANALYSIS OF CHINESE REWARD
SYSTEMS: ASSUMPTIONS

8.1 Introduction

The previous chapter introduced some theoretical models developed in a specific agency framework. These models are intended to serve as reference models with which the Chinese empirical systems are compared and analyzed. Implicit in the modelling process in the previous chapter was a Chinese setting, though we did not explicitly refer to specific Chinese systems. In this Chapter and the next, we try to model the reward systems applied to Chinese state enterprises and to use the propositions and arguments developed in the previous chapters to analyze the information and motivation properties of the Chinese systems.

The use of agency framework in analysing the planner-manager problems in a centrally planned economy was justified in Chapter 6, where some research results in this area critically were reviewed and especially Granick's agency treatment of Chinese state enterprises was presented critically. At the end of Chapter 6, we made some general assumptions about our agency model of Chinese state enterprises, based on the criticisms of Granick's model. It was indicated there that our use of agency is based on the understanding that an agency relationship results from the economic dependence between related parties. We also assumed a one-to-one relationship between state authorities (abstractly the planner) and enterprises.

The traditional Chinese industrial system used during the pre-reform time, as its Soviet prototype, featured centralized decision-making (and resource allocation) and a decentralized information system. The decision-making authority was held by the central planning authorities and, in certain periods, shared with local authorities (see Chapter 1 for a short description of decentralization at the level of local

administrative authority). The information system was, however, basically decentralized because of difficulties for central planners in obtaining and holding all necessary information concerning individual firms for decision-making. Relevant information is generally dispersed among firms and local authorities. Under this system, the central planners (hereinafter, "the planner") had to use some set of devices or mechanisms to collect and motivate the provision of relevant information from various sources in order to facilitate co-ordinating and planning activities across the whole economy. In this environment, in pursuit of economic efficiency through optimal allocation and coordinated economic activities, the planner is assumed to have given priority to the information revelation consideration when designing incentive systems applied to state enterprises. This information consideration coexists with the central planning. It is hypothesized that the higher the degree of centralization the greater the priority is given to this information collection and revelation consideration. The information revelation problem will be considered later as we examine the individual reward systems throughout the New Chinese history, especially the pre-reform system. As will be seen, the importance of information revelation has been reduced since the recent economic reforms began. This reduction has matched by the reduction in the scale and importance of central planning in the reformed Chinese economy.

The problem of effort inducement (or moral hazard) is the other consideration that the planner has to take into when designing a reward system applied to firms. The problem of moral hazard in a socialist economy had been long observed and studied even before agency research came in the limelight. For example, Hurwicz (1978; 1979) examined a such situation in the socialist context. Here, agent 1, representing some paramount interest of the community, tries to maximize a residual gain, which is the total output minus the payment to agent 2 for his effort in producing output. As agent 1 does not know the level of effort used by agent 2, a reward structure is needed. A major finding was that only a second best can be achieved because of the asymmetric distribution of information (Hurwicz, 1979). This finding has been basically confirmed by agency research. Some more recent papers appeared in the *Journal of Comparative Economics* (briefly reviewed in Chapter 6) also addressed the moral hazard problem in the socialist context. One of the authors

regarded the problem of moral hazard as central to socialist economies (Liu, 1987). In particular, the simultaneous presence of moral hazard and adverse selection creates a class of problems that the central planner has to solve. It is one of our main purposes to see how well Chinese reward systems coped with these two problems.

In attempting to do so, it is essential to model Chinese reward systems in a sensible way. Since there has been limited work to which we can refer in this area,¹ this model-building attempt seems to be a challenging task which requires both creativeness and cautiousness. It requires creativeness because the models are basically built from scratch. It requires cautiousness because the modelling process involves careful examinations of a number of assumptions which may have been taken as granted in literature. Certain special features of Chinese reward systems, such as extensive use of non-monetary rewards, add difficulties to our modelling attempt. However, some models of Chinese reward system will be built from the examination of assumptions and facts. The bonus literature and Granick's model will prove helpful and the theoretical models we developed in Chapter 7 will provide the guideline along which the Chinese models are built.

This Chapter is the first part of our modelling and analysis of Chinese reward systems. In this Chapter, we only focus on assumptions while leaving the models and analysis to the next chapter. Important assumptions for our model-building purpose will be carefully examined and clearly stated. The assumptions will be developed through analysis of factual materials and by using judgement. Richman (1969) and Granick (1990) contain rich descriptions and analyses of Chinese firms, especially for the pre-reform period. Many facts and assertions of theirs will be used as supporting evidences or references. In particular, Richman (1969) provides a valuable source of references for the pre-reform situation, since detailed documentary evidences and descriptions, not mention analysis, of pre-reform Chinese firms are rare in either Chinese or English.

The assumptions made in this Chapter are supposed to be applicable to the

¹Granick (1990) is the most relevant work for this treatment as indicated in chapter 6. Many other recent analyses of Chinese firms such as Byrd (1991) and Zhang (1992) do not contain models that can be adapted into the principal-agent context.

both pre-reform and reform years in general. Some generalization has to be used as a result. When particular dates are not mentioned, the statements and analysis are meant to be general. When it is considered necessary to make separate sub-assumptions regarding specific periods, particular dates are used to indicate the differences. Some further assumptions specific to particular systems will be made in the context of various systems in the next chapter.

8.2 Assumptions Underlying Utility Functions

A number of models of the firm in a traditional centrally planned economy have been presented in the bonus literature, largely based on the Soviet prototype. Chapter 2 reviewed some of these models along with the assumptions underlying them. Chinese firms, especially under the old economic system prior to 1979, bore some resemblances to their Soviet counterparts. This is not surprising as the Chinese central planning system prior to 1979 was basically a copy of its Soviet prototype. The basic ideas of the analysis in Chapter 2 are therefore, in principle, applicable to the Chinese firms. However, the Chinese system of industrial control and its Soviet prototype have gone different ways in the past thirty years since the Sino-Soviet relations broke off in the early 1960s. More significantly, differences in culture mean that managerial motivation and behaviour may differ in the two economies, since it is believed that culture influences motivation which, in turn, influences managerial behaviour (Webber, 1969, p.14). It is therefore necessary to examine the assumptions and their implications in the Chinese environment.

8.2.1 The Objectives for the Firm (Manager)

Models of the firm in a centrally planned economy (CPE), have been a hot topic in the bonus literature (see Chapter 2). Discussions on the objectives and success indicators for the firm have resulted in a number of models in terms of profit and output in various combinations. In modelling socialist firms, particularly in the context of the New Soviet Incentive Model, Western analysts have assumed, explicitly or implicitly, that material gain and self-interest were still key motivating forces for both managers and workers. This assumption is basically justifiable in the Soviet

regime. Observations indicated that "the Soviet philosophy of monetary incentives is basically similar to the philosophy which has long prevailed in American industry". "In both cases the basic aim of a given material-incentive scheme in use at a particular time is to harness the satisfaction of individual self-interest and goals to the attainment of formal organizational objective" (Richman, 1969, p.312). This assumption on material incentives has in principle enabled analysts to build formal models of the Soviet firm without great difficulties. The much discussed "bonus model" has been the prototype, in which the manager is simply assumed to be a bonus maximizer.²

8.2.1.1 Moral incentives and material incentives.

A natural question now is whether or not this assumption is valid in the Chinese environment. The difficulty is that there is no simple answer to the question, even when only the pre-reform period is concerned. Since the foundation of the People's Republic in 1949, one of the ambitions or aims of the Communist Party has been the transformation of the population into ideologically styled people armed with "the Communist Spirit".³ Eliminating self-interest and material desires was one of the major attempts to achieve the aim. In the area of motivation and incentives, the authorities tended to de-emphasize material incentives as a major motivating force and rely greatly on political appealing and ideological education. "Orthodox Communist theology points to altruism and other spiritual-style incentives, rather than self-interest and material gain, as being the only pure motivating forces in society; of course, the

²The term bonus is a generalized term in the bonus model. It is not the bonus that supplements the salaries or wages as normally understood. Rather it is better to be taken as the total monetary gain which is linked to a specific target(s).

³The core of "the Communist Spirit" is altruism and selflessness. A well-known prototype of Communist men in China has been a soldier named Lei Feng. Lei Feng, when he lived, is said to be always ready to help others and not to care about fame and gain. Most important is, perhaps, that he was a "yes-man" who would do what he was told to do by the Party. Since he died in 1962, people in China have been called for to learn from Lei Feng. Even today, new Chinese leaders are still actively appealing to the now money-driven people to learn from him (RMRB, 5 March 1993).

basic material necessities must be provided to the working population and their families, but non-material incentives should be emphasized" (Richman, 1969).

However, the effort to eliminate self-interest has not been a great success. The Chinese leaders, even in the Mao Period, have had to "make compromises in their ideological stand on material incentives and self-interest because of unfavourable industrial performance and poor general economic results verging on extreme crises" (ibid.). This oscillating pendulum between ideological stand and economic difficulties was accompanied with several substantial shifts in emphasis regarding material incentives involving self-interest versus non-material incentives involving social mobilization and communist education, reflecting a major contradiction with which the leaders were faced:

... when unfavourable economic conditions emerge, pressing on the vulnerably low subsistence level of the masses, too great a dependence on non-material incentives compounds the difficulties, and material incentives and self-interest must soon be reinstated. With the official restoration of material incentives, economic progress and relative affluence again evolve, and the regime again worries about "contradictions" between material and non-material incentives, individual versus collective interests, and wages versus distribution according to need. (Richman, 1969, p.313)

It is hardly possible to judge to what extent non-material incentives and ideological appeals have succeeded in motivating people in a pure economic sense. Some Western observers believe that non-material incentives did work in certain periods including the "Great Leap Forward" period (1957-1959) (ibid.). One of them observed: "non-material incentive stressing the satisfaction of social and psychic needs have been used more effectively in China to motivate industrial personnel to work hard and more efficiently than in perhaps any other underdeveloped or developing country" (Richman, 1969). When other forms of incentives are not available or very limited, non-material incentives, combined with strong social mobilization, could be expected to be appealing forces. Ignoring the impacts of non-material incentives in pre-reform China is thus perhaps not fully justifiable. It is true that "an enterprise was neither rewarded nor punished, regardless of what it did" (Granick, 1990, p.189), the rewards or punishments in question can only be in material terms or monetary terms. In fact, as described in Chapter 4, material incentives did exist though limited. When

only limited material incentives were available, the moral incentives, such as honour titles and public criticism, constituted important elements in the industrial reward system. The enterprise was actually rewarded or punished in these forms.

In spite of the emphasis that has been put on non-material incentives in certain periods and the Chinese leaders' repeated appeals to altruism, self-interest as a motivating force did not disappear as the Chinese leaders wished. Even in the periods when material incentives were de-emphasized, the pursuit of non-material incentives can be seen, to a certain degree, as the pursuit of self-interest in addition to the satisfaction of social and psychic needs. This is because non material incentives were normally linked to some sort of privileges that could bring advantages to the receiver in terms of career development and access to rationed consumer goods.⁴ By and large, for a large majority of people, self-interest has been a most important motive for working. For the firm managers, this has not been exception. This prompts us to assume that the manager and the firm as a whole are by and large self-interested and incentive-driven.

8.2.1.2 Collective-oriented incentives.

Except for the mixed reward system which combined non-material and material incentives, another difference between the Chinese reward system and its Soviet prototype is that rewards in China have been largely collective-oriented rather than individual (manager) - oriented. Related to this feature is that the Chinese use a variety of types of material incentives instead of the Soviet single monetary form (Fig. 8.1). In addition to non-material (moral) incentives, which include honour titles to individuals or the firm as a whole and party membership, there are material incentives available. Among them, monetary incentives are normally individual-oriented, bonus is the most obvious example. Non-monetary (welfare-related) incentives are more collective-oriented. Housing and other welfare facilities (for details, see Chapter 4) provided within the enterprise are very important incentives

⁴Quite often, when the emphasis on nonmaterial incentives and ideological pureness was not pushed to an extreme point, their co-existence with limited material incentives was typical. Under these circumstances, receipt of moral incentives often also gave entitlement to certain material incentives.

to employees working in state enterprises.

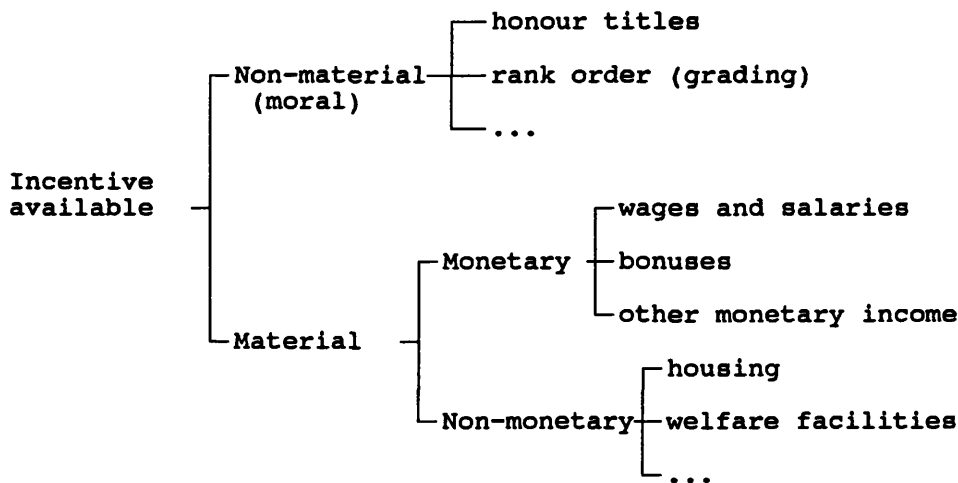


Fig. 8.1 Incentives Available to the Firm

These are perhaps two main explanations for the variety of Chinese material incentives. The ideological reason points to the egalitarian tendency associated with a majority of Chinese population, including the leaders. Repeated appeals for de-emphasizing material gains, of which monetary income was the most direct form, also caused many people to hesitate when offered monetary rewards.⁵ For the management, including the manager and the Party secretary, it was their duty and honour not to pursue monetary gain in bonus form. Interviews conducted during the middle of 1966 in thirty-eight industrial enterprises showed that none of the enterprise directors, vice directors, or Party secretaries in these firms were eligible for bonuses, despite the fact that other personnel in the majority of these enterprises were still receiving bonuses at that time (Richman, 1969, p.240). According to a recent survey,

⁵This attitude has been changed since the major economic reforms starting in 1979. However, the egalitarian tendency among Chinese is still strong. The cases quoted in chapter 5 evidence this tendency under current contract system. In some cases, managers who deserved a monetary reward were reluctant to accept it for fear that it would arouse grievances among their colleagues and workers (Xiao, et al., 1988). In others, the manager who accepted a reward had to distribute it evenly to every staff member and worker working in his factory (CASS, 1989).

the proportion of bonuses to money income for top managers was less than 60 percent of what was paid to all employees in 40 percent of enterprise-years; The said proportion was 60-80 percent in 35 percent of enterprise-years, 81-100 percent in 11 percent of enterprise-years, and was above 100 percent in only 14 percent of the cases (Granick, 1990). The second explanation is social function of Chinese firms. Chinese firms have been organized in such a way that they provide various substantial benefits to their employees in addition to employment. The most significant welfare benefits have included housing, child education and employment and other entertainment and welfare facilities. All these welfare items constitute a substantial part of material incentives for the firm as a whole. However, the main financial source for bonuses and these welfare investments has been retained profits or special funds established using retained profits or, in the case of loss due to government policy, funding from the state. Therefore, under appropriate systems, the total profits retainable by the enterprise or retained profits per head⁶ may be regarded as a proper definition of the financial component of the maximand for the firm. To this point, we can safely assume that non-material incentives constitute an important part of the Chinese incentive system. Among material incentives, monetary incentives are individual-oriented while welfare incentives tend to be collective-oriented.

8.2.1.3 The Manager's objectives.

In defining the firm's objectives, it is necessary to examine the manager (management)'s own objectives. Granick's (1990) analysis provides some useful results in this respect. In analysing incentives specific to upper managers, he uses bonuses and careers as the key components of managers' maximand. In terms of bonus earnings, the analysis "strongly suggests that, to the degree that top managers of Chinese enterprises attempt to maximize their own personal bonuses, they can do this best by maximizing the total bonus pot in their enterprises" (Granick, 1990, p.166). Examination of the role of career consideration showed that "there seems

⁶The retained profits measured against the number of employees is a more appropriate definition. But because the number of employees has not been a factor effected by a manager's decision, the two definitions are basically identical.

little reason for top managers to have believed that successful efforts on their part to improve the performance of their enterprises would make a great difference in the chances of keeping their posts" (ibid). Officially stated four principal criteria for promotion include: Party membership and loyalty (*Geminghua*), higher education (*Zhishihua*), professional experience (*Zhuanyehua*), and being relatively young (*Nianqinghua*)(Granick, 1990, p.172). Although good records of performance could be an element of professional experience, the weight put on them may be less significant than other criteria. One statement says that no one in China loses his post simply because of a negative evaluation of his work (Granick, 1990, p. 172). These analyses led Granick to reach the conclusion that it is unlikely that Chinese top managers have been guided in their managerial decision making by maximization of some combination of personal bonuses and probable future career development (p.173).

Granick's analysis covers both the pre-reform years (1975-1978) and reform years (1979-1982). However, he did not make a clear distinction between the two periods. But other researches indicate that these exist differences, as one would expect, in authorities' attitude towards managerial performance appraisal and promotion (Laaksonen, 1988, pp.252-253). During the pre-reform years, especially the Cultural Revolution, the main criteria for managerial performance appraisal was ideological "purity" and activeness (ibid.). During the reform years, the political criteria may have become less important, but prior to the recent contract system, the link between the firm's economic performance and its manager's career development has been not obvious. The contract system puts a great emphasis on the contractor's personal responsibilities and benefits. This change of emphasis may have created independent interests for the manager, if the contractor is the manager himself. This situation will be further examined when analysing the contract system in Chapter 9. This characteristic of managerial objectives prompts us to make an important assumption with regard to the objective function for the firm, that is, identifiability of maximand for the manager and that for the work force as a whole in his enterprise. This collective oriented incentive system means that the manager can be seen, by and large, as the representative of all personnel in his enterprise, when dealing with the

state (the planner). One implication of this feature would be that in making decisions affecting the overall welfare of the enterprise, the manager has ideally to, in some way or another, harmonize preferences and tastes of all employees or at least of key members and decision-participants in his enterprise. This assumption is expected to be applied to all reward systems prior to the contract system.

8.2.1.4 Summary of the assumption.

By synthesizing the above descriptions, we obtain a summary of the assumption regarding to the objectives of the Chinese firm:

Assumption 8.1: The enterprise manager and his firm as a whole behave basically in a self-interest fashion in that they are incentive driven.⁷ Moreover, non-material and material incentives are regarded as equally important, though different reward systems placed different weight on them. Material incentives include monetary incentives, which are basically individual-oriented, and non-monetary material incentives, which are usually collective-oriented. The objective function for the manager is not determined only by manager's pursuit of his own personal benefits but also by the desire to maximize the overall welfare of all members in his firm as represented by various forms of privileges. In dealing with the State, the manager is regarded as the representative of all members of his firm and his main objective is to maximize the overall welfare of the firm instead of his own personal benefits.

The final sentence of the above assumption is similar to Granick's assumptions with regard to the behaviour of the Chinese firm (Granick, 1990, p.175). The main elements of his assumptions include that i) the top managers are not in the position to try to maximize their personal bonuses and career developments due to various external constraints; and ii) the maximand for the manager (the firm) is the average welfare of the total labour force of the firm. Granick's assumption is well supported by reasoning and data analysis (see Granick, 1990, Chapter 5). It is a simplification,

⁷Here the term self-interest is relative to the state interest. When the firm acts in pursuit of benefits for its members instead of the state (planner), we say the firm is self-interested. As already indicated, the firm and its manager are interchangeable terms in this context.

of course, to take average welfare as the maximand but as Granick argued, it serves the same purpose as does the assumption of profit maximization in the neoclassical treatment of the capitalist enterprise.

In consideration of the importance and dominance of non-material incentives in the pre-reform period, it would seem appropriate to incorporate them into the maximand. In the ideal world, the incentives available to the firm should include different categories of incentives (Fig. 8.1). In broad terms, all types of incentives in Fig 8.1 affect the welfare of the total labour force of the firm. The effects of material incentives are obvious. The non-material incentives are usually accompanied by potential privileges, preferential treatment by the higher authorities (see Chapter 4) and other advantages to the firm. They can therefore effect the welfare of the firm in a long term and in an indirect way. Granick's failure to consider them in his analysis may perhaps be seen as unjustifiable. In our model, we shall include non-material incentives into the maximand for the firm, although it is difficult to express them in quantitative terms as those material incentives.

8.2.2 Economically Rationality of the Chinese Planner

A critical assumption underlying the agency approach is that both the principal and the agent are expected utility maximizers (Ashton, 1991, p.123). This implies that the both individuals are economically rational and that the agent is able to trade off the utility derived from earnings against the disutility (loss in utility) from working for the earnings. That working earns money and costs efforts is a basic reasoning underlying the principal-agent model. Criticisms can be easily raised with regard to the simplicity of such a model, even though it is an improvement on the altruistic model of an employee who unselfishly maximizes the principal's welfare (*ibid.*, pp.123-124).

Any utility may be derived not only from monetary earnings but also from some other gains that of value to the individual in question. In this regard, utility can embody any gains available to the individual in question. No problems are therefore created if we use our multiple-type incentive assumption made in the previous subsection.

The problem of defining the utility function for the Chinese planner consists

of two questions. First of all, to make the analysis sensible we have to justify that the Chinese planner is economically rational and acts in a self-interested manner. Then we look at the utilities that she is trying to maximize.

The self-interest assumption may present no problem if the planner acts in the interests of the state. In dealing with firm managers, if the planner behaves in the manner of maximizing the interests of the state, the self-interest assumption may be argued to have not been severely violated. Here, it should be noted that the planner is personalized. As with the manager of the firm, the planner is regarded as the representative of the State. In particular, "the planner" should be an organization(s) which performs supervisory functions to state enterprises on the behalf of the State. In most cases, "The department in charge" is "the planner" in our mind. In this context, whether the department in charge can represent the State interest is a critical question. We shall leave this question to the final chapter, since for our analytical purpose suffice it to have a symbolized party that represents the State and deal with enterprises.

In the Chinese context, one particular question may be raised with regard to the economic rationality assumption on the part of the planner, as it has been the case that ideology and politics frequently underline economic efficiency and managerial effectiveness. A full examination of the up-and-downs of ideological dominance verses economic dominance in Chinese policy making requires a much longer exposition than it is possible to devote to it in this thesis. But Richman's (1966) extensive analysis of the impact of ideology on the management, operation, and performance of Chinese industrial enterprises warrants giving some credibility to his assertions. One of his assertions reads:

Like virtually every other country in the contemporary world, Communist China is basically interested in economic growth, and economic growth depends on industrial development. Like many countries, economic growth *per se* is not the only ultimate end or objective in China, but the attainment of other important political, social, and ideological goals depends on how well the economy and industry in particular manages to progress (p.19).

The importance of economic growth has not been ignored by the Chinese leaders except in periods of extremism such as the "Cultural Revolution". Observation

suggests that it obvious that the main goal of the current economic reform in China is to bring the economy into full development and economic rationality has become an established rule for policy-making.⁸ For the purpose of our analysis, it may be safely argued that the self-interest and economic rationality assumption was basically justifiable during the pre-reform time except in certain periods of extremism and is fully applicable to the reform era in China.

8.2.3 Utility for the Planner

The utility for the planner in a centrally planned economy may be more difficult to define than it appears. It is normally accepted that the planner tries to construct plans and allocate resources in order to maximize social welfare (Bennett, 1989, p.9). Arrow and Hurwicz (1960) define a social welfare function, in which variables are the final demands for the desired commodities:

$$U(y_1, \dots, y_n)$$

where $y_i (i=1, \dots, n)$ is the amount of commodity i going to final consumption. This formulation, intended to serve the computation purpose in resource allocation model, is, of cause, highly simplified. As the authors themselves note, "[t]he assumption that a single utility function represents the objectives of the economy fits best the case of a firm. For a nation, the assumption is less justified, but it provides an introduction, at least, to the more complex problem raised by the presence of many individuals, each of whom judges the workings of the economic system in light of his own utility function" (Arrow & Hurwicz, 1960).

In the context of central planning, if plan targets play an important role in facilitating the communications between the planner and firm managers instead of prices in a market economy, the inclusion of the information value of these targets

⁸In 1979, new Chinese leaders made it clear that policy-making in China would centre on economic growth. "One centre (economic growth) and two basic points (reforms and openness)" have since been the guideline for policy-making. This guideline was reaffirmed by Deng Xiaoping in early 1992 to encourage further economic reforms and more openness to the rest of the world. The new Constitution adopted in 1982 and the Constitution Amendment in 1993 stipulate that the fundamental task of the state is to concentrate on socialist modern economic development (RMRB, 30 March 1993).

into the planner's utility function is desirable (Liu, 1987), since the utility level of the planner is dependent on the information value of targets. In an agency model of planner-manager, Holmstrom (1982) considers three elements in formulating the planner's objective function. First, the planner values output. Second, the planner values information carried by plan targets and target fulfilment, especially by those targets for primary products. Finally, the planner is concerned about firm costs. Accordingly, a social objective function is formulated as

$$W(y) = G(y) - H(y-\hat{y}) - C(y), \quad (8-1)$$

where $G(y)$ is value of output (y) gross of information benefits and production costs; $H(y-\hat{y})$ is cost of underfulfilment of target (\hat{y}); and $C(y)$ is firm cost of production, known only to the firm. In the context of the New Soviet Incentive Model, Holmstrom (1982) argues that the Soviet scheme was primarily concerned with managerial motivation rather than informational revelation, which was normally emphasized in the literature. When the motivational problem is the main consideration, the informational component in (8-1), $H(y-\hat{y})$, may well be dropped. The difficulty with the term $H(\bullet)$ is that modelling the information value more elaborately requires specifications with regard to the information delegation structure and how the information is intended to be used. Research so far seems to have not advanced to the stage where this intricate problem can be modeled satisfactorily. More significantly, according to Holmstrom (1982), the information value of the target setting procedure should be separated from its incentive effects on action. This is very much in the spirit of the revelation principle, which restricts decision space to the full communication sphere. In the context of motivation (moral hazard), suffice it to bear in mind that any scheme that induces communication of information will improve on one that does not provide such communication.

In a set up where the information value of target setting by the firm is ignored, the presence of cost function $C(y)$ in the planner's objective function is also immaterial. In the context of moral hazard, the reward function should be based on observable variables by the both parties. Therefore, if $C(y)$ is neither known ex ante

nor observable ex post by the planner, it should not enter any functions in question (Baron & Myerson, 1982). When the output is not marketed by the firm and the planner observes and reimburses the cost incurred by the firm and pays in addition a net monetary transfer, the cost function $C(y)$ ⁹ becomes an important component in both the planner's and the firm's utility functions (Laffont and Tirole, 1986). In the Chinese case, since cost based incentive system has not been observed in practice¹⁰, cost function is not considered in the both parties' utility functions.

8.2.4 Social and Political Objectives

The problem of defining the Chinese planner's utility function becomes much more intricate if other supposed objectives than economic ones, such as social and ideological objectives, are considered. Typically, the normative point of view based on some *a priori* desiderata is characteristic of most socialist ideology (Hurwicz, 1979). The planner, if assumed to be committed to such ideology, is typically concerned about both "social justice" or equality as well as economic efficiency. However, research has indicated that "one cannot, in general, reconcile the following three criteria: Pareto optimality, fairness (in the sense of being envy-free), and individual rationality" (ibid.). The socialist State, if concerned not only with economic efficiency but also with equity in distribution, has to face a trade-off between equity and efficiency (Okun, 1975; Gordon, 1980; Kornai, 1986). A more recent agency analysis shows that the conflict between equity and efficiency arises when there exists information asymmetry, in particular, when actions of the agent are not observable by the state (Qian, 1992). "The tradeoff occurs when the constrained efficient allocation calls for an incentive scheme with a large variance in remunerations and hence results in a large variance in welfare distribution, which the egalitarian state

⁹In this case, cost C must be defined more elaborately with effort as a variable. It is thus assumed that the level of effort by the firm can change marginal cost.

¹⁰In the pre-reform era, when the prices were fixed by the state, using cost information to monitor the firm's performance would be an important option available to the planner. However, the output orientation of then performance appraisal and incentive system undermined, in a significant manner, the potential use of cost monitoring.

tries to avoid" (ibid.). Qian (1992) further notices that the observed excessive profit-leveling across state-owned enterprises in the reforming socialist economies may be attributed to the egalitarian consideration of the State".¹¹

The equity consideration is important in interpreting some phenomena in China that may not be properly interpreted from a pure economic perspective. Ideally, this consideration should be reflected in the planner's utility function.¹² To simplify our analysis, however, we assume that the planner has a utilitarian social welfare function, that is, the planner is only concerned for the economic efficiency. The effects of other considerations on the results of this type of analysis will be considered separately and away from the formal models.

If we restrict our attention to the economic objectives of the planner, we can assume that the planner's objective is to simply maximize the sum of the contributions of all firms that utilize centrally allocated resources. This assumption is analogous to the utility function of the planner that was modeled in Chapter 7. The contribution of a firm can be roughly defined as the gross revenue generated by the firm net of resource costs and labour costs (rewards to the firm by the planner). This is equivalent to the Chinese term "economic efficiency".¹³ To increase "economic efficiency" has been a well propagandized aim of the economic reforms (Gao, 1987). It is also officially stipulated as one of the fundamental tasks of state enterprises ("the Enterprise Law").

¹¹This egalitarian tendency of the State has been observed in the Chinese reform period. The State seems to be uncomfortable with large differences in profit generation and retained profit among state enterprises. It has to use some devices, such as adjustment tax and one firm on rate, to level or reduce the differences. An excuse for this practice has been that differences in profits are largely a result of irrational prices. See chapters 4 and 5 for details.

¹²In Qian's analysis (1992), the planner (state)'s utility function contains this element. An increasing and concave function G is introduced so that if a fraction q_i of agents has an ex post utility level U_i , where $q_i \geq 0$ and $\sum q_i = 1$, then the state will evaluate social welfare as $\sum q_i G(U_i)$. For details, see Qian, 1992.

¹³*Jingji Xiaoyi* is a popular Chinese term since the start of the reforms. Strangely it is hardly possible to find an appropriate equivalence in English. *Jingji* means economic; but *Xiaoyi* has been translated as "effectiveness", "efficiency", or "benefits". Anyhow the meaning of *Xiaoyi* in Chinese is clear: net value added.

The definition of the Chinese planner's utility function should be applicable to both the pre-reform system and reform systems. Under the pre-reform system, state fixed prices were applied to all inputs and outputs of the firm, the output of the firm, if transformed in terms of value, became the output value or gross revenue for the firm. Similarly, resource costs could be calculated in the same way. The labour costs included wages and salaries, investments in the firm's welfare facilities and costs to the State of providing non-material incentives. This latter item may be open to question, since one may argue that granting a honour title may not cost the State anything. But there are costs involved in the political and ideological activities, including the opportunity costs in terms of time and effort spent on these activities and other direct costs.

Two more questions may be raised as to the utility function for the Chinese planner in the pre-reform period. First, the planner might be concerned more with political objectives than with economic objectives. Second, the planner might wish to maximize total output rather than the net output value. The political objectives were considered earlier. It is the nature of our economic analysis that makes us to filter out the effects of other considerations. The output-maximization featured many analyses of traditional centrally planned firms and economies (see Chapter 2). The reasoning was that the central planning state was not concerned with costs. However, we found that costs were always included in the performance indicators used in the pre-reform years. This led us to believe that as far as economic objectives are concerned, output-maximization is not entirely logical and if the planner is assumed to be economically rational, it is consistent to include costs in her utility function.

Based on the above descriptions, the following assumption can be made:

Assumption 8.2: The Chinese planner is assumed to be an expected utility maximizer, with economic objectives being her sole consideration. The planner acts on behalf of the society with a utilitarian social welfare function as her utility function. This function is defined in terms of net revenues from all firms.

8.2.5 The Manager's Attitude Toward Effort Exertion

It is normally assumed in agency that the agent (manager) is effort averse. This effort aversion is reflected by disutility of effort, which is usually included in

the agent's utility function as a negative item. Effort aversion implies that the agent's utility decreases with the effort level: holding constant utility level derived from income, the agent prefers less effort to more effort. In terms of disutility of effort $Z(e)$, $Z \geq 0$, $Z' > 0$ and $Z'' > 0$.

This model of disutility of effort may attract arguments in the Chinese context. One can hardly argue, for example, that all managers are effort averse. The concern about their career development and reputation may be a plausible reason for managers not displaying effort aversion. Another is that the presence and close supervision of state watchdogs such as the party organization and sometimes the workers' congress¹⁴ may act as a counterpoise to the manager's tendency to effort aversion¹⁵. The possibility exists that the party apparatus could effectively be used to identify "committed" individuals who would have relatively low aversion to effort (Conn, 1982). On the other hand, in a centrally planned economy which lacks mature competitive markets such as the Chinese, a weakness exists in that it lacks an efficient mechanism for eliminating strongly effort-averse managers. The public tendering mechanism under the contract system (see Chapter 5) could, in this regard, have the advantage that it helps the planner select less effort averse managers so as to minimize the impact of effort disutility on managerial performance. However, it is not obvious whether or not managers in a centrally planned economy are more effort-averse than their market counterparts. Moreover, the difficulty remains as to how to

¹⁴The role of the party secretary and the workers' congress in dealing with the problem of moral hazard is a complicated issue. In principle, the party secretary should act in the interest of the State, having therefore a positive role. However, his or her immediate relationship with the enterprise as a member and his or her working relationship with the manager may make him or her a partner of the manager in dealing with the State. The workers' congress is the opposite case. It should in principle work for the general benefits of the employees and therefore share the manager's preferences. But potential conflicts of interests between the manager and the other employees especially workers may restrict the manager's ability to do as he likes. Nevertheless, the interactions within the enterprises are ignored in this thesis and the enterprise is seen as a homogeneous agent with the manager as its representative rather than composed of interest groups. This assumption signals in part the simplified nature of our model.

¹⁵The role of supervision in the context of moral hazard will be considered separately later in this chapter.

satisfactorily measure the degree of effort aversion and disutility of effort. A more fundamental question may be even raised here about the appropriateness of measuring the disutility of effort in the same manner as monetary gains, as disutility of effort may not necessarily yield loss of income, even though the concept of opportunity cost is introduced¹⁶.

This problem is basically related to the definition of the effort level itself. It is noticed that the current modelling of effort in the literature is more representative of a share cropping setting in which there is a direct return from the amount of effort exerted (time length or/and intensity of labour) by the hired worker (Kaplan, 1982). In the case of managerial activities, effort takes varied forms and may be more closely related to the quality than the quantity of managerial decisions. Therefore, "the increase in expected payoff and decrease in utility associated with increases in effort may be more relevant for workers in a production setting than for managers in a decision-making or leadership process" (ibid.). In general, only those activities which can result in a increase in expected payoff can be regarded as "actions" or effort. A less rough and inaccurate interpretation of effort may be yielded in the specific setting in which the payoff to the activities can be satisfactorily linked to the activities. This activity-based identification of effort may provide a useful tool in defining the effort level in managerial settings. One example of this broad but environment specific interpretation of effort is that where the manager is provided with an incentive to reduce his overconsumption of non-pecuniary and nonproductive factors, such as office space, high-quality furnishings, and staff support (Kaplan, 1982, p.613). Similarly, when the planner is more concerned with products' quality than their quantity, activities attempting to increase products' quality should be seen more representative of effort than those invested in boosting products' quantity.

In the Chinese context, the manager's effort aversion is justifiable if the manager is seen as a proxy for his work force rather than a individual who acts on

¹⁶Measuring disutility of effort in monetary terms can partly be justified by the convenience it brings to technical analysis. The problem of choosing optimal level of effort for the manager can be conveniently modeled as that of equating the marginal disutility of effort, measured in monetary terms, to the marginal increase in monetary gains.

his own preferences. As in the case of self interest, effort aversion seems a natural assumption.

Assumption 8.3: Chinese managers are normally effort averse, especially when they act as proxy for the work force in their firms. Effort therefore causes disutility.

Assumptions 8.1 - 8.3 define the utility functions for the Chinese planner and managers. It was assumed that the both parties are basically self-interested and expected utility maximizers. The planner acts in behalf of the society with a utilitarian social welfare function as her utility function. The manager's utility function is largely determined by the desire to maximize the overall welfare benefits of the work force in his enterprise. These benefits may be derived directly from material incentives (monetary and welfare facilities) and indirectly from non-material incentives. Similarly, according to this interpretation of collective agent, effort causes disutility, in the aggregated terms, of all workers in the enterprise.

8.3 Risk Preferences

In this section, we continue the examination of parameters affecting the utility functions of the Chinese planner and managers (firms). Risk preferences of the both parties are the main concern of this section. Risk preference plays an important part in designing incentive contracts under uncertainty, especially in the situations of moral hazard.¹⁷ In cases where the agent is risk averse, there is a balance that needs to be struck between providing incentives and insulating people from risk (Milgrom & Roberts, 1992, p.207). In terms of efficient incentives, it is desirable to hold the agent responsible for his performance, implying that his compensation should depend on the results of his actions. However, due to uncertainty and randomness affecting the results or measures of the results, holding the agent responsible typically will

¹⁷Risk sharing under moral hazard has been well examined in the literature. One of the results states that under risk neutrality on the part of the agent, moral hazard can be eliminated by letting the principal assume all risks. In the models of adverse selections and mixed models involving adverse selection, the agent is assumed to be risk neutral. See also Footnote 6 in chapter 7.

involve subjecting him to risk or fluctuations in his incomes. If the agent is risk averse, ie., he dislikes bearing risks and prefers stable incomes, having pay depend on performance would generate risk-bearing costs. Efficient contracts balance the costs of risk bearing against the incentive gains that result (ibid.).

8.3.1 The Chinese Planner

Implicit in many models in the agency literature is risk-neutrality of the principal. In the context of central planning, the risk-neutrality of the planner can be normally justified in terms of Arrow's theorem on risk bearing (1971). In a community where all members are assumed to have identical utility functions of the Morgenstern-von Neumann type¹⁸ and share equally in gains and losses of public enterprises, "gains and losses from the actions of any particular public enterprise will often be sufficiently small relatively to the community's income and sufficiently widely dispersed among household's to represent only a very limited variation in the income of any single household" (Bergson, 1978). The community's pooling effect can cancel out great variations in the community's income from sufficiently large number of public enterprises. In the Chinese case, the large scale of the economy and its huge number of state enterprises mean that income from any particular enterprise represents only a drop in the ocean¹⁹. It can therefore be safely assumed that the planner is risk-neutral when dealing with a particular enterprise.

The justification for the planner's risk neutrality also derives from the fact that there are no personal penalties for the planner if things go wrong. By and large, the planner's personal incomes bear little relationship with her decisions and results of

¹⁸Here, managers of public enterprises are distinguished in terms of utility function from the entire community. Members of the community therefore include all other members than the managers.

¹⁹According to the official statistics, of the industrial gross output value in 1991, 55 percent was generated by the state enterprises, compared to 78.3 percent in 1981. In August 1992, there were 10,700 large and medium-sized state industrial enterprises, accounting for 2.5 percent of the total number of industrial enterprises in China. The industrial output value generated by those large and medium-sized state enterprises accounted for 45.6 percent of the national figure, while the revenue (profits and taxes) contributed to the state above 60 percent (RMRB, 7 August 1992).

these decisions. This implies that the planner can afford to be risk neutral even if she is seen as an individual instead of the proxy for the society.

8.3.2 Interaction between Risk Preference and Incentives

The manager's attitude towards risk may be not as obvious as the planner's. Before proceeding to analyze Chinese managers' risk preference, we would like to consider an important argument in the context of risks and incentives. Instead of taking the manager's risk attitude as given, this argument emphasizes the possibility and desirability of inducing an appropriate attitude toward risks on the part of public enterprise management (Bergson, 1978). The interaction between risk preference and incentives is the core of this argument. The issue is one of the subjects debated in the "Socialist Controversy", which is believed to be highly relevant to this study. As early as in 1920, von Mises pointed out that managers of socialist enterprises could not be counted on to exercise a necessary initiative, at least if managerial rewards are constrained ideologically in a manner that socialism supposedly requires (von Mises, 1935). Hayek (1935, 1940) argued similarly in asserting that the manager's concern over the possible loss of his or her post in case of failure provided the incentive to prefer the safe to the risky enterprise. Dickinson (1939), however, saw it as possible to suitably calibrate bonuses in order to provide managers an incentive to "experiment and improve the service and yet ... feel the consequences of imprudent and extravagant ventures". Along this line, Bergson (1948) further argued that:

Given the possibility of fixing policy on dismissals on the one hand and on rewards on the other, it should be feasible to establish a climate in which the managers evaluate risks in whatever is considered to be the proper manner. There is no reason to suppose that they would necessarily be too venturesome or, as Hayek argues, too cautious.

Bergson (1976,1978) considered that the "proper manner" of the managers towards risks should be such as to maximize "expected economic returns". As the managers are only interested in their own expected utilities (by the self-interest assumption), "they must be induced to maximize expected benefit produced" (Bergson, 1978).

Here, the problem becomes "simply a variant of the classic 'principal-agent' situation of stochastic choice and has a familiar and fairly obvious kind of solution"

(ibid.). However, as Bergson (1978) points out, there exist certain difficulties in implementation. First, the rewards for success, through bonuses or/and "career function", must be large to assure a proper evaluation of risky ventures. There might be ideological block and practical bounds which prevent them meeting theoretic requirements. Second, it could be practically difficult to measure satisfactorily benefits that managerial decisions might yield to the community in different states. Measurement of success itself for public or state enterprises may present a problem in a less simplified situation than normal theoretical case, especially when the community has a multiple-objective utility function and some of the objectives potentially conflict each other. Finally, the degree of managerial risk aversion could affect the required rewards in a significant manner. Measurement of the degree of managerial risk aversion and properly linking it to managerial compensation "might require a good deal of empirical inquiry into the variety of managerial utility functions" (ibid.).

Of all of the above difficulties, assessing general managerial risk attitude would be of primary interest to us. Given the interaction between attitude toward risk taking and reward system, it should be a natural starting point to examine the reward system for assessing managerial risk preference. Other environmental factors, such as the decision-making dimension, responsibility structure, boundaries of rationality, and degree of aggressiveness or conservatism, also account for, to varying degrees, managerial risk preference and its possible changes.²⁰

8.3.3 Chinese Managers' Attitude Towards Risks

During the pre-reform years, enterprise managers, and indeed workers and other enterprise personnel, were basically constrained in initiating major risky decisions. Higher authorities made major decisions on resource allocation, finance, production, and personnel affairs. Much of the risk function was therefore shifted

²⁰There exist few empirical studies or surveys on managerial attitude toward risk taking in China, Richman's (1969) account of the Chinese manager's risk taking behaviour in the pre-reform era provides a valuable source of reference for this section. These factors were drawn from Richman (1969).

from the individual micro-level to a more impersonal macro-level. As the decisions were not made by the enterprise, the enterprise was basically sheltered from any consequences of those decisions. The fixed wage and salary system and non-job-loss policy also strongly protected the manager and all the employees generally from production related risks. Whatever happened, the basic monetary income and welfare level for the manager and workers were guaranteed. This is what the Chinese refer to as the "iron bowl" for employees in state enterprises. All this suggest that managers were risk-neutral under the pre-reform system.

Until the late 1970s, when a series of reform schemes began to be introduced, risk taking had little effects the on basic level of benefits at the enterprise level. The situation has changed since then. One of the trends which evolved during the process of reforms has been putting increasingly greater stress on individual benefits and responsibilities and linking them more closely to the outcome of decisions made and actions taken by individual managers. Since a large proportion of bonuses and welfare benefits is subject to variation, managers of state enterprises has thus evidently become more cautious (Chen, 1989). For example, under the contract system, the contract explicitly defines financial rewards and penalties for contracting managers (in some cases, the contracting group of management personnel, or the contracting enterprise), has significantly changed managers' risk preference by making managers risk-averse. Under the contract system, various forms of risk-sharing mechanisms have emerged (see Chapter 5 for detailed description). One of the recent developments is that in contracted enterprises, a specific enterprise fund should be established and serve as the "risk fund". In some cases, a "risk pledge fund" has been set up using the manager's personal assets or employees' personal assets. In case of failure to make the pre-set amount of revenue this fund has to be used to make up the difference²¹. Under these circumstances, it can be safely assumed that managers (and

²¹According to a survey of 1,246 contracted enterprises at the end of 1990, during the first period of contracting (1987-1990), the percentages of failure to meet the annual contract targets were as follows:

Year	1987	1988	1989	1990
Percentage	5.8	9.0	21.2	39.9

Among those failed enterprises, 53.4 percent of the managers were punished by deducting a part of their salaries or/and cancelling bonuses, 5.1 percent had to make

the enterprises in general) are risk averse.

It is interesting to note that under the contract system, the Chinese government displays certain characteristics that are clearly divergent from the assumed risk neutrality. An example is that in many contracts the state claims a fixed proportion of the revenue generated by the enterprise leaving the enterprise as the residue claimant. This behaviour seems consistent with the government's intention to receive guaranteed revenue from enterprises, one of the most direct purposes for the state initiating the contract system. However, there is a lack of sufficiently convincing evidence and analytically reasoning supporting the view that the government has acted in a risk averse manner. The fixed claim design in contracting process may reflect the government's overwhelming concern to provide incentives to some enterprises with relatively poor past performance.²²

In summary, an assumption with regard to risk attitudes of the manager and the planner is made and is stated as follows:

Assumption 8.4: The planner, acting on behalf of the government (State, community, or society), behaves basically in a risk neutral manner. This attitude is not sensitive to reforms in pattern of the relationship between the State and the enterprise. The manager's (the enterprise) attitude toward risk, on the other hand, may change with a number of environmental factors such as reward structure, authority (decision-making) sphere, and responsibility structure. Prior to the major reforms in the late 1970s, the manager tended to be risk neutral. As the reforms gradually changed the above mentioned environmental factors,

up the differences using personal assets (Yu, 1991).

²²It is claimed that the initial purposes for which the state implemented the contract system included: First, to provide motivation for enterprises to improve efficiency; second, to ensure the stability of state revenue and increase in it; and third to strengthen self-constraint mechanisms of enterprises. However, some statistics show negative results in achieving these purposes. State revenue, for example, relatively decreased in 1987 and 1988. The proportion of the state revenue to the national income was decreased from 28 percent in 1986 to 24.1 percent in 1987 and further to 19.3 percent in 1988. These decreases created great financial difficulties for the central government and increased financial deficits and state debts (Xun, 1990).

especially with the implementation of the contract system, the manager behaves in a risk averse manner to an increasingly high degree.

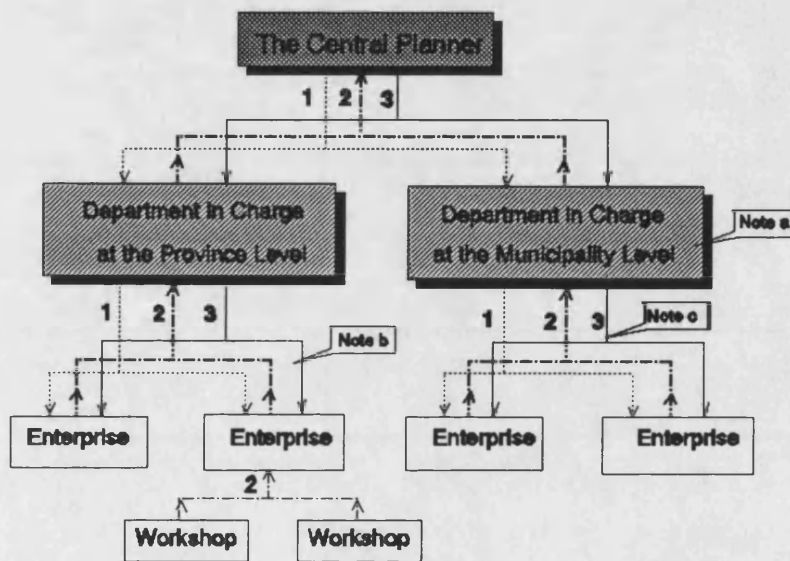
8.4 The Role of Information in Planning

In this section, we consider the role of information generated by firms in the Chinese planning system. In modelling a centrally planned economy, the most important role played by the information from the firm is assumed to be to help the planner in allocating resources to firms and coordinating economic activities across the whole economy. From the following description of the actual process of planning it will be easily seen that the firm plays an active role in this process in term of information exchange. The description and discussion below are applicable to all systems prior to the contract system.

The Chinese planning system was established based on the hierarchical structure of administration, and planning is composed of two kinds of plans: long-term plans and annual plans. Long-range economic planning (such as the five-year plans) is essentially investment planning while annual planning is basically operational planning. National level planning involve many political decisions and is dealt primarily in aggregates. As the plan is worked down to the lower levels, details are desegregated and added to and complexity is increased. It is during this process of working out detailed industrial plans that enterprise managers were required to pass relevant information to their immediate authorities as to the production potentials and resource requirements in their enterprises.

The actual process of formulating annual plans in China resembles its prototype in Soviet Union, though it is recognized by Western observers that the Chinese planning process is "significantly less monolithic or standardized than it has typically been in Soviet industry" (Richman, 1969). Normal steps involved in the process routinely include several "down and up" stages. The process generally begins each year with the issuance of preliminary directives or plan control figures by the State Planning Commission. These directives flow down the industrial hierarchy and at each level they are desegregated, elaborated on, added to, and worked out in greater detail. This stage, referred as the "first down" stage, results in the initial

plans for each level of the industrial hierarchy, which reflects mainly the planner's proposals at various levels and does not involve firm participation (see line 1 Fig.8.2). This stage is followed by the first and frequently the last "up stage". From the bottom of the hierarchy (normally workshops in large enterprises), the draft plans



1. 1st down -- plan control figures from the top (centre)
2. 1st up -- draft plans (proposed figures) from the bottom (firms or workshops)
3. 2nd down -- approved plans from the top

Fig. 8.2 Information Flows During Plan Formulation

Notes: ^a Beijing, Tianjin, and Shanghai are the three municipalities directly under the Central Government. They have the same status as provinces and autonomous regions. During the reform years, there have been a number of big cities or special zones that are granted separate planning entities by the centre. In the plan formulation process, they are treated by the Centre as equivalents to provinces.

^b There may exist other level(s) of hierarchy between the province and the enterprise. For a detailed demonstration, see Fig. 1.1.

^c This stage may involve some information exchanges between the higher level and the lower level through bargaining and renegotiations. More interactions may be needed if an agreement is not reached.

are worked out by taking into account the earlier initial plans from the higher levels and, of course, each level's own information regarding its production potentials and resource requirements. Within a firm, the planning department is responsible for internal balancing and drafting of the draft plans. The draft plans from the bottom are then aggregated and reported up to the centre (see line 2 in Fig.8.2). During this stage, enterprises' involvement is extensive and important, as the information from enterprises is incorporated into their counterproposals and draft plans. The "second down" stage follows the centre's reconciliation and approval of the draft plans (see line 3 in Fig. 8.2). During this stage the draft plans are finalized and formalized at each level through renegotiations, bargaining, and compromises. Where agreement between the higher level and the lower level is not reached during this stage, another round of up-and-down information transmission may be necessary and only related portion of the hierarchy is involved.

This highly simplified description of Chinese industrial planning presents two features of interest. First, the enterprise's involvement in the planning process implied that information it provides is important for the process. As the planning covers both production targets and related resource allocations, the information contained in the enterprise's proposals impacts on both production targets and the resource allocation to be received by the enterprise. The relationship between the targets and resource allocation deserves further consideration here. In China, not all production targets are fully supported by central allocations (normally they refer to centrally allocated raw materials).²³ Two different types of products can be distinguished according to their importance to central planning. Those products that are to be centrally allocated to other enterprises, referred to as central products here, are more important in coordinating production because their impacts on the production chain. The non-central products have no such a role. In the case of central products, the plan is determined by a central body and allocation is also carried out at the central level. The most common form of plan for these products consists of two parts, i.e., the

²³Allocations of capital appear less significant in a economy where many important products are not available in the markets (or do not exist such markets). Large financial allocations, such as investment funds, have always been accompanied by allocations of materials.

"mandatory" part, backed by materials allocations, and the "indicative" or "guiding" part that is set without the provision of materials. Even in the mandatory plan central allocations of materials are insufficient in many cases to support fully the production

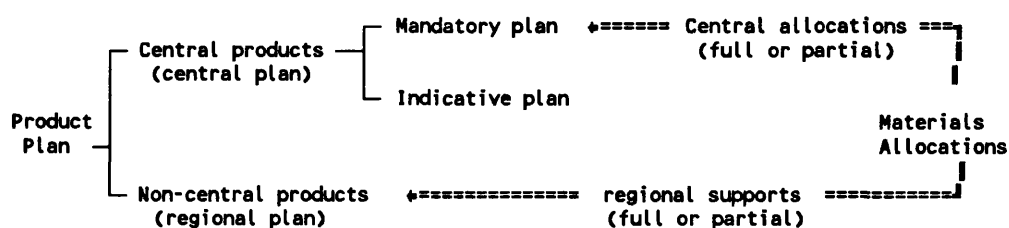


Fig. 8.3 Product Plan and Materials Allocations

TABLE 8.1

NUMBER OF PRODUCTS ALLOCATED CENTRALLY
IN CHINA AND IN THE USSR

Years	China	USSR
1952	55	
1953	227	
1957	532	
1959	285	
1965	592	
1966	579	21,655
1968		16,312
1972	217	
1973	617	48,426+
1978	689	
1979	791	
1982	837	
1987	581	

Sources: Data for 1952 to 1982 are from Granick, 1990, Table 3.1, p.73; Data for 1987 is from Gao Shangquan, 1987, p.60.

of centrally planned output (Granick, 1990, p.98). The plan for non-central products may be established by a regional body and not supported by central allocations (Fig. 8.3). This partial allocation support for plans contrasts with the practice in the former Soviet Union or in the East European countries, where all production plans were (at least in principle) fully supported by allocations of raw materials, and the products were fully allocated to other enterprises. Table 8.1 shows the numbers of products that were centrally allocated in China and the former Soviet Union. Table 8.2 further indicates that a large proportion of major intermediate products has escaped the central planning, while in the USSR there was virtually 100 percent coverage.

TABLE 8.2

PROPORTION OF MAJOR PRODUCTS THAT ARE
CENTRALLY ALLOCATED IN CHINA (%)

Product	1965	1978	1980	1987
Coal	75	54	57.9	47.2
Steel	95	80	74.3	47.1
Lumber	63	81	80.9	27.6
Cement	71	36	35	15.6

Sources: Data for 1965 and 1978 are from Granick, 1990, Table 2.1, p.30; Data for 1980 and 1987 are from Gao Shangquan, 1987, p.60.

Note: Granick (1990) contains data for 1980 but they are slightly different from those in Gao (1987).

Second, the Chinese planning process is relatively less rigid than its Soviet Counterpart in that proposals, counterproposals, negotiations, and hard bargaining are more common and extensive in China. Greater flexibility in Chinese planning is also provided in some other ways than the planning process itself. For example, as Richman (1969) noted, "the Chinese have apparently been less reluctant than the Soviets to allow for revisions, including changes in aggregate targets and resource

allocations, in the operating plans of industrial enterprises. In fact, there frequently seems to be too much flexibility in Chinese industry in this regard, since interdependent plans are often not properly brought into balance when changes are made in the plan of a given firm or sector" (p.719). Because of this flexibility in planning, the authoritativeness of plans is greatly decreased. Granick's question of why the Chinese authorities are reluctant to use plan fulfilment as the only yardstick in performance evaluation could perhaps be answered, at least in part, by the nature of Chinese plans.

In conclusion, Assumption 8.5 can be stated with regard to the Chinese planning:

Assumption 8.5: The Chinese planning process begins with initial plans from the centre and ends with final plans proposed from firms and approved by the higher authorities. Information from the enterprise impacts on formation of final plans, which covers both production targets and resource allocations. However, the production plan is not fully supported by central allocations. The more important the product, the greater the materials support. The planning process involves much bargaining and negotiations, rendering plans less accurate but more flexible. There are a lot of information transfers, formal and informal, between the firm and the higher authorities during this process. The formal channels are the routine "up and down" cycles and informal information exchanges are conducted through ad hoc bargaining and negotiations.

8.5 Summary

Based on observations and analyses of various sources, we make a number of assumptions with regard to relevant elements of agency models in the Chinese context. These assumptions are to be used for the model-building purpose in the following chapter.

Section 8.2 examined various aspects related to the utility functions of both the agent firm and the planner. The objective function of the firm was first considered. Two special features of Chinese reward systems, in relation to their Soviet prototype, were identified. Chinese reward systems tend to put much emphasis

on non-material incentives and they are, as a result, mixed reward systems which combine non-material and material incentives. Another feature is that rewards in China have been largely collective-oriented rather than individual-oriented. Moreover, it was shown that Chinese managers is not in the position to act in attempt to maximize their own personal income or career perspective. They are best seen as representatives of all personnel in their enterprises, when dealing with the planner.

The economically rationality of the Chinese planner (the party acting on behalf of the State) was then examined. First of all, we shown that if the planner behaves in the manner of maximizing the interests of the State the self-interest assumption can stand. Secondly, political and ideological objectives of the planner may underline economic efficiency but they not necessarily overshadow the overall economic objectives, except in certain periods of extremism. We established that the Chinese planner is generally economically rational, with a utilitarian social welfare function as her utility function. This function can be defined in terms of net revenues from all firms.

Before proceeding to risk preferences, we briefly considered the manager's attitude toward effort exertion, it was assumed that Chinese managers, are normally effort averse, especially when they act as proxy for the total work force in their firms.

Section 8.3 was devoted to the issue of risk preference. With regard to the planner's risk attitude, we justified the normally-assumed risk-neutrality of the planner without great difficulties. In assessing general managerial risk attitude, we indicated that there exists interaction between risk attitude and reward function. During the pre-reform years, much of the risk function was shifted from the individual level to a more impersonal macro-level and the fixed wage system and non-job-loss policy protected the manager all his personnel from variations in basic income. As a result, it was assumed the managers were risk-neutral under the pre-reform system. Since reform schemes have gradually changed the environmental factors affecting managerial risk preference, especially with the implementation of the contract system, Chinese managers behaves in a risk averse manner to an increasingly high degree.

Section 8.4 considered the role of information Chinese planning. The "down

and up" procedures of budget (target) - selling embody information transmission to and from various levels. The involvement of firms in these procedures implies that firms play an active role. Furthermore, the procedures resemble to a great extent the

TABLE 8.3
SUMMARY OF ASSUMPTIONS

Assumption	Sub-assumption	Note
The manager is self-interested and a utility-maximizer	1. The maximands for the manager and the firm are identical	Under the contract system, the manager's maximand may be different to the firm's
	2. Incentives available to the manager include non-material and material incentives; material incentives include monetary and welfare-related incentives	Under the pre-reform system-non-material incentives were dominant, while material incentives are more widely used under reform systems
The planner is economically rational	1. The planner acts in the interest of the state 2. The utility function of the planner is defined in terms of net value	
The manager is effort-averse		
The planner is risk neutral		
The manager is risk-neutral under the pre-reform system; but risk-averse in the reform period		
The information generated by the manager impacts on the target levels and central allocations		

game modelled in the context of resource allocation in the previous chapter. However, the Chinese planning system has not been as rigid and accurate as its Soviet counterpart. The production plan is not fully supported by central allocations. The budget-setting process involves much bargaining and renegotiations. These characteristics remind us that cautions should be exerted in utilizing formal theoretical models and great attention should be paid to informal and hoc elements contained in the Chinese planning and control systems.

Table 8.3 provides a summary of the main assumptions and sub-assumptions we have made in this Chapter. A problem with these assumptions is that they were made without specific indications of time they are supposed to be applied. In general, we assume that they are universally applicable to both the re-reform period and the reform period. However, differences exist between these two main periods in the New China's history. We indicate the major differences using notes if no different assumption is made.

CHAPTER 9

AN ANALYSIS OF CHINESE REWARD SYSTEMS:

MODELS AND PRIMITIVE ANALYSIS

9.1 Introduction

In this Chapter, we continue the analysis of Chapter 8 but here we place the emphasis on model-building and analysis of models. Three Chinese reward systems will be separately modeled and analyzed. They are the pre-reform system, the profit-retention scheme, and the contract system.

In modelling the pre-reform system, we shall in section 9.2 make an additional assumption about the performance indicators and their role in the reward system. We shall distinguish two groups of indicators according to their relative importance in the reward system. A model of the pre-reform system will be presented and its main features identified. The incentive properties of the system will be revealed in comparisons with the NSIM and with the theoretical model developed in Chapter 7. In analysing the pre-reform system, we shall place the emphasis on information revelation, based on the assumption that this information consideration was given a priority by the planner when designing the reward system. The aspect of effort-inducement of the system will be deliberately de-emphasized by using the theoretical model developed in Chapter 7 and the assumption of risk-neutrality of the manager.

Section 9.3 models and analyzes the profit-retention system, a major reform scheme prior to the recent contract system. In this section, we shall stress the effort-inducement ability of the new system. It will be indicated that in addition to the standard moral hazard problem resulting from the planner's inability to observe the manager's action, the problem of "rent-seeking" arises in the reformed chinese planning-market environment due to the dual-price system. We shall use the model of relative performance evaluation presented in Chapter 7 as a standard and examine the motivational properties of the profit-incentive system. The analysis will result in

some observations on and discussion about problems observed in the practice such as bonus expansion and extensive bargaining.

In section 9.4, we shall look at the contract system from our agency perspective. We shall examine a number of new elements introduced into this new system and evaluate their impacts on the motivational properties of the system.

9.2 The Pre-reform System

In this section, we analyze the informational and motivational properties of the Chinese performance evaluation and reward system used in the re-reform years (1950-1978). With the general assumptions made in the previous chapter, we begin with an attempt to model the pre-reform system in the way so that the model can be analyzed using the theoretical models of Chapter 7. This means that the model we are going to build will use the agency framework and we shall call this kind of models "agency-compatible".¹ Before the model is presented, consideration will be first given to examination of Chinese success (performance) indicators, or in Chinese terms, the evaluation index (Kaohe Zhibiao). A further assumption will be made later with regard to those indicators and their relationship with the objective function of the manager. The model will be analyzed and certain observations will be made based on its deviations from the normative model in Chapter 7 and from a comparison with the NSIM.

9.2.1 An assumption with regard to performance indicators

The New Soviet Incentive Model (NSIM) is of a character which makes it compatible with the agency model: after communication of information and target-setting, the manager is rewarded according to the degree to which some pre-set criteria are met. The criteria consist of the definition(s) of success indicator(s) and,

¹By agency compatible, we mean that the assumptions underlying the model are made in line with agency concepts and the components of the model have their equivalents in the standard agency model. The New Soviet Incentive Model can be seen as agency-compatible, though it was not modelled in the specific context of agency.

in the case of multiple indicators, success indicators with appropriate indexes (weights) assigned to them, and serve to provide an overall objective criterion (criteria) against which the manager's performance is measured. Those performance indicators, combined with properly specified weights, enable the planner, at least in principle, to motivate the transmission of accurate forecasts and encourage efficient managerial decisions. In a centrally planned economy, plan fulfilment normally serves as the standard, which is defined as a weighted (indexed) average of the plan fulfilment of a small number of well-specified, measurable, and continuous variables (performance indicators) (Granick, 1990, p.164). Physical output, output value, profit, and cost have been the most heavily used variables in both Soviet and Chinese economies.²

In the Chinese case, various combinations of indicators were used during the pre-reform years. In the following analysis, we focus on the indicator system predominantly used in the middle 1970s. The indicators included output (normally in value terms, but physical measurements were used for some critical products), product mix, quality, consumption of materials, labour productivity, cost, profit, and use of working capital (see Chapter 4 for details). In principle and broadly speaking, these indicators are both observable and measurable ex post by the planner. Product mix and quality are problematic when measured quantitatively. Quality may be convertible into quantity by using quality grades and indexes. Product mix can only be measured against assigned mix in which the proportions of major products are specified. With indexes of different products, a mix variance can be calculated, however. All these indicators are assumed to be effort-driven, that is, they can reflect in some way the effort level of the manager.

Now we try to build a model of this performance evaluation system. Let $q_l (l=1, \dots, n)$ represents the vector of success indicators and $\lambda_l (l=1, \dots, n)$ the vector of the weights (indexes) assigned to the indicators. The manager's performance in fulfilling plans can then be measured by $\lambda_l (q_l - \hat{q}_l)$, where q_l is the vector of success

²In the NSIM, a single indicator q is used and the plan fulfilment ($q - \hat{q}$) serves as a standard for performance evaluation. It is certainly a simplification. Alternatively, q can be seen as a weighted outcome combining some implicit indicators.

indicators in terms of actual results and \hat{q}_i the vector of budget (planned) success indicators.

A special feature of the Chinese pre-reform reward system was that although the q_i was made known to firms beforehand, the values of weights λ_i were not. This practice distinguished it from the New Soviet Incentive Model, in which all success indicators and relevant parameters were well specified and made known to firms before the production began (Bennett, 1989, p.78). Some observers even doubt that there actually existed any λ_i or that the planner was clear as to the values of λ_i herself. Granick (1990), for example, used annual monetary earnings (including basic wages and bonuses) as a measure of rewards to employees but failed to link these rewards to any objective criteria (profit ratios or plan fulfilment ratios in his test) and suggested that Chinese firms have largely been subject to subjective evaluation by supervisory authorities (p.188).³

This seeming lack of connection between rewards and objective evaluation can, perhaps, be explained from several points of view. Firstly, the use of the profit criterion could be misleading if the price system is problematic. The irrationality of the Chinese price system has been long recognized,⁴ and it can in principle account for the reluctance of the planner to rely on profit figures as a standard for performance evaluation. One Chinese commentator speaks the necessity of price reform as follows:

Since the pricing system is so irrational and chaotic, if the situation remains unchanged, it will be impossible to assess correctly the performance of an enterprise, ensure the smooth circulation of goods between urban and rural areas, promote technological advances and rationalize production and consumption. This wastes social resources and hampers implementation of the principle of "distribution according to work". (Du, 1992, p.129-130)

³For details of the test, see note 12 of chapter 6.

⁴The Chinese price system before 1979 was basically an artificial system in which the state authority (the State Pricing Bureau) arbitrarily set and fixed prices for all products, regardless of demand and supply relationships. Some products were low-priced and others high priced. A glaring example was the prices for important raw materials, which have been more than doubled immediately after the launch of the recent reforms (Gao, 1987, p.47-50).

Secondly, Granick's failure to link rewards to plan fulfilment is a surprising result. "for it is the supervisors themselves who have set these plans" (Granick, 1990)". Granick's result may need reexamination if other material benefits than monetary income are considered as part of rewards to enterprises. As Granick (1990) noticed, expansion of housing does seem to reflect use of the objective standard of the plan fulfilment ratio (p.187). Moreover, Granick's results were based largely on data for late 1970s and early 1980s, when the importance of the plans had been reduced.

In interpreting Granick's denial of the correlation between rewards and objective evaluation of enterprise performance, two more factors should be taken into account. The first is that the rewards in Granick's mind only include monetary income (wages and bonuses). The other incentives available to firms (see Fig. 8.1) mean that there might exist certain relationship between the incentives as a whole and performance evaluation. The second factor is that there may be a performance evaluation system which is different from that used by Granick (profit ratios and plan fulfilment ratios). This latter point will be discussed later.

Earlier observations made by Richman (1969) on bonus payments and the formation of the enterprise fund⁵ present a slightly different picture of the performance evaluation system used in the mid-1960s. Richman believed that there must be some links between rewards and success indicators but only "key indicators" played an important or decisive role in this relationship. However, there did not exist any official statement of "key enterprise success indicators" used in performance evaluation. Richman had to use several approaches in determining what appeared to have been the key success indicators⁶. His findings show that the number of key or

⁵The enterprise fund was introduced in the early 1960s. The enterprise which was entitled to the fund could retain a small proportion of its earned profits. This fund was essentially a reward and welfare fund. The enterprise fund system was abolished during "the Cultural Revolution" and reintroduced in 1978 and finally replaced by the profit retention system in 1979.

⁶One approach Richman used was to ask the enterprise executives and higher-level industrial officials. Another approach was to find out what targets had to be fulfilled in order for the enterprise to receive bonuses. The third approach was to find out which targets had to be fulfilled for the firm to establish an "enterprise fund"

top-priority success indicators ranged between three and six at most of the enterprises surveyed, with the median number being estimated to be four (p.752). Total profit or profitability computed in relation to total costs or sales was one of the key success indicators⁷. Gross output in constant-price or physical terms were also regarded in most cases as a key success indicator, especially in heavy-industry firms. Product quality was an officially stressed indicator at a large majority of the enterprises. Cost targets in various forms⁸ were seen as a key success indicator at roughly half of the surveyed enterprises. Other indicators which were used in some cases as key indicators were labour productivity, a raw material utilization norm, and technical innovation or new product development.

The methods that Richman used to determine key success indicators imply that there did exist links, though weak in some cases, between these success indicators and receipt of bonuses and the entitlement of the enterprise fund. However, the choice of the key success indicators, at which the enterprise aimed to maximize were subject to the enterprises understanding and interpretation of state policies:

Given the fact that Chinese enterprises typically have a number of key success indicators and do not have as clear-cut or precise a system of success-indicator and related rewards as in Soviet industry, how are unclear priority choices made by management? Generally stated state policies as interpreted by Chinese enterprise party cadres appear to be one common way that this type of situation is resolved. If the party cadres are not too extreme in interpreting such policies in one direction, more balanced overall enterprise performance can frequently be achieved than has typically been the case of Soviet enterprise. On the other hand, the Chinese firm is less likely to maximize results to the same degree in one or two clearly top-priority areas, such as total output, cost reduction, profit, or labour productivity. (Richman, 1969, p.753).

The existence of "key success indicators" means that the maximand for the enterprise was not all planned success indicators, but only those key indicators that

(Richman, 1969, p.751).

⁷Chapter 4 gives a more detailed discussion of profit and profitability as a success indicator in the Chinese fixed-price context.

⁸Total cost of production was the most common cost indicator. Other forms included unit costs of continuous (comparable) products, costs in relation to sales or marketable output.

were either officially stressed (but not explicitly stated) or/and "figured out" by the enterprise itself, by interpreting the state policy, capturing the spirit of directives from the higher authorities, and learning from previous experience. Given the fact that there existed so many ambiguous and subjective success indicators associated with relation between plan fulfilment and rewards, it is not surprising that Granick's well defined regression tests failed to discover any significant statistical relations between objective success indicators and enterprise benefits.

By synthesizing the above observations and analysis, we obtain two assumptions we will use regarding performance evaluation and the use of success indicators during the pre-reform years:

Assumption 9.1: The enterprise's performance with plan fulfilment was subject to continuous evaluation by the planner. The incentives given to the enterprise were linked in some way to this evaluation. However, the evaluation standards and specific linkages between rewards and success indicators were not known to the enterprise beforehand and contained subjective and ad hoc elements.

Assumption 9.2: The enterprise did not treat all plan variables as on an equal footing. The key success indicators, which were perceived by the enterprise of greater importance in determining overall performance, received more attention from the enterprise. The specification of the key success indicators and of their relative importance was in many cases not clear to the enterprise before the budgeting process and production process and was subject to the enterprise's own judgement and interpretation.

The first one of the above two assumptions indicates that there did exist a relationship between rewards to the enterprise and its performance measured by certain key indicators. The second of the assumptions states that this relationship was not clearly defined and was subject to interpretation by both the enterprise and the planner. In the following sub-section, we shall use the first of the assumptions and ignore the second for the time being. That is, we shall assume in the first instance that the Chinese pre-reform reward system was well defined and build a model based on this assumption and others. After a primitive analysis of the model, we shall

discuss the undefined nature of the system.

9.2.2 The theoretical model

Assumptions 8.1-8.4 generally establish the main elements of an agency model. This subsection will use these assumptions along with the first of those made in the previous subsection to build a formal model of the Chinese reward system for the pre-reform period. General models of reward systems in a centrally planned economy were presented in Chapter 7. In the first model built there, the planner has the function of allocating resources to better-informed managers, who possess private information on the productivity of their individual firms. Moreover, managerial effort generates disutility to the manager which is not observable by the planner. The problem of resource allocation therefore combines problems of information elicitation and of effort inducement.

The Chinese planner's problem of collecting information from enterprises and motivating enterprises to fulfil plans resembles, to a great extent, the problem set early in Chapter 7, or the general planning model presented in 7.3.3. Underlying the model in 7.3.3 were some assumptions made in 7.1, which are applicable to the Chinese problem. For the convenience, we restate the problem and rewrite the model in the Chinese context as follows.

The central planner has to rely on information about productivity of individual enterprises to efficiently allocate centrally controlled resources. Much of the information is held privately by firms, which compete each other for the resources from the planner. As the two inputs of production, central resource and the firm's effort, are substitutable, the firm prefers more resources and lower levels of effort. The information reported by a firm to the planner affects not only the central allocations to the firm but also the level of effort the firm has to exert afterwards in order to achieve the preset plan targets. The fulfilment of targets is linked in certain and known way to the welfare of the firm, which the firm is trying to maximize.

9.2.2.1 Utility Function of the Firm

The welfare of the firm, which the firm acts to maximize, is represented by the rewards from the planner. These rewards in the Chinese context include the basic

wages and all incentives available to the firm as a whole (see Fig. 8.1). This allows us to express the welfare of the firm as

$$\begin{aligned} W &= w + [(m_1 + m_2) + n] = w + (M + n) \\ &= w + B \end{aligned} \quad \begin{array}{l} w > 0, \\ B \geq 0 \end{array} \quad (9-1)$$

where W is the welfare of the firm, w represents the basic monetary income (salaries and wages) which does not change with the performance of the firm. w also represents the minimum income level that the firm can obtain to sustain its employees, therefore representing the reservation utility of the firm. m_1 and m_2 in (9-1) represent the monetary rewards (eg. bonuses) and non-monetary awards (eg. welfare investments) included in the general category of material incentives (M) available to the firm.⁹ n in (9-1) is non-material (moral) incentives awarded to the firm that are effort-driven and affect the firm's welfare. The elements other than w in (9-1) are assumed to change with performance evaluation by the planner and the sum of them B can be seen as the incentives which are variable and which affect the welfare of the firm.

It was indicated by Assumption 8.3 that Chinese firms during the pre-reform years were basically risk-neutral in income (welfare), but effort averse in that ordinary workers were adverse to effort and expected a disutility for effort. If the utility function of firm i is in the form of being separable in welfare (W) and in effort (e), then we can write the utility function of the firm as

$$U_i(W_i, e_i) = W_i - Z_i(e_i), \quad (9-2)$$

where U_i is the utility of firm i and $Z_i(e_i)$ represents the disutility of effort (e_i) for i in obtaining welfare W_i . By substituting W_i in (9-1), we get

$$U_i(W_i, e_i) = (w_i + B_i) - Z_i(e_i). \quad (9-3)$$

The minimum utility for firm i is the basic monetary income (wages and salaries):

⁹The proportion of m_2 to m_1 varies greatly from time to time and from firm to firm. At present, an official statistics indicates that in most firms, m_2 exceeds m_1 . This again highlights the importance of non-monetary income to workers' welfare (RMRB, 12 May 1993).

$$\bar{U}_i = w_i. \quad (9-4)$$

The effort function $Z_i(e_i)$ is characterized by $Z_i'(e_i) > 0$ and $Z_i''(e_i) < 0$ for any $e_i \geq 0$.

9.2.2.2 Utility function of the planner.

The planner's utility is derived from the revenue generated by firms. As indicated in Assumption 8.2, the Chinese planner's main objectives, including those of political, and social nature, are sought to be achieved principally and eventually through the economic growth. Economic growth is best reflected by the increase in net national revenue. Therefore, the assumption that the planner is to seek to maximize the net revenue applies to the Chinese planner. The net revenue is the sum of gross revenues net of the sum of the total costs, which include the cost of resources $C(\cdot)$ and the rewards to firms (monetary rewards only). The net revenue here has different economic meanings from that of profit in a market economy since in the Chinese context prices were arbitrary. Within this price constraint, the planner wishes to maximize the net revenue. The price constraint can alternatively be interpreted as reflecting certain other objectives of the planner. For example, in order to keep the costs of living low, the planner exercised a rigid price control over the price of the major farm products.

If we confine our attention to the economic objective of the planner, the planner's utility function can be written as

$$\begin{aligned} U_p &= \sum_{i=1}^N (aq_i - ck_i - W_i) \\ &= R - C - \sum_{i=1}^N W_i \end{aligned} \quad (9-5)$$

where a is the price for the single output q and $R = aq_i$ represents gross revenue generated by firm i ; c is unit price for resource k and $C = ck_i$ represents the resource cost occurred in firm i . W_i in (9-5) is cost of labour, which includes wages and all awards to the firm measured in monetary terms. As usual, the planner is assumed to be risk neutral.

9.2.2.3 The Planner's Problem.

In the context of information asymmetry, i.e., when the planner is trying to elicit productivity parameters θ_i from firm i and/or the planner is unable to observe perfectly the effort level of firm i has exerted, normally only the second best solution is achievable by the planner to her maximization problem. This second best solution concept implies that the planner has to provide incentives for firms to report their true productivity information and to exert the level of effort that the planner desires. Following the general model of incentive compatible mechanism in 7.3.3, we state the Chinese planner's problem as follows. The planner's problem is to design a reward function W_i in order to

$$\text{maximize } E[R(\cdot) - C(\cdot) - \sum_{i=1}^N W_i(\cdot)], \quad (9-6)$$

$$\text{subject to } E[W_i(\cdot) - Z_i(\cdot)] \geq w_i, \quad (9-7)$$

$$E[W_i(\cdot) - Z_i(\cdot) |_{\theta_i, m_i}] \geq E[W_i(\cdot) - Z_i(\cdot) |_{\theta_i, \bar{m}_i}], \quad (9-8)$$

$$\hat{e}_i \in \text{argmax} E[W_i(\cdot) - Z_i(\cdot) |_{m_i, \theta_i, k_i}], \quad (9-9)$$

$$\text{and } \sum_{i=1}^N k_i \leq K \quad \forall \theta \in \Theta, i=1, \dots, N.$$

The meanings of the symbols in (9-8) and (9-9) are the same as those in (7-12) and (7-13). Constraints (9-8) and (9-9) are incentive compatibility conditions which ensure that firm i will be better off sending the true message about its productivity (θ) and choosing the effort level recommended by the planner. Condition (9-7) is the participation constraint, which can be interpreted that the State (planner) wishes to keep a certain level of employment and maintain the existing employees at the minimum level w_i . In some models of planner-firm in a CPE, the participation constraint is dropped because agents (firms) are not allowed to quit (Qian, 1992). However, not allowing agents to quit is not implemented without cost. The cost is that the State has to pay a basic maintenance w to agents. As w is certain and is included in W , (9-7) can be rewritten as

$$E[B_i(\cdot) - Z_i(\cdot)] \geq 0. \quad (9-10)$$

Similarly, the element w_i in (9-6), (9-8) and (9-9) can be cancelled out because of its nature of being fixed and irrelevant to incentives. Thus we get a set of expressions that are exactly the same as (7-14) - (7-16).

In the Nash equilibrium framework, it has been shown that if the planner wishes to induce the truth-telling and obedient strategies from firms, there exists an optimal solution to the problem characterized above. (7-29) specifies this solution:

$$B_i^*(\Pi, \theta) = \tilde{B}_i(\theta) + D_i(\theta) [\Pi - \tilde{\Pi}(\tilde{e}(\theta))], \quad (7-29)$$

$$\text{with } \tilde{B}_i(\theta) = \tilde{\mu}_i(\theta) + Z_i(\tilde{e}_i(\theta), \theta), \quad (7-28)$$

$$\text{and } \tilde{\mu}_i(\theta) = - \int_{\theta_i}^{\theta_i} \int_{\theta_{-i}}^{\theta_{-i}} Z_{i(\theta)}(\tilde{e}_i(\tilde{\theta}), \tilde{\theta}_i) dF_{-i}(\tilde{\theta}_{-i}) d\tilde{\theta}. \quad (7-27)$$

The basic characteristics of the solution are summarized here. i) The optimal reward function is linear in Π , the gross profit for the planner. ii) The optimal reward function contains a portion $\tilde{B}_i(\theta)$, which is the sum of the disutility of optimal level of effort for firm i and the firm's information rents from possessing θ . For a given value of θ and a value of e^* , $\tilde{B}_i(\theta)$ is fixed. iii) The optimal function contains a variable portion $[\Pi - \tilde{\Pi}(\tilde{e}(\theta))]$, which is the difference between realized gross profit Π and budgeted (planned) gross profit $\tilde{\Pi}$; The mechanism (7-29) is therefore budget-based. iv) The D_i element reflects the power of incentives, which is specified by $Z_e(\tilde{e}(\theta), \theta) / \tilde{\Pi}_e(\tilde{e}(\theta))$.

These results are obtained in a specific setting with a number of simplifying and restrictive assumptions. Therefore it cannot be taken as granted that the optimal solution (7-29) is universally applicable. However, the basic characteristics outlined above represent some important principles that have been developed in agency (Laffort and Tirole, 1986), and therefore can serve as a benchmark of normative nature. In the following subsection, we build an empirical model of the Chinese

reward system used in the pre-reform period, which will be compared with the theoretical solution presented in this subsection.

9.2.3 The Empirical Model of Pre-reform Chinese Reward Function

In modelling the pre-reform Chinese reward system, we only consider the part that beyond the minimum level of utility, as in the previous sub-section. Since the basic wages and salaries or basic monetary incomes (BMI) are independent of performance evaluation and of effort level, they have no incentive implications. As the Chinese proverb "iron rice bowl" clearly indicates, employees in state enterprises, once employed, could be ensured that they would not be fired because of poor performance and their basic living standards were secured.

Having said that we present the model in the following form:

$$B_{CI} = \bar{B} + a\lambda(q_k - \hat{q}_k) + b\mu(q_{-k} - \hat{q}_{-k}) + c\lambda(\hat{q}_k(\theta) - \bar{q}_k) + S, \quad (9-11)$$

$$0 < k \leq 4, a, b, c > 0$$

where B_{CI} represents the reward function of the Chinese model I. This function is built to embody observations from the practice. It is therefore intended to be descriptive, in contrast with the theoretical model in the previous sub-section.

On the right-hand side of (9-11), the first item \bar{B} represents the fixed portion of the rewards which bears no direct relation with the firm's performance in plan fulfilment. This portion, unlike the basic monetary incomes W_i , which is also fixed, enters the function because it is not a part of reservation utility for the firm and may be changed by the State policy. It consists mainly of basic non-monetary, material benefits such as average housing and welfare facilities. It does not contain monetary or moral rewards. The second item of (9-11), $a\lambda(q_k - \hat{q}_k)$, represents the main part of performance-based rewards. q_k and \hat{q}_k are respectively actual outcomes and planned targets for the key success indicators. The number of the key indicators varies between 1 and 4. The key indicators index λ is a vector of weights assigned to the vector of key indicators: $\lambda = (\lambda_{k1}, \dots, \lambda_{kn})$. The constant a is a coefficient linking

the weighed performance on key indicators and rewards. The third term is similar to the second, with a different b coefficient instead of a , and $b < a$ because of the less important nature of non-key indicators. Intuitively, q_{-k} and \hat{q}_{-k} are actual results and planned targets for the non-key success indicators; and μ is a vector of weights assigned to the non-key indicators. q_{-k} and \hat{q}_{-k} may also include some measurable indicators of political and ideological nature. These indicators do not formally enter economic performance evaluation system but their incentive implications render their inclusion in the reward function justifiable in terms of their links to moral incentives.

The fourth component of the right hand of (9-11), $c\lambda(\hat{q}_k(\theta) - \bar{q}_k)$, reflects the firm's participation in the budgeting process and its incentive implication in terms of reward changes. \bar{q}_k is the initial control figures for the key indicators formulated and issued by the planner. These control figures are normally based on the firm's previous performance and therefore contain a ratchet element. $\hat{q}_k(\theta)$ is the final budget figure for the key indicators, formulated during the "up-and-down" interaction process. They are proposed in the first instance by the firm according to the issued control figures and the firm's own information about production capacity and productivity (θ). They are then approved and finalized by the planner. During this proposal - approval time, there may be other information exchanges between the planner and the firm, which may change the final values of \hat{q}_k . The difference between \hat{q}_k and \bar{q}_k is linked via c to rewards. The last element of (9-11), S represents a portion of rewards that are subject to the planner's subjective standards and evaluation and judgement on the firm's performance. Items \bar{B} , $a\lambda(q_k - \hat{q}_k)$, $b\mu(q_k - \hat{q}_k)$ and S are all functions of the firm's effort, and item $c\lambda(\hat{q}_k(b) - \bar{q}_k)$ is a function of the firm's message.

The basic features of the Chinese model I of reward system presented by (9-11) can be summarized as follows. First, it is, at least in part, linear in the firm's performance on plan fulfilment and objective achievement, therefore it is partially both plan-based and performance-based. Second, the rewards may take different forms: monetary, welfare, or moral. The moral incentives are more closely linked to the firm's performance in the fulfilment of political and social-oriented tasks and

objectives and most of them are contained in the element S . Third, the firm is subject to performance evaluation by the planner in different areas: achievements in plan fulfilment (including the key indicators and non-key indicators), attitude in budget setting process in terms of target bidding, and its performance on political and general social targets. Each of these areas are linked in certain manner to the incentives available. Fourth, the reward function contains subjective and ad hoc elements controlled by the planner. Moreover, the values of coefficients in the function are kept a secret from firms by the authorities and may be assigned and changed without the knowledge of firms.

The model (9-11) is still a much simplified presentation of the Chinese performance evaluation and reward system prior to 1979, despite the clumsy, involved expression in (9-11). The Chinese model I bears a strong resemblance to the simplified Soviet model known as NSIM in the previous chapters. In the following sub-section, we further examine the Chinese model I in the context of optimal incentive mechanism developed in 9.2.1 and in comparison with the NSIM.

9.2.4 The Analysis

9.2.4.1 The Chinese model I and the NSIM

The simplified Soviet incentive model was presented and analyzed in Chapter 2. For convenience, we copy the model here:

$$B = \begin{cases} \bar{B} + \beta(\hat{q} - \bar{q}) + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \\ \bar{B} + \beta(\hat{q} - \bar{q}) + \delta(q - \hat{q}) & \text{if } q < \hat{q} \end{cases}, \quad (2-18)$$

where B is monetary bonus for the manager and $0 < \alpha < \beta < \delta$. For the sake of comparison, we present (9-11) in a similar form as

$$B_{CI} = \begin{cases} \bar{B} + a\lambda(q_k - \hat{q}_k) + b\mu(q_{-k} - \hat{q}_{-k}) + c\lambda(\hat{q}_k(\theta) - \bar{q}_k) + S & \text{if } q \geq \hat{q}, \hat{q} \geq \bar{q} \\ \bar{B} + c\lambda(\hat{q}_k(\theta) - \bar{q}_k) + S & \text{if } q < \hat{q}, \hat{q} \geq \bar{q} \end{cases}. \quad (9-12)$$

The B_{CI} function is additively separable with non-negative components. That is, if an

budget-related element has a negative evaluation result, that element can be dropped from the calculation. However, underfulfilment or a decrease in targets may lead to penalties or losses in moral terms, such as loss of an honour title and public criticism.

It is easy to see the common feature and differences between the Chinese model I and the NSIM. Both of them are linear, additively separable with a fixed part \bar{B} and variable parts. The variable parts are plan (budget)-related, with one part being linked to plan target (budget)-setting and other part(s) to plan fulfilment. These variable parts are intended to provide the manager with incentives in choosing targets (reporting θ) and in choosing the level of effort (fulfilling the targets) respectively.

B_{CI} has some obvious differences from (2-18). Besides the contents of the rewards (various forms of rewards in B_{CI} in contrast with the single monetary rewards in (2-18)) and evaluation standard (multiple-indicators and key and non-key indicators in B_{CI} in contrast with the single target in (2-18)), there are three main differences between the two models. The first difference is that in the NSIM the values of coefficients are well-defined and made known to firms while in Chinese B_{CI} this was not the case. The claimed desirable information and motivational properties of the NSIM, as indicated in Chapters 2 and 6, are attributed largely to its definition of the values of the constants in the model: $0 < \alpha < \beta < \delta$. Moreover, in the case of effort disutility as we consider it here, if the value of β is specified such that¹⁰

$$\beta = E \left[Z'(e^*) \frac{\partial e^*}{\partial \hat{q}} \right], \quad (9-13)$$

and with properly assigned values of α and δ , the NSIM will induce truthful reporting of target \hat{q} from the manager ($\hat{q}=q^*$) and motivate the manager to fulfil the target ($q=\hat{q}$)(Weitzman, 1976; Rees, 1985; Bennett, 1989, p.85). It is also important for the values of these constants to be made public knowledge, since only if managers

¹⁰If the value of β is determined by (9-13), it is important for the manager to choose the true level of q as the target ($\hat{q}=q^*$) (Miller and Thornton, 1978). (9-13) has a simple marginal interpretation: the expected marginal disutility of fulfilling a higher target must equal β , the increase in B due to a marginal increase in the exactly achieved target.

knows these constants can they make corresponding choices from their bonus-maximizing perspective. Changes in α , β and δ have straight forward effects on \hat{q} and therefore on e in the NSIM.

For example, it is found that $\partial\hat{q}/\partial\alpha$, $\partial\hat{q}/\partial\delta < 0$, while $\partial\hat{q}/\partial\beta > 0$ (Bennett, 1989, p.86). An increase in α , the marginal reward for overfulfillment, makes the manager more willing to overfulfil and he will reduce \hat{q} . Similarly, an increase in δ will also lead the manager to reduce \hat{q} , but an increase in β will cause \hat{q} to be greater.

In the Chinese model I, one can only assume that $a > b > 0$ because of the greater importance of key indicators than non-key ones. The relation between c and the other two constants and the definition of c itself were not known to firms, and even worse still, as Granick (1990) suspects, nor to the planner. With unknown values of the coefficients, a possible response from the manager is that he figures out the probability distributions of the coefficients from previous experience and applies them to the reward function when making selections of targets and of the effort level afterwards.

This undefined nature of the Chinese reward system clearly dilutes the motivational power of the system. Without definite coefficients the system could still work if coefficients are positive and of reasonable size. The point is that the system could induce some information exchange and some effort from firms, but it could not induce optimal information and effort. Since information inducing was believed to be more important than effort inducing, the system is difficult to fine tune to reflect this preference of the planner.

The undefined nature of the Chinese system was argued to be not necessarily a disadvantage, compared with the NSIM, in the real Chinese environment (Granick, 1990, p.276-277). The incentive power of the NSIM lies partly in its well-defined coefficients. Theoretical analysis has shown that their values and interrelations must be appropriately set in order to achieve desirable effects. Therefore there is a danger that if they are not appropriately set, the model will lead to the results that are the opposite of the planner's wishes. "Apparently, Chinese principals have been more fearful than has the Soviet state of the ill effects ..., they appear to have been willing

to sacrifice the incentive advantages of having personnel know ahead of time the weighted combination of criteria by which their enterprise will be judged." (ibid.) The Chinese planner seems to have tried to achieve a more balanced, moderate result by blurring the relationship between rewards and performance and target-setting.

9.2.4.2 Information incentives in the Chinese model I.

The Chinese planning procedure, as described in section 8.4, requires the production units (enterprises as the basic units) to provide the planner with information about production potential and related resource requirements. This participation procedure, if combined with budget-based performance evaluation and reward schemes, is argued to have a significant behavioural effect (Hopwood, 1976). Participation can be seen not simply associated with determining the level of the target, but rather with providing a mechanism for exchanging information between the higher authorities and the firm (Moizer, 1991, p.136). In this context, there is also an economic rationale for participation (Christensen, 1982). Christensen (1982, 1981) has found that it is important to consider the incentives for truth-inducing reporting, as participation can have positive value when the communication structure is used for the agent's performance evaluation. This value may be even greater if the information from the communication structure is used by the planner in her own decisions, such as resource allocation.

At the beginning of Chapter 8, a hypothesis was suggested with regard to the properties of the Chinese pre-reform reward system. It was hypothesized that information elicitation was the main consideration of the planner in designing, if any, a reward system applied to state firms, since the information was assumed important in facilitating the planner's resource allocation and coordination decisions. Typically, a simultaneous presence of moral hazard and information elicitation characterizes the setting in which the firm is both effort-averse and holding private information. Fortunately, the risk neutral assumption enables us to concentrate on the information aspect of the Chinese model I, with the aid of the model (7-27)-(7-29).

The theoretical scheme (7-27)-(7-29) represents a benchmark model in the Nash equilibrium framework. For convenience of comparison, we rewrite the scheme in a simplified form as

$$B_i^* = \tilde{B}_i + D_i(q_i - \tilde{q}_i). \quad (9-14)$$

In form, (9-14) is similar to the Chinese model I presented by (9-11). They are both linear and budget (plan target)-based. They both contain fixed and variable parts. What matters here is the determination of the constants and other items in the Chinese model which cannot be fit into (9-14).

The rationale of (9-14) is that the \tilde{B}_i should compensate the firm for its disutility of the effort recommended by the planner and for the firm's reporting truthfully its θ_i . Since the recommended level of effort is fixed and determined by the planner and the true value of θ is unique, \tilde{B}_i can be fixed by the planner and should not vary with reported value of θ from the firm. This fixed-price policy for information discourages from the firm manipulating information concerning θ (by the revelation principle). The variable portion $D_i(q_i - \tilde{q}_i)$ in (9-14) is a simple output-sharing scheme, which is intended to encourage the firm to increase effort. The solution to the information revelation part of (9-14) is in line with the Groves mechanism, which states that the reward function for each firm is independent of its message choice (Banker and Datar, 1992).

In the context of resource allocation, the NSIM, in which part of bonuses are based on the self-selected target by the manager, has problems in motivating managers to report truthfully their intended targets. As analyzed in Chapter 2, when the target selected by the manager is used as a forecast by the planner in her resource allocation decision, the manager can reap individual benefits by not sending a truthful forecast. In the multi-agent setting, given that all other managers hold to their strategies of sending truthful forecast, any individual manager can benefit from sending a biased forecast. This effect can be easily seen from the design of the NSIM, which makes the rewards for the manager contingent on his self-imposed target and simultaneously makes resource allocation depend on this target.

Compared with (9-14) and the NSIM, the Chinese model I is more like the NSIM in that the firm's participation in budgeting is linked to rewards in such a way that the requested target has a proportional relation with rewards. An immediate result

of this treatment is that firms could become better off simply from boasting during the target-setting stage. In the NSIM, underfulfilment of target would entail penalties for the firm. Higher targets set in the budgeting stage involve greater possibilities of underfulfilment. The manager would therefore weight the greater bonus gained from reporting higher targets against the possible penalties due to underfulfilment of the higher targets. In the Chinese model I, there is a lack of this counteraction, since underfulfilment of high targets did not entail any penalties for firms. Richman (1969) found that a number of surveyed enterprises had requested higher targets in their plans than those which had been formally approved by higher authority. This seemingly irrational behaviour can be explained by the unbounded term $c\lambda(\hat{q}_k - \bar{q}_k)$ in the reward scheme.

However, there are certain factors that counterbalance the firm's tendency to talk big embodied in the Chinese model I. Rewards related to the targeting-high behaviour were basically of moral nature, which may in certain circumstances be not very strong incentives. Repeated underfulfilment may also damage the reputation and image of the manager in question.

9.2.4.3 Comments

In a pure economic sense, the re-reform Chinese reward system has the incentive disadvantages as analyzed above. The most obvious problem with the system, except for its non-negative treatment of separate components, is its vague and ambiguous nature, which contrasts with the well-defined NSIM (at least in theory) and the reform schemes since 1979 (to be analyzed later). If we consider some other factors than pure economic ones, the Chinese system may appear less undesirable as far as the Chinese authorities are concerned. For example, the subjective and ad hoc elements and the not-so-open nature of the Chinese pre-reform reward system did give the higher authorities much room and power to manipulate and control the behaviour of firms. It also allowed a lot of objectives to be pursued. For example, the planner could announce different values of the coefficients and weights assigned to the parameters according to her intention and environment. She might also drop any item in the reward function and give prominence to others.

Further considerations point to some ideological, sociological, and cultural factors behind the de-emphasising the use of a clearly-defined Soviet type of incentive system in pre-reform China. In ideological terms, use of material incentives and well-defined reward system seem contrary to the communist propaganda that "the workers are the real masters of the state" and "the interests of the workers and of the state are identical". The need for a well-functioning reward system was further reduced by a number of alternatives available to the Chinese authorities to direct and control enterprise behaviour. The most important of these has been the role of the Communist Party in maintaining integral cooperative relationships in Chinese industry and business:

The enterprise party committee is supposed to identify, at all times with the larger interests, objectives, and policies of the party and the state, rather than with the relatively narrow or vested interests of the enterprise. In fact, the party committee is the key local-control agent responsible for making sure that managerial decisions, plans, operations, and results at the enterprise are formulated and achieved in accordance with the best interests of the regime. This function of control and interpretation extends to the firm's cooperative relations with higher state industrial authorities, suppliers, customers, educational institutions, research and development organizations, the state bank, the trade union, and so forth, as well as to interpersonal relationships within the firm (Richman, 1969, p.266).

Another factor that has contributed to the more cooperative behaviour of the firms with authorities in China than in the Soviet Union was believed to be of cultural nature. The fact that Chinese managers were more willing to cooperate was due to a certain degree, to their "traditional cultural attitudes involving obligation, loyalty, and duty to the family which have now been transferred to the party and the regime" (ibid, p.267). In general, this kind of cooperation, compulsory or voluntary, facilitated the communication between industry and government. It also reduced the need for an economically optimal incentive system in China.

The need for an information elicitation scheme may further reduced by the repeated relationship between the firm and the State. In this context, the use of the ratchet is a common practice. Past performance of the firm serves a useful purpose in that it conveys some signals regarding to the firm's real capacity. It therefore becomes a more reasonable and economical base for target-setting.

Overall, the pre-reform Chinese reward system was a product of the specific

political and economic systems of the pre-reform period, when incentives were deemed less necessary and political consciousness more important (Fu, 1992, p.276). Without a comprehensive examination of the political and socioeconomic environment in which the system was born and operated, it is difficult to evaluate whether the system is the most appropriate for the specific pre-reform conditions. However, in the next Chapter, we shall widen our view and consider some more factors outside the formal model and offer overall comments which are more policy-oriented. In the following section, however, we extend our modelling effort to a major reform systems, the profit-retention system.

9.3 The Profit-Retention Scheme

In this section, we turn to the reform schemes introduced from late 1970s. As described in Chapter 4, a number of reform schemes, most of which were of experimental nature, were initiated by the Chinese government before the relatively stable implementation of the contract system since 1987. Among those schemes, the enterprise fund scheme, profit retention scheme, and the tax-for-profit scheme were the main ones and represented the major steps in Chinese industrial reform in late 1970s and early 1980s.

In our modelling process and analysis in this and the next chapter, we shall focus on the profit-retention scheme because of two main considerations. Firstly, the enterprise fund scheme was short-lived and can be regarded as a stepping-stone to what became the major scheme, the profit-retention scheme; Secondly, while the tax-for-profit system was seen as a big step in the process of reform (Gao, 1987), it failed to achieve the intended goal of regularizing the distributional relationship between the State and enterprises (see Chapter 4). Moreover, the patterns of division of after-tax profits under the tax-for-profit system were largely based on the previous-profit retention scheme. By and large, the reform schemes during the period 1979-1987 featured two overwhelming objectives for the State, a) providing enterprises with incentives to improve "*jingji xiaoyi* (economic efficiency, or plainly, profitability) and b) retaining controls over main areas of enterprise operation. The

profit-retention scheme was representative of some key features of the Chinese reward system applied to state enterprises during the reform period, which are to be analyzed in 9.3.3.

The emphasis in the analysis of the profit-retention scheme will be on the problem of effort-inducement, or moral hazard, instead of information elicitation in the previous sub-section. The basic rationale for this switch of focus rests on the greatly reduced importance of central planning during the reform period (See Tables 8.1 and 8.2 in Chapter 8 for a view of changes in the scope of central planning in China). As the analysis will show, the reward scheme designed by the planner also confirms our hypothesis that information elicitation becomes less important as the importance of central planning is reduced.

In the following sub-section, we shall first outline some new environmental factors assumed to affect enterprise behaviour. Based on the general assumptions made in Chapter 8 and these new factors, some more specific assumptions will be made. In sub-section 9.3.2, a model will be built reflecting the new relationship between the State and enterprises. The assumptions and the model abstract from reality and represents substantially an attempt to come to grips some factors in the "real world". In sub-section 9.3.3, we shall analyze the model, mainly from the agency perspective. Some observations are then made as a result of the analysis.

9.3.1 Between Plans and Market: New Behaviour of Firms

In the area of industrial reform, two main changes took place during the early stage of reforms (late 1970s - middle 1980s). One was that enterprises were granted greater management autonomy in a number of aspects (see Chapter 1 for details). Another was that market mechanisms were formally introduced and play a more and more important role in regulating the Chinese economy (Bromwich & Wang, 1991). This latter change gave rise to the officially termed "double track" economic system (Shuangguizhi),¹¹ which means that officially market mechanism and central

¹¹As previously indicated, limited market or quasi-market elements existed in China before the recent reform, as result of and complementary to the relatively slack Chinese planning system. However, those elements were unofficial and can only be seen as "loopholes" of the system. Moreover, they were insufficiently powerful

planning have equally important roles in regulating the economy (Zhou, 1992, p.33). Embodied in this "double track" system are concerned about at least the following key "stylized facts": (1) the parallel existence of functioning markets and the traditional system of administrative allocation and pricing; (2) market prices that are flexible and responsive to supply and demand; (3) relatively slack production plan targets in relation to capacity for most enterprises; (4) official input allocations that are insufficient for full capacity production or even to fulfil production plan targets; (5) rigidity in allocation of factors of production (land, labour, and capital); (6) a strong profit orientation on the part of enterprise; and (7) a planning system that appears to be very weak in enforcing priorities and intended to serve primarily as a means of distributing plan allocations and associated benefits or "rents" (Byrd, 1991, p.132). Some of these facts are further considered below.

9.3.1.1 The planning system.

The planning system in the reform years, as in the pre-reform period, has the basic functions of determining plan targets, state prices, input allocation, and distribution of income through wages policy and the incentive scheme. The scope of such functions in the reform years have been reduced, however. This reduced coverage of central planning omits certain parts of the above-mentioned areas from central planning. An implication of this partial planning system is that the planner may not be able to set targets on an optimizing basis (Byrd, 1991, p.157). This implication seems consistent with the Chinese reality that the planning system is highly fragmented and often works at cross-purposes and with the Chinese practice of "planning from the achieved level" (Granick, 1990, p.74). The intention of the Chinese planner to keep some important sectors of the economy under her planning and control may not be explicable from a pure economic perspective. Some of the other objectives that may be important to the Chinese planner are: (1) to maintain a certain degree of control over the economy in aggregate and a dominant control over certain critical parts of the economy; (2) to keep prices for certain goods low in order to maintain or improve the standard of living; and (3) to maintain political power

to challenge the dominant position of central planning.

through control over economy. These objectives may not necessarily be in conflict with basic economic objectives. The message is that central planning is retained in the reform period not solely or principally for the purpose of maximization of social welfare.¹² It is used by the planner to serve various purposes. Under these conditions, it seems oversimplified and unrealistic to model central planning in the reform period as an optimization device. We would suggest that the information elicitation problem considered in the previous section is no longer a main consideration for the planner in designing incentive schemes.

However, one phenomenon of Chinese practice in planning is left unexplained if the information elicitation consideration is ruled out. That is the continuing and extensive participation of enterprises in budget-setting process. Of course, the previous behavioral justification is still valid. From the economic perspective, firms' involvement in the planning process can be modeled as a bargaining game in which it may be in firms' interest to participate, and the planner may use this access to the planning process as an incentive open to firms. This hypothesis will be justified later.

9.3.1.2 The rent-seeking behaviour of firms

The Chinese "double-track" economic system embodies the "dual-price system". Under this system, there exist different prices and pricing policies for different types of products (Fig 9.1). According to official regulations, product prices may take one of three forms: the state-fixed price, a state-guided price, and the free market price. The former two are normally referred to as state prices. State-guided price needs some explanations. For certain categories of products, the enterprise may determine their prices but within limits stipulated by the State. The State recommends the "standard" price and stipulates the permissible range of fluctuation (Pricing Regulation, 1987).

¹²Chinese central planning prior to the reforms could hardly be said to have in reality served the purpose of optimization and maximization of social welfare. Central planning in China "relied mainly on administrative means to manage the economy, a policy learned from the Soviet Union" (Zhou, 1992, p.23). Its adoption was a result of mainly ideological misunderstanding rather than of economic reasoning, since traditional socialist thinking established that socialism means central planning and capitalism equals to markets (ibid.).

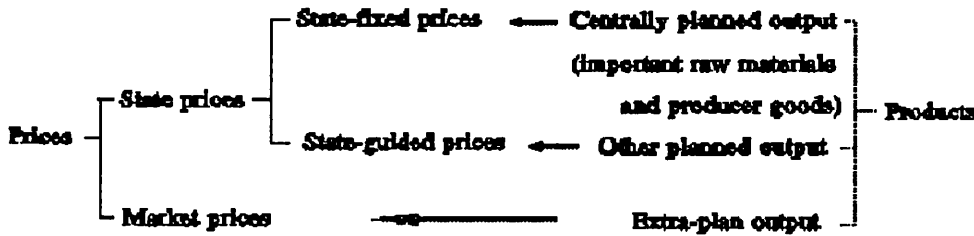


Fig 9.1 The Dual-price System, 1987

Under the "double track" system, part of total output and input for each product¹³ is controlled by the planning system, while the rest is allocated through the market mechanism. Each product has two prices, a state price \bar{p} , which applies to all transactions within the plan, and a market price \hat{p} , which applies to market transactions. In general, the market price is higher than the state price, $\hat{p} > \bar{p}$.¹⁴ This price difference means that a same product may bring the producer different contribution margins; similarly, the producer may obtain raw materials or intermediate products at different costs. The concept of allocation rents was introduced by Byrd (1991) to describe the price differences from which firms can benefit without improving efficiency. The most obvious way of seeking rents is to try to obtain as many state-allocated goods as possible and sell as many market-priced products as possible.

¹³Some consumer goods are not subject to the state control and are left to free market allocation; while the majority of important raw materials is controlled by the State. For simplicity of presentation, we assume that every product is subject to allocations through both channels and therefore the output of each product can be divided into two parts.

¹⁴Before May 1984, many large enterprises were supposed to sell all output at the state price (including extra-plan output). This forced many of them to resort to barter-like transactions, selling their above-plan output only to other firms willing to sell them products they needed at the state price in return. Price control was loosened after May 1984, and most firms were permitted to sell above-plan output at a price up to 20 percent above the state price. In 1985 and 1986, this ceiling was lifted gradually for most industrial producer goods and consumer goods (Shen and Han, 1986, p.18; Byrd, 1991, p.155-156).

Rent-seeking behaviour of firms, elicited by the large rents embodied in the Chinese allocation system, was one of the characteristics of the Chinese state-enterprises relationship in 1980s.¹⁵ Intensive bargaining over output targets, input allocations, and profit division are observed activities in which enterprise managers are bogged down (see Chapters 4 and 5). The diversion of managerial time and attention from making profits through efficient operations to seeking rents from the planning system is a serious problem. In a certain sense, the planning system itself become "increasingly oriented toward distributional infighting rather than effective management of economy " (Byrd, 1991, p.169). This may account partly for the involvement of firms in the planning procedures and confirm our earlier hypothesis that planning becomes less important in coordinating the economy and the information elicitation consideration appears less important from the planner's point of view.

9.3.1.3 Profit incentives.

As already described in Chapter 4, the incentive aspect of new reform schemes has two distinctive characteristics relative to the pre-reform system: a strong profit orientation and a clearly defined formulae that explicitly linked the financial rewards to certain criteria via pre-set coefficients. The strong profit orientation greatly reduced the importance of moral incentives in the reform period. As the bonuses and welfare investments are funded by retained profits (in loss-making enterprises, the rewards are based on reduction in losses and come from the state subsidies), enterprises have a strong incentive to generate more profits. The analysis in Chapter 2 shows that financial incentives have implications for the enterprise as a whole with workers' interests being closely tied to them, while non-financial incentives are more management-oriented in nature. Since in our models the enterprise is treated as a single agent with the manager being its representative, and Assumption 8.2 says that

¹⁵Rent-seeking activities are engaged in not only by state enterprises, but also by various middle and low level government agencies. As they are evaluated largely on the basis of the performance of their subordinate firms, they have incentives to bargain with "their" firms and higher levels of authorities. Our analysis below is limited to the firm behaviour on the assumption that they have a single principal planner.

the manager is generally not in the position to pursue his own goals, we shall place the emphasis on the financial incentives available to the enterprise in the following analysis. Moreover, as the still implicit form of non-financial incentives makes them difficult to incorporate into now well-defined financial incentive formula (see (4-1) in Chapter 4), the impacts of non-financial incentives in the reform years are considered elsewhere (Chapter 4). We shall consider them again in the next chapter.

We summarize the presentation in 9.3.1.1 to 9.3.1.3 as Assumption 9.3 relating to the expected new behaviour of firms in the reform years and Assumption 9.4 which related to the changed roles of the planning system as follows.

Assumption 9.3: Under new reform schemes, state enterprises are largely motivated by profit incentives, since they are closely linked to the bonuses and welfare investments by retained profits. Under the "double-track" economic system, enterprises are induced to engage in rent-seeking activities, causing intensive bargaining between the planner and enterprises.

Assumption 9.4: In the reform period, the coordinating role of central planning is greatly reduced as the scope of planning decreases. Central planning is retained but serves various purposes but does not function as an optimization device. Information elicitation is therefore no longer a main consideration for the planner in designing incentive schemes.

9.3.2 The Model

In this section, we attempt to place the profit-retention model into a multi-agent moral hazard setting and examine its effort-inducement properties. The multi-agent setting is similar to the one we used for the pre-reform system. The principal objective of the planner is still to seek to maximize the social welfare function represented by the sum of net revenues of all firms. However, due to difficulties in using central planning as an optimization device through optimal resource allocation and coordination of production in the partially planned environment, it is assumed that the planner seeks to maximize her net revenue by motivating individual enterprises to maximize their profits. This assumption is not a result of theoretical analysis in the ideal world. Instead it is a portrait of the Chinese reality. The following comments

provide some evidence:

During the post-Mao reform period, the major economic concern of the Chinese leadership with regard to enterprise management is how to encourage factory managers to improve efficiency so that more government revenue could be raised from state-owned enterprises. Under the enterprise reform, measures are adopted to provide greater material incentives for enterprises to earn more profits by new profit sharing arrangements. The development of rules for dividing profits between the State and state-owned firms was the key link in the reform process to improve their economic performance (Jackson, 1992, p.81).

In this context, we believe that the model of relative performance evaluation is the best model against which the Chinese system can be analyzed. Three critical factors are considered in the model: many agents, moral hazard (effort-inducement), and uncertainty. We shall first present a "standard" model in the context of single agent and uncertainty and derive the first-best solution to the model. Then we present the Chinese "real" reward model and compare it with the first-best model and tournament model. Finally, we extend the basic model into a more realistic Chinese setting and make some observations.

9.3.2.1 The setting and the first-best model.

The standard model we consider here is based on and developed from the model of relative performance evaluation in Chapter 7, presented by (7-42 - 7-44). The production function is defined as

$$q_i = q(e_i, \theta, \epsilon_i), \quad i=1, \dots, N, \quad (9-16)$$

where q_i and e_i are output and action (effort level) of i th manager respectively; θ represents a common "environmental" variable¹⁶ and ϵ_i reflects the randomness in i 's output. (9-16) is slightly different from (7-39) in that there is an individualistic disturbance in (9-16) in addition to a common random variable in (7-39). The realization of the common shock θ is observed by all managers before their action

¹⁶Note that θ has a different definition from that in the pre-reform model, in which θ represents productivity of the firm. The meaning of the common variable is further defined below.

decisions, but ϵ_i is realized after managerial decisions. This new specification of uncertainty is deemed more appropriate in a partially centrally planned environment like China in the reform era. The common shock may represent the general environment subject to central planning while ϵ_i could represent the environment outside central planning and therefore the markets faced by individual firms.

The common shock θ has following characteristics: i) the realization of θ affects the return to effort: $q_{e\theta} \neq 0$; ii) the joint realization of θ and e cannot signal precisely the value of e ; iii) the value of θ is observable by firms before they make decision on effort but not to the planner throughout the contract. The individualized shock ϵ_i has a distribution function G and its density g . The probability distributions of both θ and ϵ are common knowledge to firms and the planner. We consider a linear production function¹⁷

$$q_i = e_i \theta + \epsilon_i \quad i = 1, \dots, N. \quad (9-17)$$

The other elements of the model are the same as those in section 7.5. Briefly, the risk-neutral planner deals with N risk-averse managers simultaneously, who have an identical utility function

$$U(q, e) = \mu(B(q)) - Z(e(\theta)), \quad (9-18)$$

where B is reward to the manager. The utility of income is positive but declining: $\mu'(B) > 0$, $\mu''(B) \leq 0$; and the disutility from effort is positive and increasing: $Z'(e) > 0$, $Z''(e) > 0$.

If perfect information about e and θ are available, or, put it in another way, if e and θ are observable, to the planner, then the equilibrium exists in which the first-best optimum is achievable. As the planner is risk neutral and managers are risk averse, the managers are given perfect insurance and receive a fixed reward B_i^* which

¹⁷The choice of linear function is justified in Nalebuff and Stiglitz (1983). Other similar functions are $q_i = e_i + \theta + \epsilon_i$ and $q_i = e_i(\theta + \epsilon_i)$ (Holmstrom, 1982).

is either made dependent on the first-best output assigned to individual managers q_i^* , or dependent directly on e . The first-best level of effort e^* can be enforced at the point where the expected utility of the manager is equal to his reservation utility \bar{U} (the subscript i is omitted because of independence of the contracts):

$$\mu(B^*) - Z(e(\theta)) = \bar{U}. \quad (9-19)$$

The first-order condition gives

$$\theta u'(B^*) = Z'(e(\theta)), \quad (9-20)$$

which implies that effort is increased until the marginal utility of income multiplied by the increase in output with effort is just equal to the marginal disutility of effort:

$$e^*(\theta) \equiv Z'^{-1}(\theta u'(B^*)). \quad (9-21)$$

The expected output is specified by

$$q^* = E[\theta e^*(\theta)] = E[\theta Z'^{-1}(\theta u'(B^*))]. \quad (9-22)$$

The above q^* , e^* , and B^* define the first-best output, level of effort, and reward to the manager in the case of perfect information. Next, we look at the Chinese scheme in the context of the second-best and compare with the above solutions.

9.3.2.2 The basic Chinese model.

Chinese reward systems during the pre-contract period (1979-1986) had one common characteristic. That is the enterprise had an entitlement for certain portion of its own profit. Under the enterprise fund system, this portion was determined *ex ante* by the planner and not variable with realized profit but subject to deductions if the plan targets were not fulfilled. Under the tax-for-profit scheme, the pattern of sharing after-tax-profit between the planner and the enterprise was basically identical to the profit retention system. Moreover, under the reform schemes, financial (profit) incentives can be separate from other forms of incentives, largely because of the

explicit and well-defined formulae for the former. This allows us to examine them separately.¹⁸

The most common form of incentive formula under the profit-retention system was presented by (4-1):

$$B(\Pi, \bar{\Pi}) = \begin{cases} \alpha \bar{\Pi} + \beta (\Pi - \bar{\Pi}) & \text{if } \Pi \geq \bar{\Pi} \\ \alpha \bar{\Pi} & \text{if } \Pi < \bar{\Pi} \end{cases}, \quad (4-1)$$

$$0 < \alpha, \beta < 1,$$

subject to $\hat{q}_k / (q_k - \hat{q}_k) \geq 0$, for all k ,

where B is the portion of profit retainable by the enterprise; Π and $\bar{\Pi}$ are the realized profit and base profit respectively, and the base profit is calculated by averaging the realized profits in the immediately previous three years: $\bar{\Pi}_t = (\bar{\Pi}_{t-1} + \bar{\Pi}_{t-2} + \bar{\Pi}_{t-3})/3$; q_k and \hat{q}_k are the actual outcomes and plan targets for five plan indicators: output value, quality, costs, profits, and product variety; α and β are constants applied to the base profit and above-base profit and $\beta > \alpha$.

Reward scheme (4-1) is a single enterprise scheme with quota. It is based on targets and performance of the individual enterprise without referring to other information. Suppose that the profit function $\Pi(\cdot)$ is in the form:

$$\Pi_i(e_i, \theta, \epsilon_i),$$

which is the same as (9-17). Following Nalebuff and Stiglitz (1983), we can expect that under scheme (4-1) the manager chooses e to

$$\begin{aligned} \underset{e}{\text{maximize}} \quad & u(\alpha \bar{\Pi} + \beta (\Pi - \bar{\Pi}))(1 - G(\bar{\Pi} - e\theta)) \\ & + u(\alpha \bar{\Pi})G(\bar{\Pi} - e\theta) - Z(e) \end{aligned}, \quad (9-23)$$

¹⁸Here, we confine our analysis to profit incentives defined by profit-sharing formulae. Other forms of incentives are available, but they are not included in the formulae, and in most cases take the implicit form. See chapter 4 for a description of non-financial incentives in the reform years.

subject to $\hat{q}_k/(q_k - \hat{q}_k) \geq 0$ for all k .

The first-order condition of (9-23) is

$$\theta \Delta \tilde{u} g(\tilde{\Pi} - e\theta) = Z'(e(\theta)), \quad (9-24)$$

where $\Delta \tilde{u} = u(\alpha \tilde{\Pi} + \beta(\Pi - \tilde{\Pi})) - u(\alpha \tilde{\Pi}) = u(\beta(\Pi - \tilde{\Pi}))$, and g is density function of G , the distribution function of ϵ .

By comparing (9-24) with the its first-best equivalent (9-20), it is not difficult to see the second-best nature of (9-24) because of the presence of item $g(\cdot)$. This is expected since the Chinese scheme was constructed, on the assumption of asymmetric information. The second-best nature of (9-24) is not changed even when the manager is risk neutral (because $g' \neq 0$ unless g is uniform).

The Chinese model (4-1) can alternatively be written as a piece rate system, which is more commonly studied in the literature. In (4-1), $\alpha \tilde{\Pi}$ is guaranteed and $\beta(\Pi - \tilde{\Pi})$ is a piece-base incentive, where β is the piece rate per unit of profit. When $\Pi \leq \tilde{\Pi}$, β becomes zero. Therefore, we can rewrite (4-1) as the Chinese model II:

$$B(\Pi, \tilde{\Pi}) = \alpha \tilde{\Pi} + \beta(\Pi - \tilde{\Pi}), \quad (9-25)$$

$$0 < \alpha < 1, \quad 0 \leq \beta < 1$$

subject to $\hat{q}_k/(q_k - \hat{q}_k) \geq 0$ for all k .

The manager under this system is to select an e to maximize his expected utility given α , β and $\tilde{\Pi}$. The manager's problem is¹⁹

¹⁹We are assuming that the target fulfilment constraint $\hat{q}_k/(q_k - \hat{q}_k) \geq 0$ is not binding. This assumption is made not because plan target fulfilment does not require effort, but based on the fact that chinese plan targets are normally unambitious and relatively loose. Working within a relatively unambitious framework of low targets was in fact characteristic of chinese planning (Jackson, 1992, p.236). It was neither

$$\underset{e}{\text{maximize}} E[U] = E[u(\alpha\tilde{\Pi} + \beta(\Pi(e, \theta, \epsilon) - \tilde{\Pi})) - Z(e)]. \quad (9-26)$$

The first-order condition determines the effort level:

$$\beta\theta E[u'(\alpha\tilde{\Pi} + \beta(\Pi(e, \theta, \epsilon) - \tilde{\Pi}))] = Z'(e(\theta)). \quad (9-27)$$

We now consider a tournament scheme instead of the individualized piece-rate scheme in this sub-section and compare their results.

9.3.2.3 Comparison with tournaments.

The Chinese model II presented by (9-25) is an individualized piece-rate system, which does not use the performances of other managers in rewarding a particular manager. An immediate alternative in the multi-agent environment, as discussed in Chapter 7, is using the tournament as the device of determining rewards to managers. Consider a contest scheme

$$B = \begin{cases} B_i & \text{if } \Pi_i > \Pi_j \\ B_j & \text{if } \Pi_j > \Pi_i \end{cases}, \quad (9-28)$$

where there are two managers i and j . If i 's performance is better than j 's, he is rewarded B_i ; otherwise, the reward goes to j . In this simple two-manager case, the manager's expected utility is

$$E[U] = Pu(B_i) + (1 - P)u(B_j) - E[Z(e)], \quad (9-29)$$

the outcome of the enterprise reform nor a remnant of the Cultural Revolution period. Rather, it was a normal practice going back to the late 1950s when the Chinese planner sought to reform the Soviet planning methodology that was deemed unsuitable to the Chinese circumstances. The Chinese planning methods since then have been much less elaborate and sophisticated, "In China, it appears that the plans are often slack as a matter of deliberate policy ... This appears to result from the realization that the soviet system of aiming at taut plans generates substantial waste" (Ellman, 1979, p.39). During the reform period, targets in the State plans are becoming more lax for many firms, in order to encourage firms to use their initiatives to make better use of their real capacity through above-plan production (Jackson, 1992, p.236).

which means that a manager's expected utility is a function of the probability of his winning, which in turn depends on his level of effort, the other managers' level of effort, and variables θ and ϵ . This probability is represented by P , which, for a given distribution of ϵ , is defined by $P(e_i, e_j, \theta)$. In a Nash symmetric equilibrium, ie., $e_i = e_j$, $P = 1/2$. a manager's increased chance of winning by working harder is

$$\partial P(e, e, \theta) / \partial e_i = \partial P(e, e, \theta) / \partial e_j = \theta \bar{g}, \quad (9-30)$$

where $\bar{g} = E[g(\epsilon)]$.²⁰

Managers will increase effort until their marginal disutility from effort is just balanced by their increased chance of winning the reward. Their decision rule after observing θ is

$$[\partial P(e, e, \theta) / \partial e_m] \Delta u - Z'(e(\theta)) = 0 \quad m = i, j, \quad (9-31)$$

where $\Delta u = u(B_i) - u(B_j)$.

Substituting (9-30) into (9-31) results in the equilibrium condition:

$$\theta \Delta u \bar{g} = Z'(e(\theta)). \quad (9-32)$$

The first-best level of effort e^* is possible in this case by setting

$$u'(E[q]) = \bar{g} \Delta u, \quad (9-33)$$

where $E[q]$ is the expected outputs from the two managers.

This first-best level of effort is achievable when managers are risk neutral. However, if they are risk averse, the risk associated with prize winning means that the planner has to sacrifice some efficiency to reduce the risk borne by managers. Nalebuff and Stiglitz (1983) show that basically the pattern of the distribution of θ determines whether or not a tournament contest dominates a piece rate scheme. If the

²⁰For proof, see Nalebuff and Stiglitz, 1983, p.27.

variance of θ is great, large fluctuations in q_i are possible. Managers under a piece rate scheme have to bear the risk associated with these fluctuations with a positive piece rate, which is intended to provide a sufficient incentive for effort provision. In contrast, a contest can replicate the first-best level of effort and thus the welfare loss relative to the first best is strictly less than the loss from the risk associated with the prize. This suggests that contests can provide a certain degree of insurance when the chance of variation is large. Lazear and Rosen (1981) also illustrate that when there is a declining absolute risk aversion, the contest may dominate the piece rate.

In the context of a contest, we consider now a modified Chinese model II based on (9-25):

$$B_i(\Pi_i, \Pi_j) = \alpha \bar{\Pi} + \beta(\Pi_i - \Pi_j). \quad (9-34)$$

The difference between (9-25) and (9-34) is the replacement of $\bar{\Pi}$ in (9-25) by Π_j in (9-34), where Π_j is manager j 's output (profit). This modified Chinese model II become a tournament scheme, under which one manager's compensation includes a fixed part ($\alpha \bar{\Pi}$) and a variable part which depends on the difference between his output and another manager's output. In the symmetric equilibrium,

$$B_i = \alpha \bar{\Pi} + \beta(\epsilon_i - \epsilon_j). \quad (9-35)$$

In this scheme, the variance of the individual's income is $2\beta^2\sigma_\epsilon^2$.²¹ This scheme uses the second manager's output to filter out the uncertainty in income brought about by the common shock θ and hence $\theta e(\theta)$, but adds the variance of the second ϵ . In terms of insurance, this scheme will be preferred to an individualistic piece rate (9-25) if $E(\epsilon^2)$ is sufficiently smaller than $E[(\theta e(\theta))^2]$.

An extension of (9-34) into a many-manager environment brings the model

²¹A similar scheme was analyzed by Nalebuff and Stiglitz (1983). The conclusion here is adapted from theirs.

close to Holmstrom's concept of average-based tournament, which we considered in Chapter 7:

$$B_i = \alpha \bar{\Pi} + \beta (\Pi_i - \bar{\Pi}_{-i}), \quad (9-36)$$

where $\bar{\Pi}_{-i}$ is the weighted average performance of other managers than i . As indicated in Chapter 7, the concept of sufficient statistic can be used to rationalize schemes like (9-36). With many managers, the average output can capture all the information about the common uncertainty θ and it therefore converges to the true $\theta e(\theta)$ (the weights are used in calculating $\bar{\Pi}_{-i}$ to reflect differences in scale and the precision of ϵ_{-i}). Managers under the scheme (9-36) only bear the risk associated with their own disturbance ϵ_i . This scheme therefore provides more insurance than scheme (9-34) and represents a refined model of (9-34). The relevance of this analysis to China is considered in the following subsection.

9.3.3 Observations and Extensions

The theoretical analysis in the previous subsection concluded that when managers are risk-averse and there exists a common uncertainty factor among managers, a tournament dominates individualized schemes. The Chinese profit-retention scheme can be easily modified into a relative-performance-based reward scheme, which would enable the planner to reward managers more effectively on their effort levels. A tournament can also provide risk-averse managers with more insurance therefore improve risk-sharing between the State and managers. In this subsection, we first consider the possibilities of using tournaments in the Chinese context. We shall also consider threat-based schemes in the Chinese environment. In attempts to extend our analysis into more realistic situations in China, we shall examine the Chinese reward function in more detail and explain a common phenomenon in China, the inflation of bonuses. Finally, we shall extend the basic Chinese model to embody both the planned sector and market sector and explain the rent-seeking behaviour of firms.

9.3.3.1 The Use of tournaments in China.

The prevalent financial reward schemes used in China during the reform years have been individualistic piece-rate schemes. Relating the financial rewards to one firm to other firms' performance or the average performance of firms under an administrative authority²² was not an officially declared policy, nor it was observed in practice. One possible theoretical explanation for the absence of tournaments is the risk neutrality on the part of firms. In the context of pure moral hazard, both the piece rate and the contest are able to achieve the first-best level of effort when firms are risk neutral (Nalebuff & Stiglitz, 1983). It therefore is irrelevant whether or not contests are used. In view of the comparatively more complicated nature of contests, it seems natural to use simple piece-rate schemes. However, as analyzed in Chapter 8, assuming risk-neutrality of firms cannot be fully justified during the reform period.

Using relative performance in rewarding enterprises may prove desirable relative to individualistic schemes, as has been shown in the previous subsection. The Chinese uniform accounting system and the hierarchical organization of industrial management should provide two advantages in China of using relative performance evaluation. The uniformity of accounting reports can greatly increase the comparability of performance among enterprises and facilitate comparison of information across enterprises. The organizational hierarchical structure also increases the potential of using aggregate information since it has been a normal practice to organize similar enterprises in the same industry and same region under a single "department-in-charge". Observations show that the Chinese planner does use comparative analysis in performance appraisal (Cheng, 1989). The uniform financial analysis sheet used by enterprises and the "department-in-charge" also include comparative information (such as "compared with the average advanced level of the industry"). "Electing the advanced through comparison" has also been intensively

²²In China, an immediate candidate for such an authority is the "department in charge" at various levels of hierarchical administration. Normally, a number of firms producing similar products are organized and supervised by the department in charge. Moreover, they control major production investments into firms.

used by authorities.²³

However, the use of comparison in China has largely been restricted to moral incentives. In designing financial reward systems, the Chinese planner seems to have applied the principle of "fairness" and therefore focused much attention on the "specific circumstance" of individual enterprises, resulting in so-called "one firm, one rate" individualized schemes.²⁴ This result is consistent with the observation made by Granick (1990), who concludes that in choosing a system of evaluation, the Chinese planner has given "considerable weight to the issue of 'fairness' among enterprises" (p.277). Compared with the pre-reform system, Chinese model II is more explicit and better-defined, it should therefore provide incentive improvements over the old system in terms of effort inducement. However, it also seems true that the incentive advantages of this explicit system were not fully exploited by the Chinese planner due to other considerations, among which a concern for "fairness" among firms had the most important impact. This trade off between motivational advantages and equity has been confirmed by Qian (1992) in the agency context.

The concern of the planner with "fairness" arises from two main facts. The first is that differences in profitability among firms are not necessarily indicative of effort differences, due to differences in the original investments of the state and planned prices.²⁵ The second is the partial planned environment and the

²³These sort of campaigns are normally officially launched and involve a lot of "window-dressing" activities at the firm level. Firms often complain that these activities have become a burden for them. Moreover, the campaigns are sometimes abused in that officials from higher authorities go down to firms just to get a "treat" in the name of "inspection and evaluation" (RMRB, 5 June 1990).

²⁴In negotiating the terms of a sharing scheme or contract, information on average profitability of the industry concerned is sometimes used for reference (Xia, 1988). The effect of such information on the determination of final figures is not known due to a lack of documentation and evidence in this respect. However, the "one firm, one rate" policy may overshadow the role of average or relative information.

²⁵Chinese writers are virtually unanimous in seeing the planned "prices" or state prices as being irrational and unable to represent "true" costs. For example, it has been stated that prices of raw materials and energy are too low, while prices of processed products are too high (CASS, 1986). Another source provides data for 1978 that shows the petroleum industry to be highly profitable and agricultural equipment and coal mining to be least profitable (Lin, 1980). Similar sentiments against the price

accompanying dual-price system. Due to differences in degree by which firms are subject to central planning, marginal contributions vary greatly. Individual enterprises may try to appropriate the marginal rents embodied by the planning system without exerting productive effort (this rent-seeking problem will be further analyzed in 9.3.3.4). These two conditions may have constrained the Chinese planner in taking into account the reliability of profit figures as signals of effort. In particular, the use of relative information on profitability has been limited as a result.

9.3.3.2 Target-based threat schemes and penalties.

In the context of moral hazard, one of the incentive schemes that has received great attention in the literature has been threat scheme or "knife-edge" mechanism (Laffont and Tirole, 1986). In the context of central planning, a series of articles have been published in the Journal of Comparative Economics (JCE) concerning the possibility of implementation of target-based threat schemes (see Chapter 6 for detailed discussion and models). In this sub-section, we consider this possibility in the Chinese context. Our analysis will show that due to a number of constraints, threat-based schemes are difficult to implement in the Chinese environment.

The idea of target-based threat schemes is that by setting the target equal to a certain level of production that results from the optimal effort level (in Brown, et al., 1987, this level is equal to the lower end point of the distribution of output), the planner can detect any shirking of the manager relative to target fulfilment. A forcing contract in the form

$$w(q) = \begin{cases} w^* & \text{if } q \geq \hat{q} \\ \underline{B} & \text{if } q < \hat{q} \end{cases}, \quad (9-37)$$

will enable the planner to achieve the first-best full information results. In (9-37), w is reward to the manager, which depends on the output q , and target \hat{q} serves as the standard against which the manager's effort is measured. If the output exceeds or equate the target, the manager is rewarded w^* , otherwise he obtain a low \underline{B} . For the

system exist among enterprises.

scheme to be really threatening, this B can be set to 0 or even $-\infty$.

For the above described threat scheme to work effectively, several important conditions must be met. Firstly, the manager must be risk-averse, otherwise the threat would have no effect at all. Secondly, while the manager's utility level at plan fulfilment should be at least at his reservation level, the utility function should be unbounded from below (Brown, *et al.*, 1987). When it is bounded from below, the manager may have an effective limited liability constraint, and thus only a second-best solution is possible. Thirdly, the distribution of output should be normal and the relation between the effort level and output should be monotonic. That is to say, a greater output should always give evidence of greater effort of the manager. This third condition guarantees that the planner can infer the effort level of the manager with certainty from whether the target is fulfilled.

It is obvious that the above-described threat scheme was not implemented in China. The profits-retention scheme we modelled in this section lacks the basic characteristics of the threat scheme. The most apparent difference between the Chinese model and the threat scheme is that the Chinese model is not plan-target-based. $\bar{\Pi}$ in (4-1) is not a target, but an average base figure. Moreover, the Chinese model II is a simple linear sharing scheme based on a base figure. The plan targets in this model serves as a threshold which determines not whether a bonus or a (heavy) penalty will be applied but whether or not the bonuses are subject to reduction. The actual bonuses to which the firm is entitled had no relation to the plan targets themselves. The Chinese model II should therefore be regarded as profit-based rather than plan-based (Byrd, 1991, p.119).

A difficulty in adopting the threat scheme in the Chinese context lies in the nature of Chinese plans. According to the threat model, setting the target equal to a critical point of the output range (for example, the lower endpoint) is central in using target to induce the manager to the optimal level of effort. Given the slackness of Chinese plans, this theoretical relation becomes unrealistic, especially during the reform period. One Western observer writes:

With slack targets, tautness in plans has not been used as a means of mobilizing enterprise effort and resources. Early Chinese reform efforts attempted to create a link between material benefits and plan fulfilment at both

enterprise and individual worker levels, but this has remained tenuous in practice given the slackness and looseness of plans. In any case, the most common type of linkage between plan targets and financial incentives is of a threshold nature, with a certain level of benefits provided if the plan target is reached but no extra benefits related to the degree of overfulfillment (Byrd, 1991, p.119).

Another difficulty with the threat scheme in the Chinese context concerns the unbounded penalty prerequisite. In China the lack of penalties for poor performance was not linked to economic constraints such as bankruptcy or limited liability considerations. Rather, it tended to emerge because of ideological and political considerations. Chinese laws have been reluctant in applying severe penalties to economic agents for economic reasons, even in the theory. Here, by penalties it is meant that individuals or group of individuals are penalized because of performances in economic activities. Contrary to economic penalties, it has been common in socialist countries that individuals are subject to political penalties, which sometimes are quite severe. These political penalties can, under certain circumstances, work well to serve economic purposes. In the former Soviet Union, for example, it was observed that under the Stalin regime, the threats of exile and execution could serve to motivate managers even without explicit provision of rewards. After Stalin's death, more personal security and restrictions on penalties made moral hazard problems more severe (Osband, 1987). However, this kind of individual-oriented political penalties have been less relevant to Chinese firms, where individual managers or directors were normally exempted from personal responsibilities for economic performance of their firms, at least over certain time period.²⁶ In the economic sphere, egalitarianism shelters individuals from great losses. The State's possible tendency towards protecting individuals clearly contradicts the policy of "carrying a

²⁶The Soviet management model was characterized by the so-called one-man responsibility system, under which the manager was held sole responsibility of his firm's performance, he was also rewarded or penalized accordingly. This one-man system was introduced into China in the first instance, but caused a lot of problems. It was officially replaced in 1956 by a collective-oriented system officially called "factory-manager responsibility under the leadership of the Party committee". For details, see Laaksonen, 1988, p.196-204. The individual (director) responsibility system was restored in 1988.

big stick" of the threat scheme. In addition, one might also have regard to great job security and the State's promise to provide the "iron rice bowl" as the low boundary of the firm's utility function. Once penalties and the firm's utility are bounded, the first-best and the threat scheme become impossibilities²⁷ (Sappington, 1983).

We have examined possibilities of applying relative performance evaluation and threat-based schemes in China in this and the last sub-sections. Next, we expand our analysis of the basic model to consider two specific Chinese problems with the profit-sharing system, bonus expansion (9.3.3.3) and be rent-seeking behaviour of firms (9.3.3.4).

9.3.3.3 Bonus expansion and the reward function.

With the aid of the our earlier modelling and analysis of the Chinese profit retention scheme, we attempt in this subsection to explain a common phenomenon under the scheme, bonus expansion and benefit-pursuing behaviour on the part of firms. In Chapter 4, it was indicated that a great proportion of retained profits of firms were distributed as bonuses or invested into welfare-related facilities, despite the State's stipulation of fixed proportions with regard to intended uses of retained profits.²⁸ One estimate revealed that as much as 80 percent of retained profits have been used for bonus distribution and welfare investments, leaving only about 20 percent for productive investments (He, 1988). Moreover, the evidence suggests that the state authorities seem to have lost control over distribution of retained profits.

²⁷Osband (1987) regards the widespread use of piece rates in former Soviet and East European factories as a compensation for the state's being unable to use the threat scheme after the Stalin regime: "The considerably greater job security of soviet and East European workers relative to Western workers, and the greater ease of finding new jobs if released, may be viewed from the incentive side as extra restrictions on penalties. To compensate, Soviet and East European firms must tie 'normal' pay more directly to marginal performance, and piece rates are a convenient way to do so." Though the use of piece rates has been less widespread in China, one may see other Chinese measures such as great reliance on moral incentives and disincentives as similar phenomena.

²⁸The State stipulated that up to 30 percent, 30 percent, and 40 percent of retained profits could go in bonuses, welfare fund, and productive investments respectively.

Bonuses have been used as an effective means of increasing individual income. As a component of total monetary income for workers, bonuses made up 2.3 percent in 1978 and grew to 17.6 percent in 1989 (Jackson, 1992, p.169). In an attempt to control the expansion of bonuses, the Chinese government introduced a new bonus tax system in 1985. Under this new system, enterprises have to pay bonus tax at progressive tax rates. This new tax policy led to a new pattern of managerial behaviour. Many enterprises pay workers in kind instead of cash (*ibid.*, p.175).

This bonus expansion tendency on the part of firms can be explained if we take a closer look at the profit-retention formula (4-1). Throughout the analysis of the Chinese model II (the profit-retention scheme), the retained profits by the firm were taken as the rewards to the firm from the State. The assumption was that the firm (the manager as its representative) would try to maximize the retainable profits as the rewards to it. A problem with the Chinese profit-retention scheme was that it mixed consumption rewards (bonuses and welfare funds) with productive rewards (productive investment fund). These two kinds of rewards have different meanings to the firm. The productive rewards could benefit the firm, but the benefits are not immediate and not certain (subject to future reinvestment and production uncertainty and uncertainty in the state policy), while the consumption rewards are certain and immediate. Moreover, if the manager and personnel do not see themselves as the owners of the firm, the self-interest assumption points to the rationality of the maximizing consumption. That is to say, the firm would try to maximize the consumptive portion of the rewards if there are no workable constraints.

As the owner of the firm, the planner is naturally concerned with the value added to the firm. Intuitively, if the planner wishes to use the reward function to motivate firms to increase profits but does not want to see massive spending of enterprise retained profits for nonproductive purposes, consideration should be given to the two components of retained profits. A simple design is to let retained profits after deducting the amount going to the investment fund be used as "pure" rewards to the firm, which can be distributed freely by the firm as bonuses and welfare investments. In this way, the productive portion of profit is collected and then reinvested in the firm by the planner. Under this design, the retained profits for the firm are equivalent to the managerial bonus in the bonus model or the rewards in

the general agency model. Alternatively, the planner can "sell" the firm to the manager (or the whole work force), who then becomes the *de facto* owner of the firm. This latter idea will be considered again in the context of the contract system.

Some Western analysts explain the expansion of bonuses in China using the concept of "systems of bargaining" (Sable and Stark, 1982; Walder, 1987; Jackson, 1992). The argument is that workers normally have substantial bargaining power relative to their manager, which is supported by the permanent employment system, limited labour turnover and the almost non-existent threat of bankruptcy of the enterprise. Their demands on bonuses and welfare benefits therefore has a great impact on the managerial behaviour. In order to win their co-operation, the typical managerial strategy would be to adopt a pattern of "indulgence" towards the workers, by means of maximization of bonuses and other material benefits, and thereby minimizing conflicts (Jack, 1992, p.171). This view of an intra-firm bargaining process between the manager and workers confirms our earlier assumption that the manager is not in the position to maximize his own interest but acts for the worker-manager alliance in the face of the planner. In the interests of this alliance, the manager has to enter into another process of bargaining. This bargaining process between the manager and the planner is analyzed in the following sub-section.

9.3.3.4 Between plans and market: an extension of the model.

In subsection 9.3.1, we described briefly the Chinese "double-track" price system and the rent-seeking behaviour of the firm. In this subsection, we discuss this topic a little further and attempt to extend our earlier model of the Chinese profit-retention scheme to reflect this price system and the corresponding behaviour of the firm. This extension, as will be shown, does not change the basic characteristics of the model; but it provides some insights into the bargaining and negotiation phenomenon, which is common in China.

As indicated earlier, the difference between state prices and market prices generates substantial rents. More specifically, embodied rent is the savings to the purchaser from buying the good concerned through allocations in the plan rather than on the market. "The total value of embodied rents carried by an industrial goods can

be roughly estimated by comparing the market price and the state plan price and multiplying the difference by the amount of the goods concerned that is subject to state plan allocation²⁹ (Byrd, 1991, p.121). Symbolically,

$$r_i = (\dot{p}_i - \bar{p}_i)\dot{q}_i, \quad (9-38)$$

where r_i is the rent carried by product i , \dot{p}_i and \bar{p}_i are the market price and state price for i , and \dot{q}_i is the amount of i that is subject to state allocation.³⁰ The total rents of all products are the sum of rent carried by each individual product, $\sum r_i$.

Given the potential large rents embodied in plan-allocated products, enterprises have incentives to appropriate the rents through their involvement in the planning process. Since output of the firm can be normally divided into two parts that are allocated through state plan (planned output) and marketed by the firm (above-plan

²⁹The market price here is taken as being equilibrium price, which is the result of pure interaction between supply and demand. However, if all the rents are appropriated by selling the product on the market, this price may fall.

³⁰Byrd (1991) provides some illustrative calculations of embodied rents for centrally allocated coal, rolled steel, timber, cement, and trucks in 1985:

TABLE 9.1 EMBODIED RENTS OF SOME PRODUCTS, 1985

Product	Coal (million tons)	Rolled steel (million tons)	Cement (million tons)	Timber (million m ³)	Trucks (thousand units)
Total output	872	36.93	145.95	63.23	360
Central plan amount	441	21.0	28.3	19.4	150
State price (¥/ton, m ³ , unit)	40	700	60	170	30,000
Market price (¥/ton, m ³ , unit)	80	1,600	120	300	42,000
Embodied rents (billion ¥)	17.6	18.9	1.7	2.5	1.8

Source: Byrd, W., *The Market Mechanism and Economic Reforms in China*, N.Y., M.E. Sharpe, 1991, Table 5.5, p.122.

According to the table, market prices are often twice as high as state prices, generating a large amount of rents (differences). For example, the market price of coal is 80 yuan per ton, while its state price is 40 yuan per ton. the plan-allocated portion of the product (441 million tons) therefore carries a rent of 17.6 billion yuan.

output) respectively, the firm's profit function can be written as

$$\Pi = \sum_i (\dot{p}_i \dot{q}_i + \dot{p}_i (q_i - \dot{q}_i)) - \sum_j (\dot{p}_j \dot{q}_j + \dot{p}_j (q_j - \dot{q}_j)) - W. \quad (9-39)$$

The first term of the right side of (9-39) represents the sale revenue from its products (indexed by i) and the second term the costs of the materials and semi-products (indexed by j) consumed in the production. Both of the final products and the materials and semi-finished products can be allocated either from the planner or purchased on the market. W in (9-39) represents other costs than cost of materials. \dot{q}_i and \dot{q}_j are plan targets and plan allocations that the firm must fulfil and accept. Since resales of plan-allocated inputs are not permitted, the firm will always use any surplus plan inputs to produce extra-plan products for the market ($q_i - \dot{q}_i$). It may also seek to save plan inputs for extra-plan products through improving efficiency. The firm normally has to purchase inputs for its extra-plan products. Sometimes it also has to do so to meet its plan targets.

If plan targets and plan-allocated inputs are symmetrical, that is, the plan targets are always accompanied by an exact amount of plan-allocated inputs that needed for fulfilment of the targets, the net rents that the firm can appropriate may be minimal. To achieve this symmetrical allocation, the planner needs information on the firm's Productivity. The firm therefore has incentives to send distorted information since it can always benefit from low plan targets and high input allocations. To get a lower plan target, the firm may under-report its capacity; To obtain higher input allocations, it may under-report its productivity.

In view of this most likely information distortion on the part of the firm, the Chinese planner has to rely on some other sources to gain information. The most obvious such alternative source is historic data. The use of historic average figures as the base in the profit-retention scheme is indicative. In theory, the repeated relationship between the planner and firms enables the planner to "learn" and infer the "truth" from cumulative performance and therefore to assess the firm with greater accuracy. If the planner were confident of the accuracy of the historic information, she might be better off not letting the firm be involved in the budgeting process and

ignoring the information from the firm. The firm's involvement in the planning process has brought about intensive bargaining over output targets, input allocations, and profit distribution, which diverted a great deal of managerial time and effort from making profits through efficient operations to seeking rents from the planning system.

The rent-seeking behaviour of the firm complicates the comparatively straight forward analysis of effort-inducing problem in the normal agency context. Ideally, if the operations of Chinese firms could be divided into two separate parts which are subject to central planning and market disciplines respectively, the implications of the reward system could then be studied separately. Intuitively, the part that is subject to central planning could be regarded as being equivalent to the pre-reform system, while the part that is market-oriented would have more similarities from Western firms. However, this separating approach can hardly be justified in the sense that the two parts are in reality interrelated and the behaviour of the firm is largely affected by this interrelationship between planning and market.

To satisfactorily model this complicated setting in the agency context is difficult since several factors are simultaneously present: effort inducement, information revelation, risk aversion, and interaction of two sectors of the firm operation. Multi-agent and multi-period considerations can make the problem more intricate. This setting may provide an interesting modelling challenge for future research. Agency research at the present stage has not advanced sufficiently to lend us useful tools and models to analyze the problem in a sensible way. However, some intuitive comments can be made and they may be helpful both for policy-making purpose and to further modelling and analysis effort.

Firstly, if the planner wishes to have the firm participate in the budgeting process and report required information truthfully, she has to give the firm an incentive for so doing. Our earlier analysis indicated that this incentive should be equivalent to the information rent that is possessed by the firm. This additional reward for information should not, in theory, be large than the benefit to the planner from symmetrical allocation of inputs or the potential loss to the planner from asymmetrical allocation of inputs. Alternatively, the planner should not let the firm participate in the budgeting process and ignore relevant information from the firm. In this way, bargaining between the planner and the firm can be reduced. In this case,

attempts to solve the information problem by using historical data and average industry data.

Secondly, since effort can be used for both market sector and non-market sector, incentives have to be provided for plan fulfilment. If the plan wishes to give priority to plan fulfilment, a target-based incentive scheme can be established, in which plan fulfilment becomes the minimum requirement for rewards. This scheme is equivalent to the target-based threat scheme. Under the profit-retention scheme in reality, since the underfulfilment of plan only reduces by a limited amount the retainable profit accruing to the firm, it can easily make up this loss by putting greater effort into pursuing a larger market profit. Moreover, because of uncertainty, the firm can blame uncertainty for the underfulfilment of plan and escape the punishment, at least for some time. If the threat scheme can not be applied because of ideological and other constraints, a monitoring device for the non-market sector has to be installed. This device should enable the planner to assess whether or not appropriate level of effort has been put into the non-market sector before the firm engaged in the production for the market. In this respect, the target-based relative performance evaluation can prove useful.

Lastly, a more radical alternative is to abolish the double-track price system and the rent-seeking behaviour of the firm will disappear, so will the information elicitation problem. The whole operation of the firm is then subject to market disciplines and the planner can establish a simple reward system, which may be similar to that applied to a Western firm, to motivate the firm to act in a desirable manner. Moreover, the planner has controls over certain critical market factors such as interest rate through her policy-making power. This marketization approach is actually a variety of market socialism or the so-called "socialist market system". This approach has been confirmed as the current official line. However, the transition process may turn out to be a long one. Within the transition period, something still needs to be done. The contract system, which began in 1987, is the latest and current answer of the Chinese planner to the motivational problem. We examine this contracting approach in the next section.

9.4 The Contract System

The contract system is the current management system applied to Chinese state enterprises. The theory and practice of this system were described in detail in Chapter 5. In this section, we shall examine some important elements of the new system from the agency and contracting perspective.

As indicated in Chapter 5, the move to the contract system was mainly a result of the planner's initiative. The planner's wish to switch to the contract system could have a number of explanations. The most cited reason is the planner's wish to stabilize State revenue (Ding, 1988). Seen from the agency perspective, the planner's move can be explained by a serious problem with the profit retention system, as indicated above, the monitoring and enforcement problems faced by the planner.

Given the mix of incentives provided by the planning system and the market, the possibilities for effective monitoring and enforcement were severely limited. The difficulties the planner had in traditional central planning environment were substantially increased by the parallel market system and the rent-seeking behaviour of firms. Within the sphere of central planning, the problem of information elicitation remained; inflation of input-output coefficients in budget setting process may not only affect degree of plan fulfilment given fixed efforts but also create the opportunity of converting low-priced plan inputs into high priced output for market sale. Monitoring over fulfilment of plans is difficult when a parallel market is present. One possibility for the firm to cheat is to produce first for the market and then for the plan only late in the year, and blame "circumstances beyond the enterprise's control" for possible under fulfilment of plans³¹. Such behaviour by the firm is hard to police or penalize especially given the weakness and slackness of the Chinese planning system. The ability of firms to shift uncertainty from the market portion to the planned portion of

³¹The case of the Anshan Iron and Steel Plant is a good example of this timing strategy in the first half 1985, the Plant fulfilled only 23 percent of its state-contracted supply of pig iron but claimed that this underfulfilment was due to chronic shortfalls in plan allocations of steel scrap it received. However, informed source revealed that this result was because it was more profitable to sell pig iron at negotiated prices on the market (Xinghua News Agency, 9 August 1985).

production and the inability of the state authorities to trace the timing strategy of firms are the main causes of the monitoring and enforcement problems. Enforceability was also constrained by the extent to which financial penalties are feasible, since under the profit-retention scheme financial rewards and penalties were largely collective-oriented and welfare-related. Byrd (1991a) noted that only a strong enforcement effort, perhaps largely political in nature, would have a chance of success. However, this political enforcement would have clashed with overall government policy during the reform period, especially before June 1989.

9.4.1 New Elements

The contract system introduced certain changes in the state-firm relationship. First of all, contracts explicitly define the major aspects of the relationship between the enterprise or its manager and the supervisory agency with jurisdiction over the firm. Including in these aspects are the shares of benefit, responsibilities, authority, of the contracting parties and especially the rewards or penalties for the manager and workers. In theory, the contracts are between equals and supposedly are entered into voluntarily, which represents a departure from traditional pattern of state-firm relationship. This voluntary entrance into the contract means that the participation constraint of the manager should be strictly binding. This constraint was present in the earlier models, but under the traditional pattern of the state-firm relationship the reservation utility level for the manager could be held down to a relatively low level or even zero (but not negative). Under the contract system, since mobility of labour is possible, the manager can in reality find alternative employments (such as in joint ventures and private enterprises), his reservation utility may be positive.

Secondly, compared with the previous systems, the contract system puts much emphasis on personal rewards to the manager. With some exceptions, the manager (or director) entered into the contractual relationship with the planner as the formal representative of his enterprise. In the past, this relationship did not entitle the manager to higher income than his normal salary. The rewards and penalties under the contract system are more individual-oriented, with specifically predetermined

higher rewards to the manager in most cases.³² This individual-oriented reward scheme is accompanied by the assumption of substantial risk by the manager, with greater performance-linked variability in his rewards (see Chapter 5 for a description). In some cases, the rewards, responsibilities, and risk-bearing are group or collective-oriented, where the management (managing group) or the whole personnel of the firm enter into a contract with the State. This individual-oriented or group-oriented reward system may have created personal interest of the manager (or management) and conflicts within the manager-worker alliance. This point will be further considered later. Thirdly, the firm's performance or the managerial performance is evaluated mainly by the target profit and, in some cases, the production target. However, other targets, for example, targets for increases in asset values, technical innovation, and for product quality, are often included in the contract. Performance is thus multi-attributes or multi-dimensional. Finally, most of the contracts are relatively long-term and involve multi-year targets and incentives.

These features of the contract system represent some major efforts of the state to deal with problems of the earlier reform schemes. They also introduced some interesting points seen from the agency perspective. In this section, we try to address these points in the context of agency and contracting theory. Although the main elements of our earlier analysis apply to the new system, we are unable to address all relevant issues in a uniform, all-embracing analytical framework, as in the analysis of the pre-reform system. There are two reasons for this. The first is that relevant research has not been able to provide a ready-to-use standard framework for our purpose, especially in the context of simultaneous adverse selection and moral hazard with many risk-averse agents. Some important issues related to the Chinese system, such as multi-attribute, multi-objective contracting, are still treated in the literature in a casual way. The second reason is related to the variety of the Chinese practice itself. As can be seen from the description in Chapter 5, Chinese experiments in contracting have been greatly diversified without a "standard" model or unified practice. Any standardized analysis would therefore be oversimplified. Detailed

³²In one case for example, it was specified that the manager's rewards could exceed the average worker's income by as much as 1,000 percent (Byrd, 1991, p.14).

analysis of all aspect and practices of the Chinese contract system may well deserve a separate study which would require a much greater space than is possible in this thesis. We shall pick up only certain representative elements prevailing in the practice and address them on an *ad hoc* basis.

9.4.2 A General Assessment

In this subsection, we consider some general aspects of the contract system. We shall first present a simplified model of the contract which is applied to the majority of Chinese state enterprises. The principal-agent relationship is then reconsidered in the context of contracting. The utility function of the manager and the risk preferences of contracting parties will also reexamined.

9.4.2.1 The model.

As discussed in Chapter 5, the contract system in practice has a great diversity of formats representing differences in forms of payments, in the determination of base figures, the duration of contracts, the mix of contracting parties, and in incentive and risk-sharing arrangements. In this section, we shall base our analysis on the most common form of contracting, contracts based on progressive increases in profit-tax payments to the State. Under this scheme, the contracting parties decide and agree on a specific base profit amount to be delivered to the State and an annual rate of increase. The payments to the State are calculated according to the base and the increase rate for each contracting year. The remaining profits are to be retained by the enterprise. We express the division of profits between the State and the enterprise for the whole contract period as:

$$B(\Pi) = \sum_{i=1}^n (\Pi_i - \Pi_0(1 + \alpha)^i), \quad (9-40)$$

where $B(\Pi)$ is residual profits for the enterprise during the contract period ($i=1,2,\dots,n$), Π_i is realized profit in the i th year, Π_0 is the predetermined base figure for profit-tax payment to the State, and α is the decided annual rate of increase

in the payment to the State. The term $\Pi_0(1 + \alpha)^i$ represents the payment to the State in the i th year, this amount is compounded.

The enterprise under this scheme tries to maximize $B(\Pi)$ set in (9-40) subject to meeting other constraint targets:

$$\text{maximize } B(\Pi) = \sum_{i=1}^n (\Pi_i - \Pi_0(1 + \alpha)^i), \quad (9-41)$$

$$\text{subject to } \hat{q}_j / (q_j - \hat{q}_j) \geq 0,$$

where \hat{q}_j is the target vector and q_j the vector of outputs corresponding to the target vector. As in the previous profit-retention scheme, $B(\Pi)$ in (9-41) represents total profit incentives available to the firm as a whole, which are subject to further division by the firm in terms of wage increases and bonus distributions, welfare investments, and productive investments (the percentages are normally set in the contract). In most cases, the wage increases and bonus distributions during the contract period are explicitly pre-determined and set out in the contract. Rewards and penalties for the contractor are also separately and clearly indicated (see Appendix B to Chapter 5 for a specimen).

9.4.2.2 Principal-agent relationship under the contract system.

Under the contract system, government regulations, policies, and directives, usually in general and implicit terms, are replaced or transformed into explicit and specific terms of contracts, which are supposed to be of legal nature. The explicit and legal nature of contracts makes them easier to monitor and enforce. In this respect, the contract system may be said to be an improvement over old systems that were largely based on hierarchical structure and the somewhat haphazard relationship between state agencies and the firm.

The relationship between the firm manager and the planner under the contract system is governed by the contract. This new contractual relationship does not necessarily change the principal-agent nature of the relationship. If the ownership of the firm is still vested in the planner and the firm manager's actions are bound by the

contract, the new contractual relationship can be said to represent a typical owner-manager version of agency relationship. The core of this relationship lies in the fact that the firm manager is subject to performance evaluation by the planner and the rewards or penalties depend on this evaluation.

These is one feature of the contract system that may seemingly blur the principal-agent relationship between state authorities and the contractor. That is, under the system, it is normally the case that the firm becomes the residual claimant instead of the State under previous schemes.³³ Moreover, the firm is entitled to accumulate its own fund in a separate account during the contract years. This status of the firm seemingly points to that it acts as the principal rather than as an agent, if Granick's method of identifying principals is used. Granick (1990) considered the situation in which the firm becomes the principal instead of an agent:

This would happen if the welfare of the enterprise and its personnel depended primarily upon the results, cumulative over time, of the enterprise's actions combined with stochastic changes in the environment. Such a functional relation contrasts with dependence upon the evaluation of individual-period results by bodies outside the enterprise. The way in which I have categorized the situation of organizations that constitute principals is that they are able to accumulate wealth and act as maximizers of the present value of their wealth. (p.159).

This is a variant of Granick's property-right definition of agency. It implies that if the firm can accumulate wealth over time it enjoys a property-right of its own and then it becomes the principal. This definition has several potential problems if applied to Chinese firms, in addition to the problematic link between property-rights and the status of principal, which we have considered in Chapter 6. Firstly, even if the ability to accumulate wealth means the entitlement to property rights, Chinese firms under the contract system can only enjoy partial property rights while the State

³³Under the profit-retention scheme, for example, the retainable profit was first calculated and deducted from total profit, the remaining was turned over to the State. Under the contract system, this sequence has changed. The portion of profit-tax to go to the state is deducted from total pay off while the firm keeps whatever remains.

holds the principal ownership of firms.³⁴ Secondly, if even the firm can accumulate its own wealth it is still subject to the performance evaluation by the planner, and thus the firm is not entirely independent of outside constraints and control. Thirdly, as far as the state-firm relationship is concerned, it is hardly convincing to treat the enterprise as the principal and the State as the agent. Since the enterprise is always the party that takes actions and exerts efforts, and the welfare of the State depends on these actions. If we use a general definition of principal-agent relationship, in which the principal is who sets the reward function and who is the first mover, we believe that the nature of the State-firm relationship remains unchanged under the contract system.

In a market economy, the relationship between owners and the manager of the firm fits the definition of a pure agency relationship. This is especially obvious in the modern diffuse ownership corporation, where the "separation of ownership and control" is applied (Jensen and Meckling, 1976). The Chinese contract system facilitates this separation but does not change the ownership. However, it does change the relationship between the manager and his workers. In all our earlier treatment of Chinese state enterprises, the firm was viewed as an individual or a group of identical individuals with the manager as their representative, in dealing with the State.³⁵ This treatment is a simplification but justifiable when interests of the personnel within the

³⁴According to Article 20 of the Regulations concerning the contract system (see Appendix A to chapter 5), only retained profits during the contract period and fixed and current assets obtained using the retained profits are treated as the enterprise fund. The nature of the enterprise fund is a controversial issue in China. The fund is officially claimed to be owned by the State (Art.34), therefore ruling out the possibility of a property right for the firm. On the other hand, the firm is authorised to use the fund much more freely than state funds. This *de facto* ownership by the firm of the enterprise fund has caused state authorities to be deeply concerned with the danger that firms would try to transfer the state fund to the enterprise fund and eventually eat up the former (Fu, 1992, p.319).

³⁵This treatment was justified in terms of the overall objectives of the firm and particularly the collective-orientation of incentives available to the firm as a whole. It should be admitted to be a simplification. Moreover, strictly speaking, "the firm is not an individual" (Jensen and Meckling, 1976). In the ideal world, the firm may be viewed as the nexus of a set of contracting relationships among individuals. The firm is the outcome of a complex equilibrium process.

firm are not in a serious conflict and the incentives available to the firm are largely collective-oriented. This treatment appears problematic under the contract system, however, since the contractor's interests may not be entirely consistent with the interests of other members of the firm.

9.4.2.3 The contractor versus "the firm".

As noted earlier, the term "firm" used in this thesis is a personification by which the firm is treated as if it were a person with motivations and intentions. What "the firm" means is an equilibrium collective with identical objectives and interests. In this context, the manager of the firm, who does not have a separate personal objective(s) which is inconsistent with the objectives for the whole work force of the firm or is unable to pursue his personal objectives, is taken as the representative of the firm in dealing with the planner. "The firm" and "the manager" were thus used interchangeably. The separate reward system and other changes under the new contract system may render the above treatment less justifiable. In agency terms, the utility function for the manager may differ from that for the workers in the same firm.

Let us look at the financial rewards first. Under the contract system, the manager is eligible for an annual income that may be one to three times higher the average annual income of a worker in his enterprise (Art, 33, the "Regulations"). If we take it that the bonus for the manager may also be one to three times higher than the bonus of a worker, then the utility functions of the worker and the manager from the monetary income can be expressed respectively as

$$U_w(B_w, e) = u(B_w) - V(e), \quad (9-42)$$

$$\begin{aligned} \text{and } U_m(B_m, e) &= u(B_m) - V(e) \\ &= u(hB_w) - V(e), \end{aligned} \quad (9-43)$$

where U_w and U_m are utility functions of the worker and the manager respectively, B_w and B_m are the monetary incomes of the worker and the manager respectively, and h is the time(s) by which the manager's monetary income may be higher than the

worker's income and $1 \leq h \leq 3$. It is not difficult to see that if the manager acts to maximize (9-43), he automatically acts to maximize (9-42). This implies that as far as the financial rewards are concerned, there is no conflict between the manager's objective and workers' objective. Maximizing the manager's utility is equivalent to maximizing the workers' utility.³⁶

If we consider further non-financial rewards, especially in terms of career development and reputation, chances are that utility for the manager differs from that for the worker. Unlike the previous situation where the manager was exclusively appointed by bureaucratic authorities, the manager under the contract system is, at least in theory, selected through a competitive process involving specified criteria and formal procedures. Though it may prove difficult to make this kind of change from the old bureaucratic appointment system very quickly, the implications of the change are significant. The manager who intends to be successful in the next round of selection, should have his own managerial objectives, which may not be entirely consistent with the workers' objectives. It is observed that an important though difficult to quantify change has been the greater ability of managers to focus on financial and enterprise development goals and at least somewhat reduce the numerous non-economic objectives and burdens that impinge on the activities of Chinese state enterprises (Byrd, 1991b). One of the potential conflicts between the managerial objectives and workers' concern is related to the long-term development versus short-termism. While the manager and workers may have common interest in maximizing current financial results of the enterprise, the manager may be more concerned with the long-term development and other managerial objectives set in the contract, which are highly relevant to his managerial performance and future career development.

This potential conflict in objectives may not be of great importance to our analysis if the manager in question is the contractor who deals with the state principal. Since in this situation, the manager becomes the agent in the state-firm relationship and he may well be in the position to pursue his own managerial

³⁶Here, we assume that the disutility from effort exertion for the manager and the workers is linear and the utility functions for the both take the linear, separate, additive form. If the opposite is assumed, this statement may not be true.

objectives. The motivational problem within the firm which results from conflict in objectives becomes another level of principal-agent problem and, under the contract system, the manager seems to have sought to solve this problem using the sub-contracting approach (Chu, 1989). The so-called 'intra-firm contracted responsibility system,' which is very much in spirit of responsibility accounting, has been a common practice in many contracted firms. When the internal contracting system is implemented, the manager becomes the principal, who, with the new authority vested in him by the "Regulations", appears to have been able to design and implement better bonus and incentive systems for workers and low-level management, at least making a start at differentiating worker rewards in accordance with performance (Jackson, 1992, 153). As we are only dealing with the state-firm relationship, the aspects of internal contracting will not be discussed further. However, the principle should be the same and Western discussion on the manager-worker relationship within a Western firm, which is different to the owner-manager relationship, is relevant.

Where the contractor is a management team or the whole personnel of the firm, conflict of interests may cause problems. If some sort of game is played within the firm and an equilibrium can be reached with result of a "composite" utility function for the firm, our earlier discussions still apply. Another possibility is that due to the authoritative position of the manager, he may still be in the position to pursue his own objectives while dealing with other personnel in the firm using the sub-contracting approach. In this regard, the open, competitive selection of the enterprise manager may play an important role in establishing his authoritative position. To the extent that the manager is perceived by other members of the firm as taking greater personal and financial risks, this may have legitimized his placing himself above the others. Moreover, the position of the manager has also been enhanced by the "director (manager) responsibility system" implemented since 1986. Under this system, the manager is vested with the "central position" in enterprise management and is to be fully responsible for the enterprise operation.³⁷ The

³⁷"The director responsibility system" was first introduced in 1984 at selected pilot firms. Before this system, the leadership within enterprises was constructed according to "the director responsibility system under the leadership of the Party committee", under which the Party secretaries were important members of the

enhanced position of the manager implies that it is reasonable to regard managerial objectives as dominant in defining the utility function of the firm; or alternatively, the utility function of the manager may be the reasonable starting point in examining incentives for the firm.³⁸

9.4.2.4 Risk-bearing under the contract system.

The introduction of risk-bearing mechanisms has been one of the new features of the contract system. As described in Chapter 5, risk-bearing under the contract system takes various forms, which largely depend on the composition of the contractor party. When the contractor is the individual manager, a management team, or the whole personnel of the enterprise, the risk is borne by the manager or shared by the management team or the whole personnel respectively. Under these arrangements, the incomes of the contractor and the worker not only fluctuate with the enterprise's performance in fulfilling contract targets, the contractor and the workers are also subject to the loss of their pledged or "mortgaged" assets in the case of failure.

Setting up the risk fund and pledging personal assets are not really risk-bearing mechanisms seen from the agency perspective. Rather they can be best seen as a threat, or in the case of implementation, a penalty for the failed contractor and his

management. Under the new system, the Party committee is confined to exercising ideological and political leadership which was defined as guaranteeing and supervising the implementation in the enterprise of various Party and state guidelines and policies ("Regulations Concerning the Work of Grassroots Party Organizations in State Enterprises", in Statutes and Regulations of the People's Republic of China). The "State Enterprise Law" adopted in 1988 confirmed the director responsibility system and eventually switched the firm management from collective to individual style.

³⁸This statement is not intended to be exclusive but indicative. Some cases were reported in which the relationship between the manager and workers had been strained (Guo, et al. 1989). The enhanced position of the manager also invoked questions concerning the "master status" of workers in enterprises and democracy within enterprises (CASS, 1989). The sentiment of Party secretaries against their reduced role in enterprises can also be heard. In some cases, the collision between the manager and the Party secretary has resulted in open war against each other (Fu, 1993, p.243). It is expected that under these circumstances, compromise has to be made by the manager in determining the objectives for the firm.

colleagues and workers. The reason for saying this is that the enterprise manager (or even a management team) is simply unable to bear a significant part of the business risk of enterprise operation or investment activities. The manager and other personnel in the enterprise typically have only small bank accounts and meagre personal assets that can be pledged in the contract. In the case of failure, it would seem to be very difficult to confiscate personal assets of the manager and (or) the workers.³⁹ Besides its potential threat characteristic it serves as, a collateral device also has motivational implications in pledging personal efforts. In particular, the all-personnel collateral system seems to have a positive role in motivating all people in the firm to work hard for the contract in avoidance of the lose of their pooled fund.

The issue of risk sharing is a new problem to the Chinese planner. Prior to the implementation of the contract system, the State was virtually the bearer of all risks in operations and investments of state enterprises. Subsidies were the main means of support provided to loss-making firms. Even in the extreme cases where the State has to use bankruptcy procedures, the eventual loser is the owner, the State. Applying bankruptcy procedures to a state enterprise is a self-punishment for the State, but it is not necessarily an effective threat to the manager and his workers, since their liabilities are limited (Grimm, 1988). The contract system attempts to address the problem of risk-sharing by defining the potential punishments for the contractor. However, it does this in a half-hearted manner. As already analyzed earlier, the potential punishments may make sense in terms of negative incentives, but the risk-related practice under the contract system is far from dealing perfectly with the problem of risk and its assignment to different actors and claimants. Nevertheless, "this is not a drawback of the system *per se*, since the risk-bearing function is intimately tied in with the ownership structure of state enterprise and should be attacked from that angle." (Byrd, 1991b). We shall further consider the issue of ownership in the next chapter.

If we put the risk-pledge and risk fund aside and concentrate on the profit

³⁹Despite the common practice of pledging personal assets in contracts and reported failures (accounted for 18.2 percent of all contracted firms in 1989), few cases have been reported that involved confiscation of pledged or mortgaged personal assets.

division between the State and the enterprise under the contract system, some more points are worth noting. First, the planner has been largely motivated by her intention to secure a stable revenue from contracted enterprises. It was observed that in negotiating on the contract terms, the planner had put the top priority on guaranteeing the fulfilment of the revenue target (profits and taxes) (Grimm, 1988). A common practice when setting the target has been the fixing of the target at certain level (normally a historic level or an average historic level). In some cases, the above-target profit is shared by the state and the enterprise. In others, the target is increased annually at a fixed rate. The firm becomes in many cases the residual claimant who bears a large proportion of or even all risks. In agency language, this arrangement is clearly not optimal if the planner is risk-neutral and the firm risk-averse.

The great interest of the planner in securing her revenue in profit sharing means either that the planner is not risk neutral or that the profit division is not consistent with the risk-sharing principle in agency. The planner, being able to pool revenue from a large number of enterprises, should be able to cancel out fluctuations in revenues from different enterprises and therefore act in a risk-neutral manner. A possible reason for the departure from risk neutrality is that "the planner" in question is a local government department which is in turn subject to the performance evaluation by her higher authorities and has relatively a small number of enterprises under her jurisdiction. In this case, "the planner" herself is an agent relative to her higher authorities and her play-safe strategy may have led her to act in a risk-averse manner when dealing with enterprises. The multi-level contracting practice in recent years seems to support this reasoning.

This possible risk aversion on the part of "the planner" raises questions concerning the current design of contracts, which does not deal with the problem of risk in state enterprises in a serious manner. However, since the risk-bearing function is intimately tied in with the ownership structure of state enterprises, more questions may arise with regard to the optimal ownership structure of state enterprises and with the nature of the nominal planner herself.

Since these questions relating to the current practice have implications of future reforms, we shall leave these questions to the next chapter, where problems with the contract system will be discussed and prospects of further reforms will be

made.

9.5 Summary

In this Chapter, we present a simple analysis of the main Chinese systems of performance evaluation and reward applied to state enterprises, the pre-reform system, the profit-retention system and the contract system. The analysis was basically within the agency framework and we focused our attention on certain prominent elements of each system. The emphasis of the analysis was put upon the information and motivational aspects of the Chinese systems seen from the agency perspective. The modelling and analysis were conducted from a restricted view point, without taking into account many practical factors that were not present in the models and the conclusions are therefore intentionally limited. We shall in the next chapter make a further analysis of these systems without these restrictions of the models and some more explicit conclusions and proposals will be made there.

In section 9.2, we modelled and analyzed the pre-reform system, which applied during the period 1949-1978. Since this system was adapted from the Soviet prototype, we modelled it along the line of the New Soviet Incentive Model (NSIM) and compared them. Moreover, we assume that the planner's priority under the full central planning system was given to information elicitation. Accordingly, we built a theoretical model in the context of resource allocation and information asymmetry. The Chinese model was then compared with the theoretical model and some derivations were highlighted. We noted that the ambiguous nature and subjective and *ad hoc* elements of the Chinese pre-reform system greatly reduced its incentive power, but its incentive disadvantages might not have worried the planner if other factors are taken into account. In particular, such factors could account for the Chinese planner's not using the Soviet-type incentive schemes in the pre-reform period.

Among several reform schemes, we analyzed the profit-retention system as a representative scheme prior to the contract system. We assumed that since the importance of central planning has been greatly reduced in the reform period,

information elicitation was no longer the main consideration of the planner in designing the reward system. To motivate firms to generate more profits and fulfil plan targets seems to have been the main goal of the planner. We therefore emphasized the moral hazard (effort-inducement) problem in analysing the profit-retention scheme. We shown that the dual-price system has created rent-seeking behaviour on the part of enterprises, which increased the planner's difficulties in judging correctly the real performance of the firm. We also shown that in the multi-agent setting, relative performance evaluation may prove helpful to the planner in evaluating the performance of an individual firm. However, the profit-retention scheme was basically an individualistic reward scheme, because of the planner's concern with "fairness". Similarly, because of the loose nature of Chinese plans and limits on possible penalties, the Chinese planner is restricted in using target-based threat schemes, which could work well under certain circumstances.

In attempts to explain some common phenomena under the profit-retention system, we extended our earlier modelling and analysis of the system. The bonus expansion tendency on the part of the firm was explained by a further examination of the reward function. The bargaining problem was analyzed by an extension of the profit-retention model. We further found that during the budgeting process, the firm has incentives to misreport its production information and bargain with the planner over resource allocation, plan targets and profit shares. The simultaneous effort-aversion, risk-aversion and information asymmetry with interaction of planned sector and non-planned sector of the firm's activities make it very complicated and intricate to find a simple solution to the planner's problem.

Finally, we highlighted some changes the contract system introduced into the State-firm relationship. It was indicated that monitoring and enforcement problems with the profit-retention system were the main force prompting the planner to adopt the contract system. Under the contract system, the rewards become individual-oriented, which may create the independent utility for the manager. The performance evaluation is featured by multi-attribute set of target. Moreover, the risk-sharing problem becomes apparent with the planner acting in a risk-averse manner. However, the basic principal-agent nature of the State-firm relationship is not changed. The effects of the changes under the contract system, along with an overall assessment of

all main systems we analyzed in this Chapter, will be further considered in Chapter 10.

CHAPTER 10
FURTHER ISSUES, CONCLUSIONS
AND SUMMARY OF THE THESIS

10.1 Introduction

Throughout Chapters 6 to 9, we have used some concepts and models developed in the principal-agent framework to analyze the main Chinese reward systems applied to state enterprises since 1949. In particular, we examined informational and motivational properties of the Chinese systems in Chapter 9. The analysis was conducted in a non-integrated manner, however, in that individual systems were modeled and examined separately and individual aspects of a specific system were treated in an *ad hoc* way. This analysis enables us to see specific features of a system in its specific environment, but renders it difficult to see the relative advantages and disadvantages of the system and provide an overall assessment of the various Chinese systems.

This Chapter attempts to integrate the main points made in the previous chapters. In so doing, it attempts to derive some more explicit conclusions with regard to the incentive implications of the Chinese systems reviewed, and more importantly, to provide an assessment of the systems, which is intended to be less technical and more helpful to Chinese policy makers. The assessment is not intended to justify or criticise the Chinese reform programme *per se* but to give a clear picture of changes brought about by this programme with regard to the information elicitation and motivational aspects of the state-enterprise relationship. Since a reward system cannot be analyzed or assessed in a sensible way in isolation from the political and socioeconomic system within which it operates, a direct comparison between different reward systems does not make sense. The agency approach, however, provides a framework within which elements of different systems can be contrasted.

In the Chinese context, using the agency approach is not without its problems, especially with regard to the pre-reform system. Moreover, we also made a number of assumptions, though with justification, about agency in the Chinese context, which enable the agency approach to be applied. Here we shall reexamine implications of some of these assumptions and see what the possible results might be if the assumptions were invalid. Another concern of this Chapter is to integrate our agency conclusions with observations made in non-agency literature. We shall consider some issues relevant to our analysis but not addressed in the previous chapters. Finally, we shall summarize the main contexts of previous chapters, highlighting the contributions we have made. Limitations of this thesis will also be considered and implications for further research be suggested.

In section 10.2, we first summarize the main points we raised in analysing the pre-reform Chinese reward system in Chapter 9. The approach we took in Chapter 9 was basically incentive-based, which enabled us to compare the Chinese system with the New Soviet Incentive Model and with a theoretical model developed in Chapter 7. In this framework, it is shown that the Chinese system has a number of drawbacks but other considerations may have ameliorated to a certain extent the negative effects of the drawbacks. An alternative approach to the pre-reform system is the direct control approach, which involves no incentives but is based on direct commands. We shall argue that although this latter approach appears appealing to the planner and seems to be applicable to the pre-reform period in China, it requires certain conditions to work well and during the great part of that period some of the conditions were absent.

In section 10.3, we summarize the analysis of the profit-retention system. We shall emphasize the moral hazard problem under the dual-price system and in the partial plan environment. The advantages of the reform scheme relative to the pre-reform system will be highlighted and the problems indicated. We shall also make policy-related suggestions regarding these problems. The contract system is the planner's current answer to the problems existing with pre-contracting schemes. We shall in section 10.4 examine the advantages and disadvantages of the new system. Suggestions will then be made with regard to the future reforms.

Section 10.5 will summarize the main contents of previous chapter. To avoid

much repeat, we shall focus on the contributions we think we have made in each chapter. The final section, section 10.6 will highlight some major limitations of this thesis. Suggestions for further research will be then made in light of these limitations.

10.2 Centralization and Incentives: the Pre-Reform System Revisited

In this section, we focus on the pre-reform Chinese reward system. We firstly summarize the main points made in the previous chapters about this system, then we consider other arguments and observations made in the literature and draw conclusions based on the discussion.

10.2.1 Incentive-based Approach

The pre-reform Chinese economic system is conventionally regarded as a centralized or command economic system. As indicated earlier in Chapter 8, this is, in our view, only partially true. The pre-reform Chinese centralized economic system involved centralized decision-making and, as in other CPEs, economic decisions were often strongly influenced by political and ideological decisions. At the same time, the system was decentralized in terms of information distribution. The simple fact was that even if the central decision maker could handle a large number of decisions,¹ it was unlikely that she was also able to gather and process all information needed for the decision-making purposes. As indicated earlier, a planning mechanism in this informationally decentralized economy served an important information gathering and resource allocation role. This planning mechanism was supposed to replace the market mechanism in a market-regulated economy, which serves a similar purpose. Another indicator of only partial centralization was that instead of making all decisions the central planner was only concerned with major decisions such as resource allocation while leaving many local decisions to firms and their immediate supervisory agencies. In particular, the firm could, without knowledge of government agencies, determine

¹In fact, even decision-making centralization proved to be difficult. In pre-reform China, decentralization occurred at the level of regional governments. In this way, the whole economy was actually partitioned into sub-economics of a smaller scale.

its effort level, which might result in overfulfilment or underfulfilment of assigned targets from the State.

Among other approaches to managing the economy which were available to the planner, there exists an incentive-based (agency) approach, which we used to examine the Chinese reward systems. A basic element of this approach is to treat all participants as being economically rational, implying that both the firm and the planner were self-interested and expected utility maximizers, though not necessarily on their own behalf. We once used the concept of "agency-compatible" (Chapter 9). The central point of an agency-compatible system is that it should be incentive-compatible (Conn, 1979). That means that enterprises are directed by a reward system that is supposed to provide the enterprises with incentives to do the things desired by the system designer, the planner. Put it in another way, the planner manages the economy by first designing a set of behavioural rules, one for each agent in the economy, that collectively guarantee that the economy performs optimally (or efficiently) and then seeking an incentive structure that renders it in each agent's self-interest to follow the prescribed behavioural rules. This incentive-based approach contrasts with the command-based direct approach, which resembles the army structure in which hierarchy and orders dominate. This command-based approach will be considered later in this section.

In analysing the Chinese pre-reform system, we used both a theoretical model developed in Chapter 7 and the New Soviet Incentive Model (NSIM) as comparisons. Both the NSIM and the theoretical model developed in Chapter 7 are incentive-based. They are both derived in the context of a central resource allocation system with information asymmetry and imperfect observation of firm actions. These two models and the Chinese model I presented in (9-12) have a common property, that is they are all budget-or target-based. In these models, the role of the target (or budget) is two-fold. It enables the planner to predict each agent's capacity and actual output and therefore facilitates resource allocation; it also serves to induce firms to produce as much as possible. Optimality is achievable using the theoretical model because the scheme is so designed that the firm finds it in its own best interest to send the correct information to the planner and then to choose recommended level of effort to maximize expected output given the allocation to it. The target is thus best regarded

as the opportunity cost of allocating k_i^* to firm i . In other words, it is the minimum output firm i would be expected to produce in order to justify both its existence as a producer and its receipt of the allocation k_i^* .

A simple interpretation of the theoretical model (9-13) is as follows: Firstly, in order to motivate firms to send correct information, the planner needs to pay for the information. The information rent of firms has to be extracted at a cost. The payment for information should be constant (in (9-13), this payment is included in the fixed term \bar{B}_i , which also includes a portion of pay that is intended to compensate for the firm's disutility of effort). Secondly, in order to motivate firms to produce as much as possible, the planner needs to reward the firm for higher output. This is reflected in the linear target-reward relationship. The variability of reward with output, or with sharing output, provides firms with incentives to produce as much as possible.²

The problems associated with the Chinese model I lie in both the information and motivation aspects. With regard to the information revelation element in the model, the proportional relation between reported targets and rewards provides firms with an incentive to lie since higher targets meant higher rewards. If the underfulfilment of targets lead to penalties, ie., negative rewards, the firm's decision with regard to maximizing rewards depends on its balancing of the higher reward gained from boasting and negative rewards brought about by underfulfilment of targets. Specifically, if $a > c$ in (9-11), the firm would gain a positive reward by boasting; otherwise it might be better off reporting lower targets. However, this tradeoff was not present in the Chinese model I, which contains no negative components. With regard to the target-fulfilment element, overfulfilment wins some rewards for the firm, which, where the relation between the degree of overfulfilment and rewards was linear, conformed to the optimal effort-rewarding rule derived in the

²Note that this simple linear output-reward relation only reflects the effort incentives without risk-sharing elements. For risk averse firms, the reward should also include risk-sharing component. This consideration is avoided by assuming the risk neutrality on the part of firms.

theoretical model described above. The optimal rule also levies negative rewards if underfulfilment occurs (in equilibrium, underfulfilment should not occur since the targets are the minimum the firm is expected to produce with the recommended level of effort). If negative rewards were not levied, it can be easily seen that the firm can always benefit from reporting higher targets but later on not fulfilling the targets. If this assertion is correct, it could be expected that underfulfilment of plan during the pre-reform period was common. Data in Table 10.1 presents a comparison between plan fulfilment before and after the recent reforms.

TABLE 10.1

PLAN FULFILMENT BEFORE AND AFTER REFORMS

Percent of Plan Fulfilment	Pre-reform Years, 1965-78		Reform Years, 1979-84	
	Number of Observations	Percent of Total	Number of Observations	Percent of Total
< 90	8	13	0	0
90 - 98	4	6	0	0
99 - 100	1	2	3	4
101 - 102	9	15	8	12
103 - 110	19	31	22	33
111 - 120	13	21	20	30
121 - 150	7	11	13	19
> 150	1	2	1	1
Total	62	100	67	100

Source: W. Byrd, 1991, Table 5.1, p.111.

According to Table 10.1, the number of underfulfilments before reforms was greater than that for the reform period (21 percent against 4 percent). This is a very crude comparison but it seems to confirm weakly the earlier assertion. Plan underfulfilment was not, however, as common as the assertion predicts. A number

of reasons can be suggested for this. We mentioned in Chapter 9 that ideological and cultural factors, such as the watchdog role of the party committee and traditionally more cooperative tendency of Chinese firms, may have reduced the incentives for firms to lie. Repeated relationships and past records also enables the planner to be reasonably knowledgeable about firms' real capacity. There might be some additional plausible reasons for less serious plan underfulfilment.

It is worth noting that the final targets for the pre-reform Chinese firms were not necessarily those reported or self-imposed by firms themselves since the final targets the firm received from the planner might have been adjusted by the planner. In anticipation of the firm's overstatement of targets, the planner could be expected to adjust the targets suggested by the firm down-ward. There is no empirical data available to test this hypothesis, but Richman (1969) found that a number of enterprises he surveyed had requested higher targets in their plans than those which had been formally approved by higher authority (p.338).

Another possible reason for less than expected plan underfulfilment lies in the Chinese model I itself. One of the distinct characteristics of the model was its undefined nature and the secrecy of its coefficients. This greatly increased randomness of the scheme. Without knowing clearly the coefficients used by the planner in calculating rewards, all that the firm could do was to estimate the rough values of these coefficients by learning from past experience and use them in determining its course of action. Compared with well-defined schemes, the Chinese model might have lost some incentive advantages flowing from having firms know the values of important coefficients and the weighted combination of criteria by which they would be judged. On the other hand, this system would induce behaviour on the part of the enterprise that was less seriously sub-optimal from the standpoint of the planner than well-defined but badly-designed schemes. Moreover, as mentioned in Chapter 9, the randomness of the system gave the planner much room for discretionary actions and for control over enterprises.

A crucial assumption maintained above was that the planner had adopted an incentive-based approach to the control of enterprises. A prevailing view of the pre-reform Chinese economy in the Western literature is that it was a "command economy", suggesting that a direct control approach was used instead of an incentive-

based approach. We consider this alternative approach next.

10.2.2 Direct Control Approach

An alternative to the above incentive-based approach is the direct control approach that is based on commands and the hierarchical structure in an economy. An extreme case of this direct approach is an army in which the general supposedly gives an order to the colonel, the colonel to the major, the major to the captain, and so on down to the buck private. Traditionally in the Western literature, Chinese economy was regarded as a "most extreme command" economy (another was the former Soviet Union) (Friedman, 1984, p.6). In this version of economic structure, individuals in the economy have "no separate volition, no separate interests". "They are carrying out an order, doing what they are told" (ibid., p.5). There is therefore no need for incentive schemes to motivate people to do right things, minimum incentive costs therefore accrue to the commander or the planner.

This command model works in two cases, either where there exist no conflicts among interests of different individuals or groups of individuals (this is the team model as Marschak and Radner (1972) suggest), or where there exists an effective threat scheme, which enables the planner to force agents to obey her orders. Either of these two cases leads to the first-best results with low incentive costs to the planner. The potentiality of using a threat scheme in China was considered in Chapter 9, where we reckoned that the need for precise detection of firms' cheating and use of unbounded penalties may prevent a threat scheme from working effectively. However, possibilities of heavy punishments, not necessarily economic nature, might have served a useful motivational purpose in a socialist country. Osband (1987) cited Soviet example to illustrate the possibility of a threat scheme:

In the 1930s Soviet managers were in notoriously insecure positions. If outcomes were poor, they could be accused of conscious sabotage and "wrecking", with ominous repercussions. The threats of exile and execution, which were quite credible, could serve to motivate managers even without explicit provision for marginal rewards under "normal" circumstances.

In pre-reform China, especially during the "Cultural Revolution", the threats of

imprisonment and execution can be argued to have had similar effects to the above Stalinist methods. However, during normal periods, when the leadership was relatively reasonable and rational, any threats should be less powerful and credible, especially those based on economic rather than political and ideological grounds.

Conflicts of interests is a major cause of incentive problems. The team model which we mentioned in Chapter 7 is based on a common preference function or utility function for all members of an organization or economy. Cooperation among the members is presumed. The problem for the planner is to choose a cost-effective information system to facilitate decision-making and coordinating activities of the Planner. This model of organization was compelling to the planner and it seems that the Chinese leadership was sometimes convinced that China had achieved its ambitious aims of unifying all people's thinking and interests (Zhang, 1990). As analyzed in Chapter 8, the Chinese communist Party spared no effort in persuading the people into thinking that pursuing self-interest and material desires was neither desirable nor necessary. To prove that individual self-interest was unnecessary, the State promised to provide the working population and their families with the basic material necessities and "iron rice bowls". To make them undesirable, material incentives and self-interest were sometimes severely criticised and labelled as decadent and philistine elements. Non-material incentives were emphasized and unselfishness was advocated.³

It would have been ideal, in a sense, if the utopia of the earlier Chinese leaders been realized. Ideologically conditioned people should be easy to control and willing to cooperate. In economic terms, minimum incentive costs would be incurred and the first-best would be always achievable. During the early years of the People's Republic, the Party's appeals did work due to the moral authority the Party enjoyed as a result of the reforms it proposed and carried out. During the early and middle 1950s, which is recalled as the "golden age" by many people, people willingly subordinated their personal material interests to the common goal, which they

³As discussed in Chapter 8, contrary to the leadership's will, self-interest and material incentives had to be restored from time to time as a way out of economic difficulties.

regarded as holy and lofty. This did not last long, especially after the great disaster in early 1960s, when tens of millions of people starved to death. People began to realize that they had their own interest of which the State could not take care. The introduction of material incentives during the 1962-65 reforms also signalled the state's recognition of this fact. However, these reforms were interrupted by the "Cultural Revolution" in 1966 and non-material incentives were again restored and emphasized.

The direct control approach denies the need for incentives. In principle, it is contradictory to the claimed "socialist principle of distribution", which states that "from each according to his ability, to each according to his effort".⁴ This principle recognizes, at least, that pay should be based on effort. Logically, if this principle was implemented, some form of effort-based reward system should be expected to exist. Incentive payments are, however, not compatible with the direct control approach.

Among Western observers, the common view on the pre-reform Chinese control system for enterprises is that there was a lack of any performance-based reward system. For example, Granick (1990) comments:

Indeed, the lack of variation in annual earnings among enterprises during the pre-reform years would suggest that that period should not be described in terms of a principal-agent game. An enterprise was neither rewarded nor punished, regardless of what it did (P.189).

This view reflects the commonly preconceived direct model accompanying the centralized economic system. If the rewards and punishments are only measured in financial terms, or precisely in terms of annual earnings, the above comment may hold for a large part of that period. If the rewards and punishments are considered to include non-financial ones, it is hardly convincing that an enterprise was neither

⁴According to Karl Marx (1875), the communist principle of distribution is "from each according to his ability, to each according to his needs". It is fortunate that Chinese leaders have never announced that China has entered the paradise of communism. Therefore the Chinese version of socialist principle of distribution was developed and applied. In the reform period, the Chinese authorities emphasize the differences between communism and socialism and officially announced that China is still at the "elementary stage of socialism" (CCP, 1984).

rewarded nor punished regardless of what it did. In criticizing central planning systems, Friedman (1984) once imagined how a manager in a CPE would be motivated to undertake a risky project:

If the venture is successful, he will no doubt receive some extra compensation; he may be awarded a medal, receive kudos and honours, become a hero of the nation. If, however, the venture is a failure,, he will almost surely be reprimanded and may lose his position and perhaps even his life and liberty (p.15).

If these kinds of rewards and punishments should be regarded at least as important as their financial equivalents, it can be said that Chinese enterprises and their managers were indeed subject to influences of a reward system, at least during "normal" times.

10.2.3 Concluding Comments on the Pre-reform System

To say the least, the shifts in economic policy during the pre-reform period cannot perhaps be fully explained from the economic point of view. The dominance of the political and ideological considerations during that period weakens any economic analysis of the pre-reform reward system. Our analysis of the pre-reform reward system represents a primitive attempt to model and dissect the system in a systematic and critical way.

Above we considered two possible approaches available to the Chinese planner to control state enterprises. The direct approach is in theory more cost-effective to the planner than the incentive-based approach in terms of lower agency costs. This approach works only in the presence of certain conditions. The Chinese planner enjoyed a short period of harmonious relationship with workers and firm managers in the earlier history of the People's Republic. During that period, the planner might not have to be concerned much about motivating people to cooperate and work hard. In addition, the underdeveloped and unsophisticated economic system at that time enabled the planner to control the state sector of the economy without great difficulties. Centralized planning and control did help the new government guide the recovery of a very backward economy that had been ravaged by wars. Central control enabled the Chinese government to establish an independent and relatively complete industrial system and national economic structure by centralization of manpower,

material, and financial resources (Zhou, 1992, p.21). As the complexity and scale of the economy grew, especially as workers manifested independent interests and required material benefits, the direct approach may no longer work. This resulted in a major introduction of incentive--oriented reforms in early 1960s. However, the regime's worries about ideology and its seeming partial ignorance of material needs of the working population brought about several substantial shifts in its incentive-related policy.

The incentive-based approach was adopted by the Chinese planner, from time to time, as a remedy for unfavourable industrial performance and poor general economic results. As we previously suggested in Chapter 8, the Chinese pre-reform incentive system was a result of compromises made by the planner between ideological "ideal" and economic and political reality. It was necessarily designed and implemented with half a heart, featuring a combination of ideological elements providing non-material incentives and the economic rationale of material incentives. The half-heartedness of the regime regarding the motivational considerations of the system was also reflected in the undefined coefficients and its reluctance to use negative economic incentives. The other mixed element of the system related to the goals that enterprises were expected to achieve. As a rule the party assigned a high priority to ideological-qualitative objectives rather than to economic-quantitative goals. Those ideological and political goals made the whole system of performance evaluation difficult to operate, as they are difficult to quantify and normally contained many *ad hoc* and discretionary elements.

In theory, centralization does not necessarily lead to inefficiency and sub-optimality. With aid of properly designed reward and information systems, it is possible for the central planner, at least in principle, to achieve optimal resource allocation and economic efficiency. Our earlier theoretical model has shown this possibility. The model enables, among other things, the planner to obtain sufficient and correct information for optimal central planning. It requires, on the other hand, a number of assumptions to work well. In the Chinese case, the sociopolitical environment and the party's concerns over non-economic factors clearly created powerful constraints for the planner.

10.3 Incentives in A Partially Planned Economy

It is not appropriate, to say the least, to blame the reward system for the low economic efficiency and productivity during the pre-reform years. In our analysis, economical rationality on the part of the planner was assumed (Chapter 8), but the validity of that assumption could be argued with sometimes strong opposing evidence. The assumption may appear less problematic if we confine our attention to the economic analysis and filter out as many political and ideological elements as possible from the analysis. Given the importance of politics in China, especially in the pre-reform China, it seems, more convincing to consider the political effects, but outside the formal model and analysis, as we did in the previous section and Chapter 9.

One of the trends which evolved during the 1980s' reforms has been seeking to minimize political and ideological effects on economic policy-making. The new government's top priority has since late 1970s been given to economic developments, despite some swings from time to time. This economic-orientation of the new Chinese leaders enabled us to undertake economic analysis in a somewhat "pure" form without too much concern about possible validity of the assumptions we made regarding the goal of the planner and her economic rationality.

In analysing the pre-contracting reform schemes, we pointed out that the main feature of these schemes was profit-sharing between the state and enterprises. The profit shares of the enterprise were supposed to be used for reinvestment, the welfare fund and bonus distribution. Accompanying the introduction of these schemes were the planner's efforts to decentralize certain decision-making authority to enterprises and the official introduction of market elements. The reward schemes during the reform years were so shaped that profit was the *de facto* measure of the firm's performance subject to limited constraints in the form of planned targets for output, quality, cost and other items, which varied under different schemes. The profit incentive has thus become the main objective that firms wish to achieve. Armed with gradually greater autonomy and freedom in various areas including production, marketing, and finance, enterprises were expected to raise profitability and productivity under market regulation and limited state control. In Chapter 9, we

analyzed some aspects of the reformed reward systems, mainly based on the profit-retention scheme. In the remaining part of this section, we shall expand the previous analysis and highlight some points that have policy-making implications.

10.3.1 Motivational Advantages of New Profit Incentive Schemes

The industrial reform programme began in the late 1970s with the initiation of new incentive systems at the firm level. The purpose of these systems was to raise the enthusiasm of managers and workers for raising profitability and productivity. The new systems sought to motivate managers and workers by linking their material interest with the performance of firms, which was supposedly measured by preset indicators. Compared to the old system, the reform systems had two major advantages in terms motivational power. Firstly, they were better defined, more explicit and more transparent. The schemes were specific and made known in advance to firms. This brought the state-enterprise relationship well into line with a typical principal-agent game, in which the agent is expected to respond to a pre-designed reward function by the principal. It greatly decreased the obscurity and discretionary elements contained in the old system.

Secondly, the new systems placed emphasis on material incentives instead of non-material incentives. This shift in emphasis clearly signalled official recognition of the need to make use of self-interest and benefit-driven behaviour on the part of managers and workers. It is difficult to generally compare material incentives and non-material incentives in terms of their relative motivational power. When material incentives are not available or limited, as in pre-reform China, non-material incentives could be powerful and provide the planner with alternative and possibly less costly means to motivate people. In the reform years, the open-door policy made ordinary Chinese people aware of higher living standard of Western countries, and the awakened materialism has become a strong driving force. Material incentives appear more powerful despite the constant and continuing official appeal for moralism.

As models in Chapter 9 show, the new reward systems did not contain any element that perceptibly had any information elicitation effects. It was reasoned in

Chapter 9 that this dropping of information elicitation can be largely accounted for by the introduction of a partially decentralized planning system. Since only portion of the enterprise's production is subject to central planning, information about the enterprise's overall production capacity because largely irrelevant for central planning. Moreover, historic data can provide the planner with useful information needed for planning purposes. The use of the ratchet reduces the need for this still further. The dropping of information elicitation in the reward system enables the planner to concentrate on the moral hazard problem, which became more serious under the dual plan-market system.

10.3.2 Moral Hazard under the Dual System

The Chinese economic system in the 1980s was basically a mixed one with coexisting central planning and market elements. The market elements were introduced and imposed on top of the existing central planning system. Under this system, it was indicated in Chapter 9 that moral hazard problems on the part of enterprises were aggravated by the interaction between the plan and the market and the dual-price system. This situation is mirrored in the planner's difficulties and problems in using profit as a measure of the enterprise's performance (effort) and in verifying whether the underfulfilment of plan is due to uncertainty or a result of the enterprise's shirking.

An important guideline with regard to the choice of performance indicator(s), according to the agency model, is that the indicator(s) should bear a traceable relation to the agent's action (effort level). In the world of uncertainty, especially when the manager has only partial control over the outcome or performance, it is possible for the manager to achieve good or bad performance whether or not he works hard, but a good performance indicator should be such that the probabilities of a particular performance change with the effort level of the manager. The performance indicator(s) should therefore be indicative or informative about the action taken by the manager.

The profit indicator in the Chinese reformed environment can hardly be seen as a good performance indicator. This is because enterprise profits can be raised in a number of ways other than by raising productivity which involves greater effort.

The rent-seeking behaviour of the enterprise, which takes advantage of the grey area between central planning and market, may be the most serious problem with a profit-based performance evaluation and reward system in a partially planned environment. Profits can be raised by raising prices, by bargaining with the planner for more materials and less plan output at state prices, or by obtaining a favourable tax treatment from the State. It was widely accepted that the input and output quantities under the plan, the plan prices for inputs and outputs, and market conditions for production outside the plan are far more important in raising profits than enterprise efforts at raising productivity (Gordon, 1990).

The profit incentives combined with the problematic profit indicator was the main source of problems associated with the Chinese profit-sharing schemes in the early to middle 1980s. The other major performance indicator, plan fulfilment suffered from a similar problem. Enterprises could simply blame unfavoured external conditions or elements out of their control for underfulfilment of plan while devoting production capacity and plan-allocated inputs to production for market. The planner's inability to separate the planned portion from the unplanned portion of the enterprise production made the verification and monitoring very difficult.

The double-track or dual system may have been a transition system from the old centrally planned system to a market system, and its merits and disadvantages are a subject beyond the scope of this thesis. Therefore, in discussing the profit-sharing schemes under this system, we took the dual system for granted. In the ideal world, where profit can relatively precisely reflect the firm's effort level, profit-sharing⁵

⁵ Note that the term profit-sharing used here implies schemes in which the firm shares (retains) a portion of its own profit as an incentive. Normally, profit-sharing is used to indicate situations in which a division shares a portion of profits generated firm-wide in the context of intrafirm resource allocation (Cohen & Loeb, 1984). Profit-sharing in this sense has been studied largely relative to its information-revelation property. In the information context, it is shown that in the presence of moral hazard problems, profit-sharing may induce a division manager to transmit misinformation so as to change the division's resource allocation and reduce the effort level subsequently selected by the manager (*ibid.*). In the Chinese context, profit-sharing (retention) schemes are studied purely in the context of moral hazard, since information revelation considerations are assumed to have been greatly deemphasized in the reform era.

should have positive motivational properties. One of these properties would be that profit-sharing provides the firm with incentives to increase its effort to the level desired by the planner, who has control over the coefficients of a profit-sharing scheme. This property is closely linked to the profit indicator's ability to signal monotonously the firm's effort level. In this sense, the ability of profit-sharing schemes to provide the firm with incentives to exert desired effort level really depends on profit's characteristics, or in other words, the signalling ability of the profit indicator. This signalling ability has been greatly handicapped under the Chinese dual-price system, under which profits can be raised by a number of ways other than exerting productive effort.

A solution to the above problem is obviously to eliminate the dual system. A competitive market system should then be established as the main regulator of the economy. This market solution has been recently confirmed by the Chinese authority, who declare that it is to be committed to developing a "socialist market economy" (RMRB, 30 March 1993). However, even if this commitment is credible, it takes time to change a centrally planned economy into a market economy. The evolutionary approach taken by the Chinese authorities means the reform process will be a long and slow one. If market reform eventually succeeds, profit may become an important criterion for evaluation of Chinese firms' performance. Problems under the dual system, such as rent-seeking behaviour on the part of the firm and faulty signalling by profit of firm's effort levels will at least be eased.

This market solution is not an agency solution though. Given the existing dual system, agency theory would suggest that there are still something that the planner can do to combat moral hazard problems. First of all, the planner should make a better use of information systems to obtain information with respect to enterprise performance that is objective and useful. In this respect, reform of the accounting system is of great significance. In the Chinese context, information (reports) from the enterprise seems to have served two distinctive purposes: macroeconomic planning (information elicitation) and performance evaluation. As indicated earlier, if one information system is intended to serve both the purposes simultaneously, a certain tradeoff has to be made. On one hand, if the planner gives first priority to information elicitation, she may well design a system to create an incentive to induce

the enterprise to report truthfully. One way of so doing is to disconnect the relationship between reported results and rewards (penalties). The problem with this design is that it may create serious moral hazard problems with an effort-averse agent. On the other hand, if the information from the firm is used in performance evaluation and what a reward system, the firm may have incentives to manipulate the signals reported to the planner. This dual-purpose dilemma may prove a major disadvantage from the agency perspective. If the Chinese planner under the dual system is more concerned with the moral hazard problems, as we previously assumed, she should perhaps discard the information elicitation requirement from the accounting system and let the system serve solely performance evaluation (providing information for that purpose) and monitoring. This control-oriented accounting system should concentrate on measuring costs and profit accurately, objectively, and reliably. Under the current system,⁶ considerable useless effort goes into collecting actual product costs under a full cost accounting system, but there is practically no classification of actual and budget costs by organization and function. The rules which governed the measurement of profit were specified with tax collection as the primary objective. The profit indicator therefore generates little information that can be useful for management control.

Secondly, if the planner is really concerned about efficiency, she should be less worried about the issue of equity and, in particular, she should get rid of egalitarianism in rewarding firms. One of the conflicts existing in an socialist economy was said to be that between efficiency and equity (see Chapter 8). If socialism meant egalitarianism, agency-type incentives would be a fantasy, since the agency approach implies great differences in income among agents with diversified performance. However, the conflict between socialism and agency may have been exaggerated and contain certain man-made elements, because the socialist principle of distribution does not mean egalitarianism; on the contrary, it should be considered

⁶A new accounting system was brought into effect as of the 1st July 1993. This system, designed in line with international standards and practice, is expected to align the Chinese accounting practice and common Western practice, under the market economic system that is taking shape in China. This means that China will eventually abandon the central planning system and the associated Soviet-type accounting system.

compatible with agency.⁷ If the planner wishes to use agency-type of incentives, the following variations in income should be allowed: variation in income across different firms, variation in income across different periods for a firm, and differential incomes within a firm.

To reward firms according to their performance, it is important to distinguish between effort-driven (generated) profit and rent-transformed profit. The former results from the firm's productive effort and should be the sole base for performance evaluation, and the latter is generated from the firm's rent-seeking behaviour and should be eliminated from the firm's performance. In this area, an information system should be, again, useful. In particular, the Chinese uniform accounting information system should facilitate evaluation of performance in two ways: relative evaluation in a multi-agent environment and continuous evaluation in the multi-period context. In the former case, as stated in Chapter 7, there exist situations where using peer firms' reports in evaluating the firm's performance is desirable. When a group of enterprises operate in a similar environment with certain common uncertainty, it is in the planner's interest to use relative performance evaluation. The rationale is that other firm's performances (or performance reports) allow the planner to more precisely determine the enterprise's level of effort (performance). In this context, the uniformity of Chinese accounting reports can greatly increase the comparability and facilitate comparison of information across enterprises. The Chinese hierarchical organization of industrial management also increases the potential for using the comparative data, as it has been a normal practice to organize similar enterprises in the same industry and same region under a single "department-in-charge".

The Chinese accounting system also enables the planner to use accumulated historic data in performance evaluation. The Chinese planner has the advantage of having a relatively long-term relationship with enterprises. The intuition with long-

⁷The socialist principle of distribution is "from each according to his ability, to each according to his performance (of work)", which contrasts with the communist principle "to each according to his needs". Thus a performance-based distribution should not have led to egalitarianism, at least in principle. One of the reasons for the egalitarian trend in the practice has been the confusion between socialism and communism (CCP, 1984).

term relationship is that time permits sharper inferences about the firm's true performance. The repeated relationships enable the planner to "learn" and infer the "truth" from cumulative performance and therefore to improve monitoring accuracy. The common practice of budgeting on the base of previous performance may be justified in this sense. However, it is difficult to find other uses of historic information by the Chinese planner in the motivational context.

The Chinese planner's answer to the serious moral hazard problem under profit-sharing schemes was more radical than what was suggested above. Instead of seeking to close a number of loopholes in the profit-based reward system, the Chinese authorities introduced the contract system in 1987, which was to provide the necessary tight structure of a binding contract to force firms to hand over to the State an agreed sum of the after-tax profit.

10.4 Control by Contracting: Force Plus Motivation

The introduction of the contract system was actuated mainly by the government's motives to stabilize state revenue from state enterprises. It was a result of the failures of previous reform schemes (including the profit-retention scheme and the tax-for-profit system) to achieve the expected results of raising economic efficiency, and increasing the State revenue. The planner's inability to monitor enterprise performances and enforce her policies led to the loss of effective control over enterprises. The contract system can be interpreted as a move back to more planing controls because managers have to comply with the terms of contract which extend to mandatory output and wage targets as well as the guaranteed payment of taxes and profits to the State (Jackson, 1992, p.125). However, the contract system can be hardly seen as a simple restoration of the old centralized planning and control system. It has brought about incentive improvements under the existing dual-price system and partially planned economic system. In Chapter 9, we gave a general assessment of the new characteristics of the contract system. In this section, we further evaluate those new features in terms of the incentive advantages and disadvantages they bring about. Based on this evaluation, we shall suggest possible further directions for Chinese future reform in the area of state enterprise

management.

10.4.1 Major Improvements

The contract system has brought about the following major improvements in the motivational aspects of the state-enterprise relationship.

Firstly, the equalitarianism under the contract system has become less powerful, since the differences in income across different firms and within a firm are greater than under previous schemes. The rewards to managers can be several times higher than to other personnel in the firm. Within a firm, the manager has been vested with authority to design and implement better bonus and incentive systems for workers. This, at least, is making a start at differentiating worker rewards in accordance with performance. This, to say the least, indicates that the Chinese planner's concern over the issue of equity or "fairness" may have been reduced with the introduction of the contract system. The new policy of "allowing some people to get rich first"⁸ and the attempts to smash the "iron rice bowl" in recent years may be indicative of the Chinese planner's new anti-egalitarianism tendency. If no trade off has to be made between providing incentives and reducing income differences, a more effective reward system should be expected.

Secondly, the contract system has attempted to personalize enterprise interests by making contractors a relatively independent class of entrepreneurs instead of officially appointed cadres or unofficial workers' representatives. In our earlier analysis of Chinese reward systems, the State-firm relationship was simplified as the planner-manager agency relationship. This approach assumes that the planner represents the State's interests and the manager represents his enterprise interests. This personalization of state interests and enterprise interests is clearly a simplification which is not entirely justifiable. The problem of interest representation is closely tied to the question of ownership of the means of production or property rights, which is still a delicate and sensitive issue in China. Without a clear and

⁸In the words of Deng Xiaoping, "We must allow some enterprises and some individuals to get rich first, to influence others and reach the magnificent great goal of getting rich together." Quoted in Zhang Yi, 1986.

realistic designation of state interests and enterprise interests, the principal-agent relationship between the State and the firm cannot be a entirely true one, and incentive problems cannot be satisfactorily solved. As a Chinese economist comments, the problem of efficiency must be solved not by devising ingenious schemes of profit-sharing between state, enterprise and workers, but by solving the problem of enterprise interest representation (Huang, 1986; Quoted in Korzec, 1988).

The success of the contract system in the agricultural sector can be interpreted as a result of the personalization of the principle of responsibility in a peasant household (*ibid.*). The contract system applied to state enterprises seems to have attempted to create a similar responsibility system by enhancing the position of managers, both externally *vis-à-vis* the supervisory agency and other government organizations and internally in relation to the Party Committee, lower-level management, and workers. Under the contract system, the manager's reward is ideally precisely preset by linking it to profits and by defining the margin by which the reward may exceed that of workers. Moreover, in many cases there is an open, formalized, competitive selection process for managers. Managers who pass through a competitive process are likely to be able to focus on financial and enterprise development goals and have a more business-like orientation (Byrd, 1991, p.24).

Thirdly, the multi-attribute target setting and performance evaluation system enables the planner to guide the enterprise behaviour through long-term and efficiency-related objectives. Unlike the previous schemes, the contract system explicitly defines a number of objectives that can signal in various ways the effort of the enterprise relating to long-term development and management improvement. The most common ones include that the firm will upgrade its equipment and technology to a certain level each year, and the firm would increase its net asset value and product quality to certain levels (see appendixes A and B to Chapter 5). The inclusion of these objectives is a result of the recognition of limitation of the profit indicator in signalling comprehensively the enterprise's effort in increasing efficiency and meeting other objectives that concern the planner. Moreover, these objectives are clearly defined and quantitatively measurable and therefore making evaluation easier and more objective than with undefined objectives. Fulfilment of these objectives is also directly linked to the material rewards to the manager and workers. Compared

with the previous schemes, in which profit was the only *de facto* objective on which the firm had to concentrate, the multi-attribute objective system of the contract system can be expected to facilitate the planner's control over long-term-related activities of the firm. If the planner can commit herself to long-term development of the enterprise, multi-attribute performance evaluation provides a necessary mechanism which helps to combat the perceived short-termism on the part of the enterprise, especially when the market conditions and the profit indicator are far from perfect.

Finally, the contracts normally last more than two years. This relatively long-term contracting helps reduce the tendency to short-termism by the both parties. It can also reduce the frequency of bargaining between the planner and the manager.

10.4.2 Problems

Despite the improvements brought about by the contract system, there are some problems associating with the system. Some of these problems relate to the implementation of the system, while others are more fundamental ones which relate to important aspects of enterprise reforms.

i) Incompatibility with the price reform

The Chinese double-track pricing system is a result of partial decentralization and a transitional system before a full price reform can be undertaken. The fear of price inflation and therefore of an unstable political situation has delayed the prompt revisions of prices. The double-track price system has caused a number of problems, including the rent-seeking behaviour on the part of firms as mentioned in Chapter 9 and earlier in this Chapter. This rent-seeking behaviour still exists under the contract system, since the basic market and planning environment and the profit incentive have not changed very much since the implementation of the contract system.

More fundamental is that the contract system is not consistent with price reform. The quotas and targets in the contract should be fixed and relatively stable. Revision of prices would require frequent changes in the terms of the contracts. If the price system is intended to play a crucial role in resource allocation in China, there must be a reform of the price system. An efficient allocation of resources cannot be achieved by an "irrational price system" in which prices of products "reflect neither

their value nor the supply-demand relations" (CCP, 1984) nor by a double-track price system. The relative stable price system required by the contract system is thus incompatible with a price reform required by an efficient resource allocation. This incompatibility may seriously limit the life-span of the contract system. As Jackson (1992) observes, this incompatibility is mainly caused by the incentive priority of the contract system:

At the general level of analysis, there would be a conflict of goals between the two sets of policies -- the price reform policy and the contract system policy. ... It was clear that the primary goal of the contract management system was to provide better material incentives to stabilise state revenue and, if possible, to "invigorate" the enterprises. It was not really concerned with the better allocation of resources because of the generous provisions made by the government towards the operation of cons-making firms (p.114).

ii) The planner's compromise in reaching an agreement

As indicated in Chapter 5, the planner (the party that offers the contract) normally faces difficulties when setting the base figure. In practice, there exists a tendency in the negotiating process between the planner and firms to fix base figures generally low. The planner normally makes concessions in order to reach an agreement (Qu, et al., 1989). Several possible reasons were suggested in Chapter 5, including information asymmetry and a lack of objective standards for setting base figures. Having examined some aspects of the contract system from agency perspective in Chapter 9, we can offer another plausible explanation for the planner's position, which is related to the risk-sharing mechanism in the contract system.

According to agency principles, when the agent is risk averse, a main consideration for the principal in designing the reward system is risk sharing. The risk issue will not be a problem when the principal is risk neutral since she can always bear all risks without letting the agent share any risk. However, if the principal is risk averse, some risk-sharing arrangement has to be made and the issue of risk-sharing becomes an important consideration in designing the reward system. A common practice under the Chinese contract system has been that firms are required to guarantee a minimum amount of payment to the planner while any above-base payoff is retained by firms or shared between the firms and the planner. Moreover, the contractor and in many cases the whole working force in the firm are

expected to make up the shortfall using reserved funds or/and pledged personal assets in case of failure to deliver any guaranteed payment. This practice requires puts the contractor and the firm as a whole to bear a significant part of risk of enterprise operations, since their income is normally tied to the residual profit. Although in practice it seems to be difficult to confiscate personal assets of contractors, the potential risk involved in contracting for contractors may scare them away from participation. In this case, a compromise has to be made by the planner in order to attract the contractor's participation. This compromise can well be seen as an reward provided by the planner to the contractor for bearing risk.

In Chapter 9, we suggested that multi-level contracting within the Chinese industrial hierarchy can perhaps explain the risk-averse behaviour of "the planner", who has a limited number of firms under her jurisdiction and becomes an agent relative to the higher-level authorities. When the planner acts in a risk-averse manner, the above fixed-payment-to-the-planner contract can indeed shelter the planner from any great variance in income. However, it imposes too much risk on the contractor. Reducing the fixed amount (base figure) can ensure that the contractor's expected welfare is sufficiently high. In cases where the planner is less certain about the base figure, lowering the base figure may prove a costly way of providing incentives. Alternative to this arrangement, full profit-sharing as in the previous profit-retention scheme may reduce the costs of imposing too much risk to the contractor. However, whether or not this intuition is valid depends on several other factors. Fixing the sharing rates, verifying the profit figure, and enforcing the sharing contract are all important and costly.

iii) Enforceability and flexibility of contracts

One of the serious problems associating with the pre-contracting schemes was that there was a problem of enforceability especially in the presence of a double-track planning and pricing system (see Chapter 9). The heart of the contract system is to increase the enforceability through signing legal documents (Byrd, 1991, p.29). If contracts lose credibility, the whole system would become meaningless. Even worse, very unbelievable contracts may severely erode the incentives that the contract system tries to strengthen and bring about adverse consequences for managerial behaviour and the attitude of workers. In Chinese practice, the planner's failure to honour the

contract commitments (see Chapter 5) has been a main source of suspicion of the credibility of the contracts. Any vagueness of contracts can also increase possibilities of disagreements and difficulties in enforcement.

The issues of enforceability and credibility are closely related to the incompleteness and vagueness of contracts. Due to uncertainties and the difficulties in foreseeing shocks, the stated terms of written contracts are often vague on some key aspects. This leaves numerous important matters open for subsequent negotiation and bargaining between contracting parties. This soft contracting approach increases the flexibility of contracts but decrease their enforceability. An obvious example is that terms of a contract are subject to revision if there are changes in state policies, plan parameters, and prices which have a significant impact on enterprise performance. Allowing for the possibility of adjusting targets in the light of these changes seems to be reasonable. It can, however, also lead to bargaining over the significance and impact of such changes, and over the extent to which the enterprise should be "compensated".

In the world of uncertainty, there seems to be a tradeoff between the enforceability and the flexibility of contracts. In present China, because markets are just beginning to develop and are rather unstable, economic shocks and changes in business conditions are more substantial than in established market economies. Flexibility is therefore needed in contracting but at the cost of softness. In this respect, contracting may not represent an ideal way of dealing with relations between the planner and firms since the costs of contracting are high in the face of great economic and policy uncertainties.

iv) Ambiguity of property rights

Throughout our previous analysis, we assumed that the planner is exercising ownership rights on behalf of the State, which in turn is representing "the whole people". In the two-tier relationship between the planner and the enterprises, both sides are assumed to act like maximizing individuals. The contract system makes a good start at clarifying the position of the manager as the chief decision maker for the enterprise. It has, to say the least, cleared up doubt about the simplification (assumption) that the manager is representing the whole work force in his enterprise. This clarification highlights the lack of clarity on the other side of the contract, the

party that offers the contract or in our terms, the planner.

Assuming that the planner is representing the State is clearly a simplification. There are several reasons for saying this, even if we ignore the fact that there exist multi-level authorities within the Chinese industrial and governmental hierarchy. First of all, "the planner" in question is actually an individual(s) who performs the planning and supervisory functions on behalf of the State. A basic question one would ask is what incentives does she have to behave in the interest of the State. If she does not enjoy the property rights of enterprises, she cannot personally benefit directly from the better performance of enterprises. In the case of multi-level principals, the lower level may be motivated by the higher level. But who motivates the highest level if the highest level of planner is not the owner of property rights?

The answer to this question may be of political nature and controversial. To the question who own the city bus system, Barzel (1989) offers an answer using the example of a city bus system. He states, "the city" is not a satisfactory answer, because it does not identify the individuals who gain when the buses are running on time and lose when they are not. Some property rights must be granted to the individuals operating the bus system; otherwise no service whatsoever would be forthcoming. Barzel's (1989) conclusion is that there must exist certain form of private property rights in the public sector. To quote:

The distinction between the private and the public sectors is not a distinction between the presence and absence of private property rights. Such rights are necessarily present in both systems. The distinction lies instead in organization, and particularly in the incentives and rewards under which producers tend to operate. In the private sector, producers are more readily given the opportunity to assume the entire direct effects of their actions. In the government sector, people assume a smaller portion of the direct effect of their actions. Both systems reflect the outcome of the actions of maximizers. (p.107).

The message from this statement is that private property rights are present in both the private and the public sectors but people in the public sector only enjoy partial property rights. These "property rights" are limited by the highest level authority or the superior, who possesses the ultimate authority and the property rights. Applying this view to the Chinese case would result in what Granick (1990)

called joint property rights by the central government and regional governments.⁹

Under the contract system, the signatories of contracts are typically directors of the industrial departments in charge of the enterprises being contracted, but contracts must be subject to approval of the local finance bureau, since they may affect local government revenue. Moreover, on the surface, the department in charge is exercising property rights on behalf of the State. However, the property rights of the department in charge with respect to the enterprise are severely limited. It cannot freely dispose of enterprise assets, nor can it appropriate any large part of the enterprise's returns. A result of the divorce between the effective control of the department in charge and the property rights it actually enjoys is that the department in charge may lack incentives to maximize the objectives of the ultimate owners of the enterprise. Even in the presence of an incentive system applied to the department in charge, the effectiveness of such a system within a multi-level hierarchy is not beyond doubt. The reported drain of state-owned assets from some contracted enterprises is indicative of problems with the ambiguous ownership of these enterprises (Chen, 1989).

State ownership in China has perhaps more political and ideological implications than economic implications. The holders of ultimate property rights of state enterprises, the central decision-makers, are unwilling to give up this basic format of socialism, which is closely related to the leadership of the Communist Party. "They are willing to sacrifice pecuniary gains that they could obtain by auctioning off various residual rights but that poses a risk to their security for the option of operating bureaucratically -- an option that is less lucrative but that promises greater longevity" (Barzel, 1989, p.107).

10.4.3 Conclusion and Prospect

The reform of state-owned enterprises has been an extremely difficult part in

⁹The property rights enjoyed by regional governments can be best seen as incentives given by the centre. Once the property rights are granted, the centre is constrained by the existence of these property rights held individually by the regional governments. But the centre has the ultimate authority to change the rights of lower bodies. In this sense, the relationship between the centre and the regional governments can be still described as that of principal-agent rather than that between different principals as in Granick (1990).

the Chinese entire reform programme. A number of reformed reward systems applied to these enterprises since 1978 have highlighted the difficulties, and in a sense, they also seem to have signalled the determination of the Chinese leadership to reconstruct the relationship between the state bureaucratic authorities and state enterprises. The reform of this relationship is believed to be vital to stimulating enterprise vitality and improving economic efficiency of enterprises (Zhou, 1992, p.11). The difficulty with this reform is that it requires changes in a larger number of aspects than in just the administrative relationship itself. Some of the important aspects here include the planning and resource allocation system, the autonomy of enterprises, and the labour and wage systems. A comprehensive analysis of the enterprise reform therefore requires a wide perspective and a framework that enables various aspects of the reform and important elements to be included in the analysis.

We looked at the information and motivational aspects of the reward systems from the agency perspective. Compared with a fully comprehensive approach, our analysis is very narrow and focuses only some elements. However, our approach enabled us to highlight some important characteristics of Chinese reward systems, through which other elements of the relationship between the state and the enterprise can be easily brought into analysis.

The information consideration in reward systems in the reform period is much less important in contrast with the situation before the reforms beginning in the later 1970s. This is not surprising since a major intention the reform programme has been introducing more market elements into the functioning of Chinese economy, or in other words, the resource allocation system in the reformed Chinese economy is no longer dominated by central planning. Since information elicitation is related mainly to resource allocation, it no longer enjoys the first priority in the design of a reward system as it did in the pre-reform period. Moreover, the Chinese leadership has been giving more attention to improvement in operational efficiency within the enterprise than to improvement to the overall allocation of resources in the national economy. "Though not entirely ignored in China, the principle of efficient allocation of resources, the most fundamental guiding principle of the functioning of Western market economies, has had only a secondary role in the formulation of the Chinese reform policy" (Jackson, 1991, p.285). One of the main barrier for a market-based

resource allocation system in China has been the price system, which has undergone a very slow and cautious reform process. The Chinese reformers' reluctance to carry out a comprehensive price reform resulted in the dual-price or double-track system, in which the market sector and planned sector of production and pricing coexist. This dual-price system cannot be efficient in terms of resource allocations since the planned sector and market sector are not separable and advantages of neither of the two approaches in their complete form can be fully present in this half-planned half-market economic system.

The Chinese evolutionary approach to market reform and price-reform can be justified in many ways. The concern over their effects on the living standard of the people has been a conspicuous and officially emphasized concern (Du, 1992, p.133). However, in the long-run, the "transition" cannot be prolonged too much, since if it is believed that resource allocation efficiency is the most important reform policy goal and that the market mechanism should play a dominant role in resource allocation, the shorter the process of market reform the better. A comprehensive price reform and the development of factor markets, including labour and capital markets, are thus called for. Developments in these areas since early 1992 suggest that the Chinese leaders are beginning to take seriously the problem of resource allocation.¹⁰

The emphasis of our analysis of reform schemes was placed on their motivational aspects rather than their information elicitation properties. Our basic hypothesis was that reform schemes were largely intended to create more incentives for enterprises to increase profit by linking the profit level of the enterprise to its material welfare. The general validity of this hypothesis is confirmed by Jackson's recent analysis and a Chinese official statement. Jackson (1991) believes that reforms

¹⁰It is now officially recognized in China that the market mechanism plays a "fundamental" role in resource allocations and that delay in developing factor markets has restricted the marketisation effort (RMRB, 2, November 1993). In early 1992, encouraged by Deng Xiaoping's speech, the Chinese leaders announced the goal of developing a socialist market economy. Since then, factor markets, financial markets, the real estate market and the labour market have been created and developed. In addition, an increasing number of state enterprises have adopted the share-holding system. Up to October 1993, 3,800 state enterprises have entered experiments in share-holding (RMRB, 25, October 1993).

at the firm level initiated the whole reform programme in the industrial sector and that "the failure to develop factor markets simultaneously with the product market clearly suggests that it was the concern for operation efficiency within the individual enterprise organization, rather than the functioning of the whole economy, that had worked up into the Chinese economic reforms" (p.287). A recent Chinese official statement (see Note 9 of this Chapter) also admits that the emphasis of reforms should switch to developing various markets and reforms at the macro-economic level (RMRB, 2 November 1993).

If we examine the reforms with regard to the state-firm relationship from the pure economic perspective or more specifically from the agency perspective, some improvements can be easily identified relative to the pre-reform reward system. For example, we indicated earlier that more precise and specific definitions between rewards and performance indicators, greater reliance on bonuses and material incentives, and individual-oriented reward function under the contract system could bring about motivational improvements. These improvements also suggested that generally the reforms of incentive systems have been in the right direction, at least seen from this perspective.

Our analysis also revealed a number of areas in which the Chinese planner could do better if she was less constrained by other considerations, most of which were of ideological nature. Examples of these areas are target setting and performance evaluation. We suggested that relative performance evaluation could be helpful if the concern over "fairness" were eliminated, and targets could serve a useful standard in performance evaluation if the planner were "hard" in the target setting process and bargaining between the planner and the firm did not allow great flexibility.

Some drawbacks of the reward systems considered have been related to more fundamental problems. As we shown in Chapter 9 and earlier in this Chapter, problems with the profit indicator under the dual-price system have been a main source of enhanced moral hazard problems on the part of enterprises. The rent-seeking behaviour of firms could hardly be eliminated without abandonment of the dual-price system. On the other hand, the contract system requires a relatively stable price system to operate, highlighting its incompatibility with the price reform, which is in turn necessary for overcoming the rent-seeking problem and more importantly for

efficient resource allocations

A message from this analysis is that isolating reforms in reward systems from other more radical reforms such as the price reform may not be the best approach. Changes in the reward systems applied to enterprises can only play a limited role in the overall improvement of economic efficiency. This is especially true when there is a lack of the proper environment that the reward system requires to work well. For example, given the lack of factor markets, the bureaucrats in various industrial ministries continue to carry out the administrative allocation of the factors of production. State enterprises still have to follow orders from the central authorities; numerous administrative hands are still meddling and abusing the autonomy of enterprises; losses incurred in many state enterprises are still covered by government subsidies (China Daily, 13 April 1991).

These behaviours of state authorities point to another fundamental issue, the issue of property rights. In this respect, the contract system "may have done China's reform effort a service" by highlighting the weakness in the ownership system (Byrd, 1991, p.31). Recent reform policies have begun to focus on this issue and the increasing scale of experiments with the shareholding system can be seen as seeking a way to solve the problem. As privatization is regarded as contradictory to socialist principle, its practice can therefore be ruled out, at least for the time being. Reforms of State ownership are being considered and experimented on. A dominant view is that the State should have the ultimate ownership of the property of a state-owned enterprise, while the enterprise has ownership of the property in a legal sense or as a legal entity (Zhou, 1992, p.147; RMRB, 2 November 1993). It can also be suggested that state enterprises should use the corporation (limited company) form as the organizational model (*ibid.*). The assets of the corporation are the legal property of the corporation itself, not the ultimate owners (shareholders or the State). The shareholders or the State possesses only the rights accruing to the shares. The state-manager relationship would then become a typical principal-agent one in a Western corporation. "The planner" in our earlier analysis will no longer exist.

The shareholding system as currently being experimented with in China is seen as a way of clarifying and diversifying State ownership. Under this system, shares are made up of (a) state-held shares (b) institution-held shares and (c) individually-held

shares. The State or its representatives can retain and exercise the function of supervision and control through their participation in the supervisory organizations such as boards of directors. Shares can be transferred or exchanged at stock exchange markets. Clearly, this reform in the ownership of state enterprises involves enormous changes in the bureaucratic structure in charge of the macro-level management of state ownership. Whether or not such changes can result in desirable achievements in terms of efficiency improvements is a question awaiting answers in both theory and practice. More importantly perhaps, whether or not such changes will take place nationwide in China and what their results will be will depend, to a large extent, on the extent of political and ideological liberalisation.

10.5 Summary of Previous Chapters

In this thesis, we have attempted to address incentive problems embodied in the Chinese State-enterprise relationship at the theoretical level. The main purpose of our analysis was to examine information and motivational properties of the reward systems applied to Chinese state-owned enterprises. Our emphasis was on the systems prior to the contract system. In the context of enterprise reforms, advantages and disadvantages of different systems revealed in this analysis have important policy making implications with regard to further reforms with state owned enterprises. The analysis also revealed some limitations of the relevant theories, in particular, agency theory, and in applying these Western theories to the analysis of Chinese economic problems. In this section, we summarize the main contents of previous chapters.

Chapter 1 serves as the main introduction to this thesis. Here, we briefly considered limitations of the current literature on Chinese economic reforms and indicated that a lack of theoretical analysis is the main problem with the literature. It was suggested that agency theory may be helpful to the analysis of incentive problems in reforming the State-enterprise relationship. Following the lines of agency theory and the bonus literature, we outlined key questions we intended to address in this study. We also indicated intended contributions of this study. The second part of Chapter 1 was devoted to a background description of the relationship between state authorities and state-owned enterprises in China. This description provided a general

presentation of changes in the area of enterprise autonomy in the reform period, which was intended to be helpful to understanding reforms of the reward systems in their specific contexts.

Chapters 2 and 3 presented a survey of relevant Western literature and introduced the main elements of managerial incentive problems. In Chapter 2, we emphasized Western analyses of managerial motivation in a centrally planned economy. In particular, the bonus model based on the New Soviet Incentive Model was critically reviewed in detail. The model highlights the central problem with which the planner is faced, that is, to elicit correct production information from individual firm managers and to motivate them to fulfil plan targets set on the basis of such information. Our review of the bonus literature represents a concise but informative exposure of relevant models and achievements.

Chapter 3 reviewed another branch of literature dealing with incentive problems, agency theory. The basic concepts, assumptions, and models were presented and discussed. The concept of incentive compatibility was suggested as the centre of the principal-agent relationship in presence of information asymmetry and conflicts of interests. The basic idea of agency models is that the principal designs a reward system in such a way that the agent will be motivated by the system to act in the interests of the principal. In doing so, the principal has to take into account a number of factors such as the utility functions and risk preferences of the both parties, the production function of the agent and the information structure. In the basic model, two constraints on the agent are present in the principal's maximization problem, i.e., the participation constraint, which guarantees the agent's participation in the contract, and the incentive compatibility constraint, which provides the agent with incentives to work hard. Limitations and extensions of the basic model were then considered. The role of communication and value of information were also briefly discussed.

Chapters 4 and 5 provided system descriptions. Based on surveys and document research, these two chapters provide a systematic presentation of main Chinese systems of performance evaluation and incentives applied to state enterprises during the period from 1949 up to the present. Chapter 5 provided up-to-date details of the contract system as currently practised in China. These two chapters are in

essence descriptive, but they constitute a major contribution of this thesis. Collecting the materials in such detail turned out to be a difficult and tricky task, on which we spent a lot of time and effort. The complete and thorough account in English of the Chinese reward systems, especially the detailed presentation of the current contract system in Chapter 5, represents an important part of this thesis. It provides a very informative and up-to-date source of data, which is not yet available in English. An important finding of Chapter 4 was that contrary to some observations made in the West and in China, incentive systems had been applied to state enterprises, even in the pre-reform years. The evidence of the use of moral incentives, different objectives for enterprises and incentives in various forms available to enterprises all represent the discovery of new facts.

Chapter 6 returned to the theme of Chapters 2 and 3 and further considered all relevant works in an attempt to establish the theoretical feasibility and suitability of using the agency perspective to analyze the state-firm relationship in a centrally planned economy (CPE). We first brought together the two main models reviewed in Chapters 2 and 3 respectively, i.e., the bonus model and the principal-agent model, and identified similarities and differences between them. This comparison is the first in the literature and represents a theoretical contribution to both schools of study. We found that many elements of the two models are the same or similar, including their basic assumptions, game structures and the use of the marginal principle. However, they have different emphases. As the information needs of the central planner are regarded as a top priority in a centrally planned economy, the bonus model has put much emphasis on the information elicitation problem. Agency models, on the other hand, emphasize the internal consistency of analysis and an optimal contract design. Agency research so far has largely focused on the moral hazard problem. Despite this limitation, agency theory has an advantage in that it enables almost all incentive problems within an organisation to be analyzed in a consistent framework. And in this sense, the bonus model can be seen as a specific variant of the agency model. With its specially developed concepts and tools, agency research can enhance our understanding and analysis of incentive problems in a CPE. This possibility was demonstrated by some recent analyses of the New Soviet Incentive Model (NSIM) from the agency perspective.

Chapter 6 also reviewed some agency analyses conducted directly in the context of central planning, which shown the direct relevance of agency theory to managerial incentive problems in a CPE. The analyses are still very primitive but generate insights into the moral hazard problem in the context of central planning, which was largely ignored in the bonus literature. Granick's agency treatment of Chinese state enterprises brought us closer to the theme of our analysis. We critically reviewed this unique piece of work in the later part of Chapter 6. Our review focused on the conceptual and structural rather than technical aspects of his analysis. Based this review, we defined our agency approach to Chinese state enterprises, which includes two main elements. First, we use the agency concept in the conventional sense implied in Chapter 3 instead of Granick's notion of property rights. Second, we treated the state-enterprise relationship as a simplistic one-to-one principal-agent relationship.

Chapter 7 was a chapter exclusively dealing with the theoretical and technical aspects of our analysis. Strictly speaking, this chapter did not model and analyze Chinese systems *per se*. Rather, it sought to set up some theoretical settings that resemble the Chinese environments and establish and refine theoretical models in these settings based on existing models in the literature. The major part of Chapter 7 was devoted to developing a theoretical model in a general resource allocation setting with a planner and many firms. The setting was characterized by simultaneous presence of adverse selection (information elicitation) and moral hazard (effort inducement). Within the framework of Nash equilibrium, we worked out step by step standard agency models in above setting and characterized optimal solutions to the models. The main characteristics of the optimal solution when all the parties are risk-neutral include that a) the reward function is a linear function of the payoff for the planner; b) it is budget-based; c) it is a bonus-penalty scheme including a fixed fee for the firm and a portion variable with the budget variance; and d) it is a second-best solution in that the planner has to pay managers information rents and provide them with effort incentives.

In the context of resource allocation, we also examined the Groves Mechanism in Chapter 7. We indicated that the merit of the Mechanism lies in its ability to

reconcile the interests of relevant parties and therefore make possible the elicitation of truth-telling behaviour on the part of managers. However, the Mechanism requires some pre-conditions to work well, which restrict its use. Because of the characteristics of the Chinese planning system, we argued that the Groves-type mechanisms are not applicable to the analysis of Chinese reward systems.

To facilitate our later analysis of Chinese reform schemes, we examined in latter part of Chapter 7 the moral hazard problem in the multi-agent setting. Relative performance evaluation, or the use of tournaments, was the main focus. We adopted the notion of informativeness to the central planning environment and argued that target-based tournaments should be valuable to the planner.

In Chapter 8, we made a number of general assumptions with regard to relevant elements of agency models in the Chinese context. These elements included the utility functions and risk preferences of both the planner and firm managers, managerial attitudes toward effort exertion, and the role of information reported by firms in the planning or budget-setting process. The main purpose of making these assumptions was to enable us to use the agency models developed in Chapter 7 in the Chinese context and to model and analyze Chinese reward systems in the agency framework. In examining the utility functions, we carefully considered the underlying assumptions in agency, in particular, the assumption of economic rationality on the part of the planner. Based on some evidence and on reasoning, we argued that the Chinese planner is generally economically rational. We also identified some special features of Chinese reward systems. They are that 1) both non-material and material incentives are used, 2) rewards are largely collective-oriented, and that 3) Chinese managers have no independent utility function and they represent the whole personnel of their firms when dealing with the planner.

Other important assumptions made in Chapter 8 included the risk-neutrality of the planner, and of the risk-neutrality of firm managers in the pre-reform period and risk-aversion in the reform period. This change in the managerial risk attitude reflects other environmental changes affecting this attitude, such as the wage policy and employment policy. Finally, we indicated that information from firms plays a role in the planning process and firm managers tend to take advantages of their role in this process and pursue bargaining and renegotiations with the planner over plan targets

and allocations.

Chapter 8 was actually a non-technical agency general analysis of Chinese reward systems. Some of the assumptions made in Chapter 8 were based on Granick (1990) but with our own justifications; others were originally made by examining relevant literature and survey data. They represent the reasoning and evidences supporting our agency approach and the technical analysis in Chapter 9. They also imply some of the limitations of our analysis, which was also considered in this Chapter.

Chapter 9 represents our major attempt to model and analyze Chinese reward systems in the agency framework. It therefore embodies our major contributions in the area of system analysis. Three main Chinese systems were modelled and analyzed. They were the pre-reform system (1949-1978), the profit-retention system (1979-1986) and the contract system (1987-now).

The emphasis of our analysis of the pre-reform system was placed on its information aspect, since it is our view that the planner's priority under the full central planning system was obtaining information for the purpose of resource allocation. We modelled the Chinese system along the line of the New Soviet Incentive Model (NSIM) and compared them. They were also compared with the theoretical model we built in Chapter 7 in the context of resource allocation and information asymmetry. Based on these comparisons, we noted that the basic form of the Chinese system resembled both the NSIM and the theoretical model. The system therefore had incentive implications, but its incentive power was greatly reduced by its ambiguous nature and its subjective and *ad hoc* elements. Further considerations of the Chinese environment led us to believe that the Chinese planner might not need a very powerful information elicitation system. It was suggested that the discovered incentive disadvantages of the Chinese pre-reform system might be offset by other potential advantages it provided to the planner. For example, it gives the planner much more discretion to pursue non-economic objectives.

The major theme of the analysis of reform schemes was the presence of moral hazard in a partially planned environment. This switch of emphasis from information inducement under the pre-reform system to effort inducement was justified by our

reasoning that information elicitation was no longer the main consideration of the planner in designing a reward system. In analysing the profit-retention scheme, we showed that the dual-price system in the reform period created rent-seeking behaviour on the part of enterprises, which increased the planner's difficulties in assessing enterprise performance. We demonstrated that relative performance evaluation could be a useful tool to the planner in the multi-agent environment. However, we found that the profit-retention system was basically an individualistic scheme. The planner seems to have given priority to her concern with "fairness" or equity among enterprises.

The contract system is seen by Chinese authorities as the current answer to the moral hazard problem under the dual-price system. We identified some new elements which distinguish this system from previous ones. The basic feature of the contract system is that it tries to enforce certain targets on enterprises in the form of contracts. Its incentive power is also enhanced by emphasising the contractor's rewards and penalties and more specific link between targets and rewards. It introduced a multi-attribute set of targets in attempt to discourage enterprises to take short-term actions only.

The analysis of the contract system is continued in Chapter 10. Two main problems with this system were highlighted. The first one was the incompatibility between this system, which requires a relatively stable price system, and any comprehensive price reform, necessary for long-term efficiency of resource allocation. Another problem concerned the issue of property rights. The contract system starts to address this problem but it highlights weaknesses in the ownership system. We pointed out that unless the fundamental problem of property rights is solved, incentive problems associated with state enterprises will continue. Recent Chinese reform efforts have begun to focus on this issue. The shareholding system is one experimental example. We indicated, however, that political and ideological considerations entertained by Chinese authorities have been and will continue to be decisive factors of the success of economic reforms.

Chapters 6-10 represent the major contributions of this thesis at the theoretical and analytical level. The major contributions of this part included setting up an agency framework for the analysis of the Chinese state-firm relationship, modelling

the Chinese reward systems along agency lines, revealing motivational and information properties of the Chinese systems, and making policy recommendations derived from the analysis. In setting up the general analytical framework, we first made an explicit comparison between the bonus model and agency model, both of which are relevant to our analysis. Our comparison represent a theoretical contribution to both schools of study. In examining Chinese reward systems, some theoretical models were formulated and elaborated based on existing models in the literature. These models was adapted and refined in a central planning setting with a planner and many firms (managers). The optimal solutions to the problems represented by the models were characterized. This theoretical approach provided a new perspective in addressing the current problems in the Chinese economic reforms. In particular, it enabled us to derive certain conclusions and suggestions which cannot be deduced from *ad hoc* treatments of implementation of the systems but only from the analysis of relatively "pure" theoretical models. Based on the theoretical models and empirical models of Chinese reward systems we built, we found a number of properties of each Chinese system which represent independent findings of this thesis. The main conclusions of our analysis were presented in Chapter 9 and the early part of Chapter 10.

10.6 Limitations of the Thesis and Suggestions for Further Research

This thesis is a primitive attempt to apply agency theory and related theories, which have grown in the West, to an analysis of Chinese reward systems. It also represents an early effort in modelling the Chinese reward systems along the agency lines. Because of embodied difficulties in such modelling and analysis and because of the limited space available in this thesis, there exist a number of limitations and, without doubt, problems with the analysis. In this section, we highlight some of these limitations and elements of the analysis which are sensitive to specific assumptions. We also suggest certain worthwhile topics that need further research. Basically, the limitations of the thesis can be grouped into two categories, which are related to agency theory itself and to the analysis respectively.

The main theoretical framework of this thesis, agency theory, is a relatively young theory and is still developing. In a sense, some limitations of our analysis result from imperfections and immaturities of the theory. Many limitations of the theory were revealed in Chapter 3 and we are not going to repeat them here. Rather, we shall emphasize the problems we experienced when trying to apply the theory to the Chinese case. One of the problems was that while the simultaneous presence of moral hazard and adverse selection is a typical problem in an agency world, research in this area has not advanced enough to provide satisfactory models and solutions for real-world applications. The resource allocation setting with many better-informed, effort-averse, and risk-averse agents provides an example of the combined problem of moral hazard and adverse selection. This resource allocation problem has been analyzed and modelled in the agency context in several recent papers (see Chapter 7), but in a much stylized setting. For example, agents (managers) are assumed to be risk-neutral in rewards, and collusion among agents (divisional managers) is also ruled out. Risk-aversion on the part of agents and collusion among agents are more likely in reality. Incorporating these elements into analysis would bring agency models and its solutions closer to the reality.

Another problem we had with agency research was that while some elements such as multiple-period contracting, the role of reputation, and multi-attribute performance indicators can be important in the real-world contracting, it is still difficult to formally model them and incorporate them in formal analysis. Models in the literature, including those in this thesis, have been confined to the single effort-output relation, where effort is measured in one time period and output measured by a single indicator of outcome such as profit or the volume of production. In real-world situations, especially in cases of managerial performance evaluation, a number of other measures are used. In particular, how to measure effort and how to distinguish between desirable (productive) effort and undesirable (non-productive) effort seem to be a problem which has not received great attention. In our analysis of Chinese reward systems, we noticed an important characteristic of the systems was their multi-attribute indicators of performance. A group of indicators instead of a single indicator have been used to measure the performance of the firm. Since they are all effort-driven and can reflect effort from a number of different angles, it is

highly relevant to our analysis to model them in a sensible way. However, our treatment of the indicators under the reform schemes was far from satisfactory. Lack of time and inadequate modelling of multiple indicators in the literature, probably due to technical problems, accounts partly for our simplified discussion in this regard.

The above problems indicate a major limitation of agency models, which was discussed in Chapter 3, that is "mathematical tractability prevents us enriching the models and widening the scope of application" (Ashton, 1991, p.123). Mathematical tractability can, in certain sense, be seen as an appealing strength of agency models, since it brings consistency and mathematical justifiability to analyses. However, it is also mathematical tractability that dictates the simplistic structure of agency models. From this point of view, one would argue that if agency research is to provide an analytical framework for a wide range of real-world applications, the technical limitations which it currently has should be substantially reduced. Clearly, further research is needed in every aspect of agency theory in order to achieve more reality-related modelling and solutions.

With regard to our agency approach to Chinese reward systems, the validity of such an approach itself is the first element that is vulnerable to criticism. In particular, the assumption that both the planner and firm managers are economically rational utility maximizers can easily attract question, especially in the pre-reform Chinese context. We justified this assumption in Chapter 8 and argued that economic rationality on both sides can be generally justified. This justification may seem somewhat weak when related to practice especially if some extreme periods such as the "Cultural Revolution" are considered. Part of our justification was that we ruled out these extreme periods and only considered "normal" periods. Even though some evidence was provided to support the assumption, there was a lack of systematic and convincing data for the pre-reform period.

While our agency approach can be generally justified by relying on the economic emphasis of our analysis, it is to be desired that a more comprehensive analysis integrating political, economic, social, and cultural aspects should generate less biased and more realistic conclusions. If seen from the point of view of comprehensiveness, our economic analysis is very narrow and limited in scope. We attempted to incorporate certain political and other elements in our economic analysis

and tried to balance certain arguments in light of the influence of non-economic elements. In consideration of the conceived dominance of political and ideological forces over economic principles in much of the Chinese economic policy-making reviewed, much more analysis of the politic-economic relationship is called for.

A major simplification in our agency analysis was the simple two-tier game structure in which only the planner and firm managers were present. In reality, Chinese industrial hierarchy consists of multi-level authorities above the basic firm level. As indicated in Chapters 6 and 8, there might exist both multiple principals for a single Chinese firm and games among different levels of principals. The multi-headedness of supervision was regarded by Granick (1990) as a unique feature of Chinese industrial management. In our analysis, we ignored hierarchical relations among principals and took it that the planner was the only principal dealing with firms. As far as the State-firm relationship is concerned, this may not be too restrictive, but in the ideal world, the structure of the games among principals should be fully analyzed and the influence of these games on the state-firm relationship be considered. An obvious example is the prevalent multi-level contracting practice under the contract system as mentioned in Chapter 9. In this practice, the immediate higher authority over the firm may be an agent in relation to its higher authorities and its risk attitude and objectives may change when dealing with the firms. Similarly, within the firm, most of time we simply assumed that the manager was representing the whole personnel of the firm and ignored his interrelations with other authorities such as the Party secretary, the workers' union and lower management. Clearly, multi-level contracting practice should have been analyzed in more detail, especially in the agency context where changes in certain elements such as risk preference may have vastly different implications.

Another weakness of our analysis was that the information aspect of reform schemes was largely skipped. The main reasons for this were two-fold. Firstly, the Chinese reform schemes laid emphasis on motivation and the importance of information revelation decreased with central planning. Secondly, there are technical difficulties in modelling information revelation when managers are risk averse and effort averse. However, the information revelation problem still exists in the reform period since central planning and resource allocation still have a role in planning,

though increasingly limited, under reform systems. With the existence of limited central planning and markets, information regarding to firm's productivity and capacity is important for the planner in seeking to restrict the rent-seeking tendency of firms and correctly appraise firm performance. With advances in agency research in the relevant areas, the information aspect of reform systems will become a promising research territory.

Finally, the analysis of the contract system in this thesis is comparatively weak. The main reason for this is that the practice with the system has been various and changed over time. In fact, it is still changing. It seems premature to give a formal analysis to many unestablished experiments and it is difficult and does not make sense to embody a variety of practices in a single model. We provided a rich description of the contract system in Chapter 5, which may prove a useful and informative source of material for further research into the system. We also believe our detailed analysis of the earlier reform models and our findings will help the further understanding of the contract system.

BIBLIOGRAPHY

- ACTUA (the All-China Trade Union Association), "A Survey Report on the Implementation of the State Enterprise Law" (in Chinese). Economic Management, No.10, 1990, pp.24-7.
- Adelman, I. & D. Sundings, "Economic Policy and Income Distribution in China." Journal of Comparative Economics, Vol.11, 1987, pp.444-461.
- Akerlof, G., "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." Quarterly Journal of Economics, August 1970, pp.488-500.
- Alchian, A. and H. Demsetz, "Production, Information Costs, and Economic Organization." American Economic Review, Vol.62, 1972, pp.777-95.
- Allen, "Repeated Principal-Agent Relationships with Lending and Borrowing." Economics Letters, Vol.17, 1985, pp.27-31.
- Amershi, A. H., and P. Cheng, "Intrafirm Resource Allocation: the Economics of Transfer Pricing and Cost Allocations in Accounting." Contemporary Accounting Research, Vol.7, No.1, 1990, pp.61-99.
- Antle, R. and J. S. Demski, "The Controllability Principle in Responsibility Accounting." The Accounting Review, Vol.LXIII, No.4, October 1988, pp.700-718.
- Antle, R. and A. Smith, "An Empirical Investigation of the Relative Performance Evaluation of Corporate Executives." Journal of Accounting Research, Vol.24, No.1, Spring 1986, pp.1-39.
- Armstrong, P., "Contradiction and Social Dynamics in the Capitalist Agency Relationship." Accounting, Organizations and Society, Vol.16, No.1, 1991, pp.1-25.
- Arrow, K. J., "The Economics of Agency." In Pratt, J.W. and R.J. Zeckhauser (eds) Principals and Agents: The Structure of Business, Boston, Mass.: Harvard Business School Press, 1985, pp.37-51.
- Arrow, K. J., Essays in the theory of risk Bearing, Chicago, Ill.: Markham, 1971.
- Arrow, K. J. and L. Hurwicz, "Decentralization and Computation in Resource Allocation." In R. W. Pfouts (ed.), Essays in Economics and Econometrics, Chapel Hill: University of North Carolina Press, 1960, pp.34-104; Reprinted

- in K. J. Arrow and L. Hurwicz (eds), Studies in Resource Allocation Processes, Cambridge: Cambridge University Press, 1977, pp.41-95.
- Ashton, D., "Agency Theory and Contracts of Employment." In D. Ashton, *et al.* (eds) Issues in Management Accounting, Hemel Hempstead: Prentice Hall, 1991, pp.106-125.
- Atkinson, A. A., Intra-firm Cost and Resource Allocations: Theory and Practice, Toronto: The Canadian Academic Accounting Association, 1987.
- Baiman, S., J. H. May, and A. Mookherjee, "Optimal Employment Contracts and the Returns to Monitoring in a Principal-Agent Context." Contemporary Accounting Research, Vol. 6, No.2-II, 1990, pp.761-799.
- Baiman, S., "Agency Research in Management Accounting: A Second Look." Accounting, Organizations and Society, Vol.15, No.4, 1990, pp.341-371.
- Baiman, S., "Agency Research in Managerial Accounting: A Survey." Journal of Accounting Literature, Vol.1, Spring 1982, pp.154-192.
- Baiman, S., J. Evans, & J. Noel, "Optimal Contracts with A Utility-maximizing Auditor." Journal of Accounting Research, 1987, pp.217-244.
- Baiman, S. and J. H. Evans, "Decision Information and Participative Management Control Systems." Journal of Accounting Research, Autumn, 1983, pp.371-95.
- Baiman, S. and J. S. Demski, "Economically Optimal Performance Evaluation and Control Systems." Journal of Accounting Research, Vol.18, Supplement 1980, pp.184-220.
- Baldwin, W. L., "The Motives of Manager, Environmental Restraints, and the Theory of Managerial Enterprise." Quarterly Journal of Economics, Vol.LXXVIII, No.2, May 1964, pp.238-256.
- Banker, R. D. and S. M. Datar, "Optimal Transfer Pricing Under Postcontract Information." Contemporary Accounting Research, Vol.8, No.2, 1992, pp.329-352.
- Baron, D. P., "Incentive Contracts and Competitive Bidding." The American Economic Review, Vol.LXII, No.3, June 1972, pp.384-394.
- Baron, D. P. and D. Besanko, "Monitoring, Moral Hazard, Asymmetric Information, and Risk Sharing in Procurement Contracting." Rand Journal of Economics, Vol.18, No.4, Winter 1987, pp.509-532.
- Baron, D. P. and D. Besanko, "Regulation, Asymmetric Information, and Auditing." Rand Journal of Economics, Vol.15, No.4, Winter 1984, pp.447-470.

- Baron, D. P. and R. B. Myerson, "Regulating a Monopolist with Unknown Costs." Econometrica, Vol.50, July 1982, pp.911-30.
- Barone, E. (1908), "The Ministry of Production in a Collectivist State." English Translation in F.A. von Hayek (ed.), Collectivist Economic Planning, London: Routledge, 1935.
- Barzel, Y., Economic Analysis of Property Rights, Cambridge: Cambridge University Press, 1989.
- Battat, J. Y., Management in Post-Mao China: An Insider's View, Michigan: UMI Research Press, 1986.
- Bennett, J., The Economic Theory of Central Planning, Oxford: Basil Blackwell Ltd., 1989.
- Bergson, A., "Managerial Risks and Rewards in Public Enterprises." Journal of Comparative Economics, Vol.2, 1978, pp.211-225.
- Bergson, A., "Entrepreneurship and Profits under Socialism: The Soviet Experience." Mimeo., 1976, in A. Bergson, Productivity and the Social System, Cambridge, Mass.: Harvard University Press, 1978.
- Bergson, A., Essays in Normative Economics, Cambridge, Mass.: Harvard University Press, 1966.
- Berhold, M., "A Theory of Linear Profit-Sharing Incentives." Quarterly Journal of Economics, Vol.LXXXV. No.3, Aug.1971, pp.460-482.
- Berliner, J. S., Factory and Manager in the Soviet Union, Cambridge, Mass.: Harvard University Press, 1957.
- Bonin, J. P., "On the Design of Managerial Incentive Structures in a Decentralized Planning Environment." American Economic Review, Vol.66, 1976, pp.682-687.
- Bonin, J. P., "On Soviet Managerial Incentive Structure." Southern Economic Journal, Vol.42, No.3, January 1976, pp.490-495.
- Bonin, J. P. and A. J. Marcus, "Information, Motivation, and Control in Decentralized Planning: The Case of Discretionary Managerial Behaviour." Journal of Comparative Economics, Vol.3, 1979, pp.235-253.
- Bornstein, M., "The Comparison of Economic Systems: An Integration." In M. Bornstein (ed.) Comparative Economic Systems: Models and Cases, Homewood, Ill.: Richard D. Irwin, Inc, 1979.

- Bromwich, M., Financial Reporting, Information and Capital Markets, London: Pitman, 1992.
- Bromwich, M. and G. Wang, "Management Accounting in China: A Current Evaluation." The International Journal of Accounting, Vol.26, No.1, 1991, pp.51-66.
- Brown, P.C., J. B. Miller, & J. R. Thornton, "An Optimal Incentive Scheme for Planning with Targets." Journal of Comparative Economics, Vol.11, 1987, pp.596-600.
- Buck, T., Comparative Industrial System, London: MacMillan Press Ltd, 1982.
- Bull, C., The Existence of Self-Enforcing Implicit Contracts, New York: C.V. Starr Centre, New York University, 1985.
- Byrd, W. A., The Market Mechanism and Economic Reforms in China, New York: M. E. Sharpe, 1991(a).
- Byrd, W. A., "Contractual Responsibility Systems in Chinese State-Owned Industry: a Preliminary Assessment." In N. Campbell *et al.* (eds) The Changing Nature of Management in China, JAI Press Inc. 1991(b), pp.7-35.
- Byrd, W., "Enterprise-Level Reforms in Chinese State-owned Industry." The American Economic Review, Papers and Proceedings, 1983, pp.329-332.
- Byrd, W. & G. Tidrick, "Factor Allocation and Enterprise Incentives." In G. Tidrick and Chen Jiyuan (eds), China's Industrial Reform, New York: Oxford University Press, 1987, pp.60-102.
- Canes, M. E., "The Simple Economics of Incentive Contracting: Note." The American Economic Review, Vol.LXV, No.3, June 1975, pp.478-483.
- CASS (Chinese Academy of Social Science, Institute of Economics), "State Enterprises in Difficult Transition: A Survey of Large And Medium-sized Enterprises in Baoding, Hebei Province" (in Chinese). Economic Theory and Economic Management, No.1, 1989, pp.38-43.
- CASS (Chinese Academy of Social Science), "Economic construction and Reform During the Sixth five-Year Plan Period" (in Chinese). Social Sciences in China, June 1986, pp.44-45.
- CCP (Chinese Communist Party, Central Committee), "Decision on Reform of the Economic Structure." Beijing review, 29 October 1984, pp.I-XVI.
- CEEM, the Editorial Board, China Encyclopedia of Enterprise Management (in Chinese). Beijing: Enterprise Management Press, 1984.

- CESR (China Economic System Reform), "Situation of Applying the Contract System in Industrial Enterprises" (in Chinese). China Economic System Reform, No.8, 1990, p.23.
- Chen Guogang, Agency Theory and Reform of the Management System of Chinese State Enterprises (in Chinese). Chinese Economic Issues, January 1989, pp.19-25.
- Chen Jiyuan, "The Planning System." In G. Tidrick & Chen Jiyuan (eds), China's Industrial Reform, New York: Oxford University Press, 1987, pp.148-174.
- Chen Yizi, Wang Xiaoqiang and Colleagues, "Reforms: Results and Lessons from the 1985 CESRRI Survey." In B. L. Reynolds (ed.) Chinese Economic Reform: How Far, How Fast? San Diego: Academic Press, 1988, pp.172-188.
- Cheng Wei, Actual role of Moral Incentives in business Management (in Chinese). Business Operation and Management, April 1989, pp.10-15.
- Child, J., "Enterprise Reforms in China -- Progress and Problems." In M. Warner (ed.) Management Reforms in China, London: Frances Printer (Publishers), 1987, pp.24-50.
- China Daily, "China's Reforms Need Bold Steps", China Daily, 13 April 1991.
- Christensen, J., "The Determination of Performance Standards and Participation." Journal of Accounting Research, Vol.20, No.2, Part II, Autumn 1982, pp.589-603.
- Christensen, J., "Communication in Agencies." Bell Journal of Economics, Autumn, 1981, pp.661-74.
- Christensen, J., Communication and Coordination in Agencies: An approach to Participative Budgeting, Ph.D dissertation, Stanford University, August 1979.
- Chu Qiugen, "Several Problems in Implementing the Contract System" (in Chinese). Economic Management, No.2, Feb., 1989, pp.17-19; translated and reprinted in JPRS-CAR-89-056, 31 May 1989, pp.2-6.
- Coase, R. H., "The Nature of the Firm. Economica." NS4(16), 1937.
- Cohen, S. I., Loeb, M. P. and A. W. Stark, "Separating Controllable Performance from Noncontrollable Performance: The Case of Optimal Procurement Contracting." a paper presented at the Management Accounting Research Group Conference, Birmingham, Sept.1991.
- Cohen, S. and M. Loeb, "Improving Performance through Cost Allocation." Contemporary Accounting Research, Fall 1988, pp.70-95.

- Cohen, S. I. and M. Loeb, "The Grove Scheme, Profit Sharing and Moral Hazard." Management Science, Vol.30, No.1, January 1984, pp.20-24.
- Commonwealth Secretariat, Performance Evaluation of Public Enterprises: Report of a Seminar Organized by the Commonwealth Secretariat and the Institute of Development Management, Gaborone Botswana, 1-7 April 1988, London: Commonwealth Secretariat, 1988.
- Conn, D., "Effort, Efficiency, and Incentives in Organizations." Journal of Comparative Economics, Vol.6, 1982, pp.223-234.
- Conn, D., "A Comparison of Alternative Incentive Structures for Centrally Planned Economic Systems." Journal of Comparative Economics, Vol.3, 1979, pp.261-276.
- Cui Jianmin, "On Perfecting the Contract Auditing System" (in Chinese). Economic Daily, 3 July 1990.
- Cummins, J. M., "Incentive Contracting for National Defense: A Problem of Optimal Risk Sharing." Bell Journal of Economics, Vol.8, No.1, Spring 1977, pp.168-185.
- Dai Yuanchen & E.Hon-ming Li, "Wage Swallowing Up Profit -- A Hidden Danger in the Reform of China's Economic System" (in Chinese). Economic Research, No.6, 1988, pp.11-20.
- de Jasay, A., Market Socialism: A Scrutiny 'This Square Circle', The Institute of Economic Affairs (London, 1990).
- Demski, J. S., "A Simple Case of Indeterminate Financial Reporting." In G. Lobo & M. Maher (eds) Information Economics and Accounting Research, University of Michigan, 1980.
- Demski, J. S., "Uncertainty and Evaluation Based On Controllable Performance." Journal of Accounting Research, Autumn 1976, pp.230-245.
- Demski, J. S. and Sappington, D., "Optimal Incentive Contracts with Multiple Agents." Journal of Economic Theory, Vol.33, 1984, pp.152-171.
- Dickinson, H. D., Economics of Socialism, London / New York: Oxford University Press, 1939.
- Ding Xuedong, "Enterprise Contract System in Retrospect and in Prospect (in Chinese)." Accounting Research, No.6, 1988, pp.5-10.
- Dong Shaohua, "Contracting, Competition, And Dual Dependence" (in Chinese). Enterprise Management, No.4, 1988, p.6.

- Donithorne, A., China's Economic System, London: George Allen and Unwin Ltd., 1967.
- Du Haiyan, "The Contract System: An Initial Choice in Reforming the State Enterprises" (in Chinese). Economic Research, No.10, 1987, pp.10-18.
- Du Haiyan, *et al.*, "Autonomy, Market Structure and Incentive System for State-owned Enterprises: A Survey of 403 State Enterprises" (in Chinese). Economic Research, No.1, January 1990, pp.3-14.
- Du Mengkun, "Price Reform", in Totten, G. and Zhou Shulian (eds) China's Economic Reform: Administering the Introduction of the Market Mechanism, Boulder: Westview Press, 1992, pp.125-136.
- Dye, R. A., "Earnings Management in An Overlapping Generations Model." Journal of Accounting Research, 1988, pp.195-235.
- Dye, R. A., "Costly Contract Contingencies." International Economic Review, Vol.26, No.1, Feb.1985, pp.233-250.
- Dye, R. A., "Communication and Post-decision Information." Journal of Accounting Research, Autumn, 1983, pp.514-33.
- Ekern, S., "The New Soviet Incentive Model: Comment." Bell Journal of Economics and Management Science, Vol. 10, No.2, Autumn 1979, pp.720-725.
- Ellman, M., Socialist Planning, Cambridge: Cambridge University Press, 1979.
- Ellman, M., "Bonus Formulae and Soviet Managerial Performance: A Further Comment." Southern Economic Journal, April 1973, pp.652-3.
- Ellman, M., Soviet Planning Today, Cambridge: Cambridge University Press, 1971.
- Engelbrecht-Wiggans, R., "On Optimal Competitive Contracting." Management Science, Vol.33, No.1, Nov.1987, pp.1481-1488.
- Forges, F., "An Approach to Communication Equilibria." Econometrica, Vol.54, No.6, November 1986, pp.1375-1385.
- Freixas, X., R. Guesnerie, & J. Tirole, "Planning Under Incomplete Information And The Ratchet Effect." Review of Economic Studies, 1985, pp.173-191.
- Friedman, M. Market or Plan? London: The Centre for Research into Communist Economies, 1984.
- Fudenberg, D., B. Holmstrom and P. Milgrom, "Short-term Contracts and Long Term Agency Relationships." MIT Working Paper, 1987.

- Fujimoto, A., "Progress in China's Enterprise Reform." China Newsletter, No.68, May-June 1987, pp.2-6.
- Fu Tingmei, "The Law And Policy of State Enterprises in Post-Mao China." Ph.D Thesis, School of Oriental and African Studies, University of London, 1993.
- Gao Shangquan, Nine Years' Chinese Economic System Reform (in Chinese). Beijing: People's Publishing House, 1987.
- Gietzmann, M. B. and M. J. P. Selby, "Productivity Revelation and Agent Effort Control with the Overhead Production Volume Variance." unpublished paper, LSE, 1992.
- Gindin, S., A Model of the Soviet Firm, Economics of Planning, Vol,10, No.3, 1970, pp.145-157.
- Gjesdal, F., "Information and Incentives: The Agency Information Problem." Review of Economic Studies, Vol.XLIX, 1982, pp.373-390.
- Gordon, M. J., "The Principal-Agent Problem and Its Solution for China's State Enterprises." a paper presented in the session of the Society on Economics and Management in China at the meetings of the Allied Social Sciences Associations, Washington, D. C., December 29, 1990.
- Gordon, H. S., Welfare, Justice and Freedom, New York: Columbia University Press, 1980.
- Granick, D., Chinese State Enterprises -- A Regional Property Rights Analysis, Chicago: The University of Chicago Press, 1990.
- Green, J. R. and N. L. Stokey, "A Comparison of Tournaments and Contracts." Journal of Political economics, Vol.91, 1983, pp.349-364.
- Green, J. R. and J.-J. Laffont, Incentives in Public Decision-Making, Amsterdam: North-Holland Publishing Company, 1979.
- Green, J. and J.-J. Laffont, "Characterization of Satisfactory Mechanisms for the Revelation of Preferences for Public Goods." Econometrica, Vol.45, No.2, March 1977, pp.427-438.
- Grimm, K., "On the External Conditions for the Effective implementation of the Contracted Responsibility System" (in Chinese). Economic System Reform, No.2, 1988, pp.38-45.
- Grossman, S. J. & O. D. Hart, "An Analysis of the Principal-agent Problem." Econometrica, Vol.51, No.1, January 1983, pp.7-45.

- Groves, T., "Incentive Compatible Control of Decentralized Organizations." In Y. Ho and S. Mitters (eds), Directions in Large Scale Systems: Many - Person Optimization and Decentralized Control, New York: Plenum, 1976.
- Groves, T., "Incentives in Teams." Econometrica, Vol.41, No.4, July 1973, pp.617-631.
- Groves, T. and M. Loeb, "Incentives in a Decentralized Firm." Management Science, Vol.25, No.3, March 1979, pp.221-230.
- Guesnerie, R. and J.-J. Laffont, "A Complete Solution to a Class of Principal-Agent Problems with an Application to the Control of a Self-Managed Firm." Journal of Public Economics, Vol.25, No.3, Dec.1984, pp.329-369.
- Guesnerie, R., P. Picard and R. Rey, "Adverse Selection and Moral Hazard with Risk Neutral Agents." European Economic Review, Vol.33, 1988, pp.807-823.
- Guo Jianping, et al., "The Manager, Workers, and Incentives" (in Chinese). China Economic System Reform, June 1989, pp.54-56.
- Harris, M. and A. Raviv, "Optimal Incentive Contracts with Imperfect Information." Journal of Economic Theory, Vol.20, No.2, April 1979, pp.231-259.
- Harris, M. and A. Raviv, "Optimal Incentive Contracts With Imperfect Information." Carnegie Mellon University, mimeo, 1976.
- Harris, M., C. H. Kriebel & A. Raviv, "Asymmetric Information, Incentives and Intrafirm Resource Allocation." Management Science, Vol.28, No.6, June 1982, pp.604-620.
- Hart, O. and B. Holmstrom, "The Theory of Contracts." In T. Bewley (ed.) Advances in Economic Theory, 5th World Congress, Cambridge: Cambridge University Press, 1987, pp.71-155.
- Hayek, F. A., "Socialist Calculation: The Competitive Solution." Economica, N. S. 7, No.2, May 1940, pp.125-149.
- Hayek, F. A., "The Present State of The Debate." In F. A. Hayek (ed.) Collectivist Economic Planning, London: Routledge, 1935.
- He Guanghui, "On Upholding and Perfecting the Contract System: A Talk On Contracting by He Guanghui, Deputy Minister of the China Economic System Reform Commission" (in Chinese). China Economic System Reform, No.5, 1989.
- He Xin, "Exploding the Problems in Economic Reforms in Recent Years from The

- Worsen Inflation" (in Chinese). Economics Weekly, 20 November 1988.
- Hiller, J. R. and R. D. Tollison, "Incentive versus Cost-Plus Contracts in Defense Procurement." The Journal of Industrial Economics, Vol.XXVI, No.3, March 1978, pp.239-248.
- Holmstrom, B., "On the Theory of Delegation." In M. Boyer and R. Kihlstrom (eds), Bayesian Models in Economics Theory, Amsterdam: North-Holland, 1984, pp.115-141.
- Holmstrom, B., "Design of Incentive Schemes and The New Soviet Incentive Model." European Economic Review, Vol.17, 1982(a), pp.127-148.
- Holmstrom, B., "Moral Hazard in Teams." Bell Journal of Economics, Vol.13, No.2, August 1982(b), pp.324-340.
- Holmstrom, B., "Groves' Scheme on Restricted Domains." Econometrica, Vol.47, No.5, September 1979(a), pp.1137-1144.
- Holmstrom, B., "Moral Hazard and Observability." Bell Journal of Economics, Vol.10, No.1, Spring 1979(b), pp.74-91.
- Holmstrom, B. & R. B. Myerson, "Efficiency and Durable Decision Rules with Incomplete Information." Econometrica, November 1983, pp.1799-1819.
- Holmstrom, B. and J. Ricart-Costa, "Managerial Incentive and Capital Management." Quarterly Journal of Economics, Vol.101, 1986, pp.835-60.
- Holt, C. A., Jr., "Uncertainty and the Bidding for Incentive Contracts." The American Economic Review, Vol.69, No.4, Sept.1979, pp.697-705.
- Holthausen, R. W. and R. W. Leftwich, "The Economic Consequences of Accounting Choice: Implications of Costly Contracting and Monitoring." Journal of Accounting and Economics, 1983, pp.77-177.
- Hopwood, A. G., Accounting and Human Behaviour, Hemel Hempstead: Prentice Hall, 1976.
- Horwitz, B. N., "Profit Responsibility in Soviet Enterprise." Journal of Business, Vol.41, No.1, January 1968, pp.47-55.
- Huang Yantai, "On the Types of State Owned Enterprise Behaviour and the Ways to Treat It" (in Chinese), Economi Research, No.3, 1986, pp.29-33.
- Hunt III, H. G. and Hogler, R. L., "Agency Theory as Ideology: A Comparative Analysis Based on Critical Legal Theory and Radical Accounting." Accounting, Organizations and Society, Vol.15, No.5, 1990, pp.437-454.

- Hunter, H., "Optimum Tautness in Developmental Planning." Economic Development and Cultural Change, Vol.IX, No.4, July 1961, pp.561-572.
- Hurwicz, L., "Socialism and Incentives: Developing a Framework." Journal of Comparative Economics, Vol.3, 1979, pp.207-216.
- Hurwicz, L., "Incentive Structures Maximizing Residual Gain under Incomplete Information." Bell Journal of Economics, Vol.9, No.1, Spring 1978, pp.180-191.
- Hurwicz, L., "The Design of Mechanisms for Resource Allocation." American Economic Review, Proceedings, May 1973, pp.1-30.
- Ireland, N. J. and P. J. Law, "Incentives and Efficiency in the Kosygin Reforms." Journal of Comparative Economics, Vol.4, 1980, pp.33-39.
- Jackson, S., Chinese Enterprise Management: Reforms in Economic Perspective, Berlin: Walter de Gruyter & Co., 1992.
- Jensen, M. C. and W. H. Mechling, "Theory of the Firm: Managerial Behaviour." Agency Costs and Ownership Structure, Journal of Financial Economic, Vol.3, 1976, pp.305-60.
- Jiang Yiwei, "Vivid Enterprises is Still the Core of the Economic Reform (in Chinese)." Renmin Ribao (People's Daily), 31 October 1986.
- Jiang Zemin, "Report on the 14th National Congress of the Communist Party of China." Renmin Ribao (People's Daily), 21 October 1992.
- Jin Qi, "Factory Directors' Worries." Beijing Review, Oct. 3-9, 1988, pp.4-5.
- Kanbur, S. M. R., "Increases in Risk with Kinked Payoff Functions." Journal of Economic Theory, Vol.27, 1982, pp.219-228.
- Kaplan, R. S., Advanced Management Accounting, Englewood Cliffs, N.J.: Prentice-Hall, 1982.
- Keren, M., "On the Tautness of Plans. Review of Economic Studies." Vol.XXXIX, No.4, October 1972, pp.469-486.
- Keren, M., J. Miller, & J. R. Thornton, "The Ratchet: A Dynamic Managerial Incentive Model of The Soviet Enterprise." Journal of comparative Economics, Vol.7, No.4, December 1983, pp.347-367.
- Komiya, R., "Japanese Firms, Chinese Firms: Problems for Economic Reform in China, Part 1." Journal of the Japanese and International Economics, Vol.1, No.1, March 1987, pp.31-61.

- Kornai, J., "The Dual Dependence of the State-owned Firm in Hungary." In G. Tidrick & Chen Jiyuan (ed.) China's Industrial Reform, Oxford Univ. Press, 1987, pp.317-338.
- Kornai, J., "Efficiency and the Principles of Socialist Ethics." In J. Kornai (ed.), Contradictions and Eilemmas, Cambridge: MIT Press, 1986, pp.124-138.
- Kornai, J., Economics of shortage, Vols. I and II, Amsterdam: North-Holland, 1980.
- Korzec, M., "Efficiency Wages and Enterprise Behaviour in China." Journal of Communist Studies, Vol.4, No.1, March 1988, pp.3-25.
- Kreps, D. M., A Course in Microeconomic Theory, Herdfordshire: Harvester Wheatsheaf, 1990.
- Kreps, D. M., Corporate Culture and Economic Theory, Graduate School of Business, Stanford University, Working Paper, 1984.
- Kreps, D. M. and R. Wilson, "Reputation and Imperfect Information." Journal of Economic Theory, Vol.27, No.2, Aug. 1982, pp.253-279.
- Laffont, J.-J. and J. Tirole, "Auctioning Incentive Contracts." Journal of Political Economy, Vol.95, No.5, Oct.1987, pp.921-937.
- Laffont, J.-J. and J. Tirole, "Using Cost Observation to Regulate Firms." Journal of Political Economy, Vol.94, No.3, 1986, pp.614-641.
- Laffont, J.-J. and E. Mackin, "The Theory of Incentives: An Overview." In W. Hildenbrand (ed.) Advances in Economic Theory, Cambridge: Cambridge University Press, 1982, pp.31-94.
- Lambert, R. A., "Long-Term Contracts and Moral Hazard." Bell Journal of Economics, Vol.14, No.2, Autumn 1983, pp.441-452.
- Lange, O., "The Computer and the Market." In M. bornstein (ed.).*op.cit.* reprinted from C. H. Feinstern (ed.). Socialism, Capitalism and Economic Growth: Essays Presented to Maurid Dobb, Cambridge University Press (Cambridge, 1967).
- Lange, O., "On the Economic Theory of Socialism." Review of Economic Studies, 4(1), Oct. 1936 & 4(2), Feb. 1937.
- Law, P. J., "On a Proposal by Liberman for Enterprise Incentive Funds." Economica, November 1974, pp.368-376.
- Lazear, E. P. and S. Rosen, "Rand-Order Tournaments as Optimum Labour Contracts." Journal of Political Economy, Vol.89, No.5, 1981, pp.841-864.

- Lee, P. N. S., Industrial Management and Economic Reform in China, 1949-1984, HongKong: Oxford University Press, 1987.
- Lee, P. N. S., "Enterprise Autonomy Policy in Post-Mao China: A Case Study of Policy-Making 1978-83." The China Quarterly, March 1986, pp.45-71.
- Leeman, W. A., "Bonus Formulae and Soviet Managerial Performance." Southern Economic Journal, April 1970, pp.434-445.
- Lerner, A. P., "Economic Theory and Socialist Economy. Review of Economic Studies." Oct 1934;"Statics and Dynamics in Socialist Economics, " Economic Journal, June 1937.
- Li Ping, "Large and Medium-sized Enterprises: The Backbone of Industrial China." Beijing Review, 4-10 December 1989, pp.25-29.
- Li Zhenzhong, Economics of Planning (in Chinese). People's University Press, 1985.
- Lieberthal, K., & M. Oksenberg, Policy Making in China: Leaders, Structures, and Processes. Princeton: Princeton University Press, 1988.
- Lin Ling, "On Perfection and Development of the Contract Responsibility System (in Chinese)." Reform, No.3, 10 May 1988, pp.19-27; translated in JPRS-CAR-88-051, 29 August 1988, pp.20-26.
- Lin Zili, "Initial Reform in China's Economic Structure: the Experiments in giving Greater Autonomy to Enterprises in Sichuan, Anhui, and Zhejiang Provinces " (in Chinese). Social Sciences in China, September 1980, p.185.
- Liu, C.-N., "Managerial Objectives and Equilibrium Outputs in the Socialist Firm: Reply." Journal of Comparative Economics, Vol.8, 1984, pp.333-334.
- Liu, C.-N., "The Ratchet Principle: A Diagrammatic Interpretation." Journal of Comparative Economics, Vol.6, No.1, March 1982, pp.75-80.
- Liu, P.-W., "Optimal Incentive Schemes with Targets: First-best Or Second-best?" Journal of comparative Economics." Vol.11, 1987, pp.601-602.
- Liu, P.-W., "Moral Hazard and Incentives in a Decentralized Planning Environment." Journal of comparative Economics, Vol.10, No.2, 1986, pp.91-105.
- Liu Renxiu & Zou Belin, "Opinions on Short-term Behaviour of Enterprises (in Chinese)." Economic Management, No.3, 1990, pp.25-28.
- Loeb, M. & W. A. Magat, "Soviet Success Indicators and the Evaluation of Divisional Management." Journal of Accounting Research, Vol.16, No.1, Spring 1978(a), pp.103-121.

- Loeb, M. & W. A. Magat, "Success Indicators in The Soviet Union: The Problem of Incentives and Efficient Allocations." The American Economic Review, Vol.68, No.1, March 1978(b), pp.173-181.
- Loaksonen, O., Management in China during and after Mao in Enterprises, Government, and Party, Berlin: Walter de Gruyter & Co., 1988.
- Luo Guoxuan, "An Analysis of Short-term Behaviour in Contracting" (in Chinese). Economics Weekly, 5 December 1988.
- Ma, C.-T., J. Moore and S. Turnbull, "Stopping Agents from 'Cheating'." Journal of Economic Theory, vol.46, 1988, pp.355-572.
- Ma Hong (ed.), Modern China's Economy and Management, Beijing: foreign Languages Press, 1990.
- Marschak, J. and R. Radner, Economic Theory of Teams, New Haven: Yale University Press, 1972.
- Maruyama, N., "The Market, Competition and Technical Reform --Chinese Enterprises in the Present Period." China Newsletter, No.78, Jan-Feb, 1989, pp.2-6.
- Martin, J. M., "Economic Reform and the Maximizing Behaviour of the Soviet Firm." In J. Thornton (ed.) Economic Analysis of Soviet-type System, Cambridge: Cambridge University Press, 1976, pp.216-241.
- Miller, J. B. and J. R. Thornton, "Effort, Uncertainty, and the New Soviet Incentive System." Southern Economic Journal, Vol.45, No.2, October 1978, pp.432-446.
- Ministry of Finance, China's Financial Reforms (in Chinese), Beijing: Beijing University Press, 1988.
- Ministry of Finance, Changes in Chinese Financial Systems (in Chinese), unpublished document, 1987.
- McAfee, R. P. and J. McMillan, "Optimal Contracts for Teams." International Economic Review, Vol.32, No.3, August 1991, pp.56-577.
- McAfee, R. P. and J. McMillan, Incentives in Government Contracting, Toronto: University of Toronto Press, 1988.
- McAfee, R. P. and J. McMillan, "Auctions and Bidding." Journal of Economic Literature, Vol.XXV, June 1987(a), pp.699-738.

- McAfee, R. P. and J. McMillan, "Competition for Agency Contracts." Rand Journal of Economics, Vol.18, No.2, Summer 1987(b), pp.296-307.
- McAfee, R. P. and J. McMillan, "Bidding for Contracts: A Principal-Agent Analysis." Rand Journal of Economics, Vol.17, No.3, Autumn 1986, pp.326-338.
- McCall, J. J., "The Simple Economics of Incentive Contracting." The American Economic Review, Vol.LX, No.5, Dec.1970, pp.837-846.
- Melumad, N. D. and S. Reichelstein, "Centralization versus Delegation and the Value of Communication." Journal of Accounting Research, Vol.25, Supplement 1987, pp.1-18.
- Milgrom, P. & J. Roberts, Economics Organization and Management, Englewood Cliffs, N.J.: Prentice-Hall, 1992.
- Milgrom, P. R. and R. J. Weber, "A Theory of Auctions and Competitive Bidding." Econometrica, Vol.50. No.5, Sept.1982, pp.1089-1122.
- Miller, J. and P. Murrell, "Limitations on the Use of Information -Revealing Incentive Schemes in Economic Organizations." Journal of Comparative Economics, Vol.5, 1981, pp.251-271.
- Mirrlees, J. A., "The Optimal Structure of Incentives and Authority within an Organization." Bell Journal of Economics, Vol.7, No.1, Spring 1976, pp.105-131.
- Mirrlees, J. A., "The Theory of Moral Hazard and Unobservable Behaviour - Part I." Mimeo, Nuffield college, Oxford, 1975.
- Mirrlees, J. A., "Notes on Welfare Economics." Information, and Uncertainty, in M. Balch, D. McFadden, and S. Y. Wu (eds), Essays on Economic Behaviour under Uncertainty, Amsterdam: North-Holland, 1974, pp.243-258.
- Moizer, P., "Performance Appraisal and Rewards." In D. Ashton *et al.* (eds). Issues in Management Accounting, Hemel Hempstead: Prentice Hall, 1991, pp.126-144.
- Mookherjee, D., "Optimal Incentive Schemes with Many Agents." Review of Economic Studies, Vol.LI, 1984, pp.433-446.
- Murrell, P., "The Performance of Multiperiod Managerial Incentive Schemes." The American Economic Review, Vol.69, No.5, December 1979, pp.934-940.
- Murrell, P. and J. Miller, "The Applicability of Information-revealing Incentive Schemes in Economic Organizations." Journal of Comparative Economics,

Vol.8, 1984, pp.277-89.

Myerson, R. B., "Multistage Games with Communication." Econometrica, Vol.54, No.2, March 1986, pp.323-358.

Myerson, R. B., "Bayesian Equilibrium and Incentive - Compatibility: An Introduction." In L. Hurwicz, D. Schmeidler & H. Sonnenschein (eds), Social Goals and Social Organization, Cambridge: Cambridge University Press, 1985, pp.229-259.

Myerson, R. B., "Optimal Coordination Mechanisms In Generalized Principal-agent Problems." Journal of Mathematical Economics, Vol.10, No.1, June 1982, pp.67-81.

Myerson, R. B., "Incentive Compatibility and the Bargaining Problem." Econometrica, Vol.47, No.1, Jan.1979, pp.61-73.

Nalebuff, B. J. and J. E. Stiglitz, "Prizes and Incentives: Towards a General Theory of Compensation and Competition." The Bell Journal of Economics, Vol.14, No.1, Spring 1983, pp.21-43.

Namazi, M., "Theoretical Development of Principal-agent Employment Contract in Accounting: The State of the Art." Journal of Accounting Literature, Vol.4, Spring 1985, pp.113-163.

Nove, A., "The Problem of 'Success Indicators' in Soviet Industry." Economica, Feb., 1958, pp.1-13.

Okun, A. M., Equality and Efficiency: The Big Tradeoff, Washington, DC: The Brookings Institution, 1975.

Osband, K., "Speak Softly, but Carry A Big Stick: On Optimal Targets under Moral Hazard." Journal of Comparative Economics, Vol.11, 1987, pp.584-595.

Pareto V., Cours d'Economie Politique, Vol.II, Lansanne: Rouge, 1897.

Penno, M., "Asymmetry of Pre-decision Information and Management Accounting." Journal of Accounting Research, Spring, 1984, pp.177-91.

Picard, P., "On the Design of Incentive Schemes under Moral Hazard and Adverse Selection." Journal of Public Economics, Vol.33, No.3, 1987, pp.305-331.

Picard, P. and P. Rey, "Incentives in Cooperative Research and Development." In Champsaur *et al.* (eds), Essays in Honour of Edmond Malinvaud, Cambridge, Mass.: MIT Press, 1990, pp.252-279.

Qian, Yingyi, "Equity, Efficiency, and Incentives in A Large Economy." Journal of

Comparative Economics, Vol.16, 1992, pp.27-46.

Qu Xiaohui, *et al.*, "A Survey on the Contract System" (in Chinese). Chinese Economic Issues, No.5, 1989, pp.47-52.

Radner, R., "Repeated Principal-agent Games with Discounting." Econometrica, Vol.53. No.5, September 1985, pp.1173-97.

Radner, R., "Monitoring Cooperative Agreements in A Repeated Principal-agent Relationship." Econometrica, Vol.49, 1981, pp.1127-48.

Rasmusen, E., Games and Information: An Introduction to Game Theory, Oxford: Basil Blackwell Ltd., 1989.

Rees, R., "The Theory of Principal and Agent, Part I; Part II" Bulletin of Economic Research, Vol.37, No.1, 1985, pp.3-26; No.2, pp.75-95.

Reynolds, B. L. "Introduction." In B. L. Reynolds (ed.) Reform in China: Challenges & Choices, New York: M.E. Sharpe, 1987, pp.1-4.

Reynolds. B. L (ed.) Reform in China: Challenges & Choices, New York: M.E. Sharpe, 1987.

RG CER (Research Group on Chinese Enterprise Reform), Contract System in Practice (in Chinese). Beijing: Economic Management Press, 1988.

Richman, B. M., Industrial Society in Communist China, New York: Random House, 1969.

Riordan, M., "Hierarchical Control and Investment Incentives." Stanford University Working Paper, 1987.

Riordan, M. H., "Uncertainty, Asymmetric Information and Bilateral Contracts." Review of Economic Studies, Vol.LI, 1984, pp.83-93.

RMRB (People's Daily), "China Furthers the Reform of Incomes System in Enterprise" (in Chinese). Renmin Ribao (People's Daily) (Overseas Edition), 12 May 1993.

RMRB (People's Daily), "The Amendments to the Constitution of the People's Republic of China" (in Chinese). Renmin Ribao (People's Daily) (Overseas Edition), 30 March 1993.

RMRB (People's Daily), "Lei Feng Spirit is immortal" (in Chinese). Renmin Ribao (People's Daily) (Overseas Edition), 5 March 1993.

RMRB (People's Daily), "Reform with the Share-holding System Entered A New

- Stage" (in Chinese). *Renmin Ribao (People's Daily) (Overseas Edition)*, 25 October 1993.
- RMRB (People's Daily), "The Only Way Out Lies in Deepening Reforms" (in Chinese). *Renmin Ribao (People's Daily) (Overseas Edition)*, 2 November 1993.
- RMRB (People's Daily), "There are 3518 Large Enterprises Nationwide" (in Chinese) *Renmin Ribao (People's Daily) (Overseas Edition)*, 18 September 1992.
- RMRB (People's Daily), "Tremendous Changes in the Chinese Economic Structure" (in Chinese). *Renmin Ribao (People's Daily)(Overseas Edition)*, 7 August 1992.
- RMRB (People's Daily), "New Developments in Chinese Enterprise Reforms" (in Chinese). *Renmin Ribao (People's Daily)(Overseas Edition)*, 19 September 1992.
- RMRB (People's Daily), "Concentrating Our Energy on Vivifying Large and Medium-Sized State Enterprises" (in Chinese). *Renmin Ribao (People's Daily)(Overseas Edition)*, 7 October 1991.
- Rob, R., "The Design of Procurement Contracts." *The American economic Review*, Vol.76, No.3, June 1986, pp.378-389.
- Rogerson, W. P., "The First-order Approach to Principal-agent Problems." *Econometrica*, Vol.53, No.6, November 1985(a), pp.1357-1367.
- Rogerson, W. P., "Repeated Moral Hazard." *Econometrica*, Vol.53, 1985(b), pp.69-76.
- Rubinstein, A., "Offenses that May Have Been Committed by Accident -- An Optimal Policy of Retribution." In S. Brams, *et al.* (eds) *Applied Game Theory*, Wurtzburg: Physica-verlag, 1979, pp.406-13.
- Sable, C. F. and D. Stark, "Planning, Politics, and Ship-flower Power: Hidden Forms of Bargaining in soviet-imposed State-socialist Societies". *Politics and Society*, Vol.11, No.4, 1982, pp.439-475.
- Samuelson, W., "Bidding for Contracts." *Management Science*, Vol.32, No.12, Dec. 1986, pp.1533-1550.
- Sappington, D., "Incentive Contracting with Asymmetric and Imperfect Precontractual Knowledge." *Journal of Economic Theory*, Vol.34, No.1, Oct.1984, pp.52-70.
- Sappington, D., "Limited Liability Contracts Between Principal and Agent." *Journal*

of Economic Theory, Vol.29, Feb. 1983, pp.1-21.

Scapens, R. W., Management Accounting: A Review of Recent Developments, New York: Macmillan, 1985.

Scherer, F. M., "The Theory of Contractual Incentives for Cost Reduction." Quarterly Journal of Economics, Vol.LXXVIII, No.2, May 1964, pp.257-280.

Shavell, S., "Risk Sharing and Incentives in the Principal and Agent Relationship." The Bell Journal of Economics, Vol.10, No.1, Spring 1979, pp.55-73.

Shirk, S., "The Political Economy of Chinese Industrial Reform." In Victor Nee & David Stark (eds.) Remaking the Economic Institutions of socialism: China and Eastern Europe, Stanford, California: Stanford Univ., Press, 1989.

Shoudu Iron & Steel Co., "Achievements in Five Years' Contracting" (in Chinese). Enterprise Management, No.7, 1987, pp.22-23.

Singh, N., "Monitoring and Hierarchies: The Marginal Value of Information in a Principal-Agent Model." Journal of Political Economy, June 1985, pp.599-609.

Skonsen, C. R. & Yang Ji-Liang, "Western Management Accountant and the Economic Reforms of China." Accounting, Organizations and Society, Vol.13, No.2, 1988, pp.201-206.

Snowberger, V., "Interaction Between Central Planners and Firm: The Uncertainty of Target Adjustment." Economics of Planning, Vol.15, No.2-3, 1979, pp.168-183.

Snowberger, V., "The New Soviet Incentive Model: Comment." Bell Journal of Economics and Management Science, Vol.8, No.8, Autumn 1977, pp.591-600.

The State Council, "Provisional Regulations On the Contracted Operational Responsibility System Applied to Industrial Enterprises Owned by the Whole People" (in Chinese). China Economic System Reform, No.11, 1988, pp.56-58.

Stiglitz, J. E., "Incentives, Risk, and Information: Notes towards a Theory of Hierarchy." Bell Journal of Economics, Vol.6, No.2, Autumn 1975, pp.552-579.

Strong, N. & M. Walker, Information and Capital Markets, chapter 8, Oxford: Basil Blackwell Ltd. 1987.

Sun Shuming & Zheng Li, "The Legal Stipulations for Profit Distribution in State

- Enterprises" (in Chinese). Inquiry into Economic Problems, No.12, 1988.
- Sun Zhixin, "The Contract System Plays A Vital Part in Economic Structural Reform" (in Chinese). China Economic System Reform, No.4, 1988, pp.25-27; translated in JPRS-CAR-88-041, 29 July 1988, pp.29-31.
- Suuh, Y. S. and S. Y. Kim, "Conditional Monitoring Policy Under Moral Hazard." University of California Working Paper, 1989.
- Taga, L. S., "Managerial Objectives and Equilibrium Output in the Socialist Firm: A Comment." Journal of Comparative Economics, Vol.8, 1984, pp.328-332.
- Tang Fengyi, *et al.*, "Make Rapidly State Enterprises Become Real Legal Person Enterprises: Analysis and Exploration of Reform in State Enterprises (in Chinese). Economic Research, No.7,1987, pp.53-60.
- Tao Youzhi, Gu Cunwei & Wang Jie, "A Survey on Responsibility, Authority, and Benefit in the State Enterprises in Shanghai" (in Chinese). Economic Research, No.4, 1988, pp.68-72.
- The State Council, Bulletin of the State Council (in Chinese), series, Beijing.
- Thomson, W., "Eliciting Production Possibilities from A Well-informed Manager." Journal of Economic Theory, Vol.20, No.3, June 1979, pp.360-380.
- Tidrick, G., "Planning and Supply." In G. Tidrick & Chen Jiyuan (eds), China's Industrial Reform, New York: Oxford University Press, 1987, pp.175-209.
- Tidrick, G., "Productivity Growth and Technological Change in Chinese Industry." World Bank Staff Working Paper, No. 761, 1986.
- Tidrick, G. & Chen Jiyuan (eds), China's Industrial Reform, New York: Oxford University Press, 1987.
- Tinker, A. M., B. D. Merino and M. D. Neimark, "The Normative Origins of Positive Theories: Ideology and Accounting Thought." Accounting, Organizations and Society, 1982, pp.167-200.
- Tirole, J."The Theory of the Firm." In J. Tirole, The Theory of Industrial Organization, Cambridge, Mass.: The MIT Press, 1988.
- Townsend, R. M., "Optimal Multiperiod Contracts and Gain from Enduring Relationships under Private Information." Journal of Political Economy, Vol.90, No.6, Dec.1982, pp.1166-1186.
- von Mises, L., Socialism: An Economic and Sociological Analysis, London: Jonathan Cape Ltd., 1936.

- von Mises, L., "Economic Calculation in the Socialist Commonwealth." In F. A. Hayek (ed.), Collectivist Economic Planning, London: Routledge, 1935.
- Walder, A. G., "Wage Reform and the Web of Factory Interests". The China Quarterly, No.109, 1987, pp.22-41.
- Walder, A. G., Communist Neo Traditionalism Work and Authority in Chinese Industry, University of California Press, 1986.
- Wang Jiye & Zhu Yuanzhen (eds), A Handbook of Economic Structure Reforms (in Chinese). Beijing: Economic Daily Press, 1987.
- Warner, M. (ed.), Management Reforms in China, London: Frances Pinter (Publishers), 1987.
- Webber, R. A., Culture and Management: Text and Readings in Comparative Management, Homewood, Ill., Richard D. Irwin, 1969.
- Weitzman, M. L., "The 'Ratchet Principle' and Performance Incentives." The Bell Journal of Economics, Vol.11, No.1, Spring 1980, pp.302-308.
- Weitzman, M. L., "The New Soviet Incentive Model." Bell Journal of Economics, Spring 1976, pp.251-257.
- Williamson, O. E., Markets and Hierarchies: Analysis and Antitrust Implications. The Free Press (N.Y. 1975).
- The World Bank, China: Finance and Investment, Washington D.C.: The World Bank, 1988.
- The World Bank, China: Socialist Economic Development, Vol.II, Washington D.C.: The World Bank, 1983.
- Xia Chao, "My Opinion on the Contract Management System's Predicament". (in chinese) Research on Economics and Management, No.6, 1988, pp.43-44.
- Xia Xiaoxun & Li Jun, "Consumption Expansion: A Grave Challenge to Reform and Development." In B. L. Reynolds (ed.) Reform in China: Challenges and Choices, San Diego: Academic Press, 1987, pp.89-107.
- Xiao He, *et al.*, "Contractors Trapped between the Old and New Systems (in Chinese)." Economics Weekly, 5 December 1988.
- Xinghua Yuebao, "Directions on Enterprise Grading" (in Chinese). Xinghua Monthly, No.5, 1987, pp.90-91.
- Xun Dazhi, "The Contract System: Straits and Way Out" (in Chinese). Jinji Yanjiu

- (Economic Research), No.3, 1990, pp.51-58.
- Yang Jiwan, "Thinking on the Contracted Operational Responsibility System" (in Chinese). Research on Finance and Accounting, No.8, 1988, pp.2-10.
- Yang Peixin, "On Upholding and Perfecting the Enterprise Contract System (in Chinese)." Economic Research, No.3, 1990, pp.44-50; translated in JPRS-CAR-90-048, 5 July 1990, pp.48-54.
- Yang Peixin, "Contract System in Shoudu Iron & Steel Co.." Beijing Review, No.23, June 8, 1987, pp.14-17.
- Yang Xiaobing, "Enterprise Law: A Milestone for Reform." Beijing Review, May 2-8 1988, pp.20-22.
- Yin Guanghua & He Zhongze, "Summary of the Enterprise Contract System in 1987" (in Chinese). China Economic System Reform, No.3, 1988, pp.35-38; translated in JPRS-CAR-88-041, 29 July 1988.
- Yu Quanlin, "The Contracting System: The First-round's Performance and the Second-Round's Pattern Of Development" (in Chinese). Working Paper, Research Institute of Economic Systems and Management, the Economic System Reform Committee, 1991.
- Yuan Baohua, "Perfecting the Contract Management System" (in Chinese). Economic Information, 30 October, 1,2 November 1989; translated in JPRS-CAR-89-121, 22 December 1989, pp.21-25.
- Yuan Baohua, "On Contract Responsibility System" (in Chinese). Economic Daily, 26 June 1987.
- Yue Haitao, "Contract System Animates Jilin Enterprises," Beijing Review, May 23-29, 1988, pp.15-18.
- Yunker, J. A., "A Dynamic Optimization Model of The Soviet Enterprise," Economics of Planning, Vol.13, Nos.1-2, 1973, pp.33-51.
- Zhang Shaojie & Zhang Amei, "The Present Management Environment in China's Industrial Enterprises." In B. L. Reynolds (ed.) Reform in China: Challenges and Choices, New York: M.E. Sharpe, 1987, pp.47-58.
- Zhang, Xun-Hai, Enterprise Reforms in a Centrally Planned Economy: The Case of the Chinese Bicycle Industry, Hampshire: The MacMillan Press Ltd., 1992.
- Zhang Yanning, "New Problems in Contracting" (in Chinese). Enterprise Management, No.4, 1988(a), pp.4-7.

- Zhang Yanning, "Perfect and Develop the Contract System, Improve Economic Efficiency of Enterprises" (in Chinese). China Economic System Reform, No.8, 1988(b), pp.7-11; translated in JPRS-CAR-88-064, 12 October 1988, pp.22-27.
- Zhang Yuyan, "Economic System Reform in China." WIDER Working Papers, WP.55, March 1989.
- Zhang Yi, "Efficiency Wages and the Law of Value" (in Chinese), Chinese Economic Issues, No.4, 1986, pp.18-21.
- Zhao Shuguo, *et al.*, "A Survey Concerning the Implementation of the Enterprise Law in Yantai City" (in Chinese). China Economic Structure Reform, No.9, 1989, pp.30-31.
- Zhao Xiaoping, Importance of Combining Material Incentives and Moral Incentives (in Chinese). Guizhou Accounting, March 1988, pp.21-25.
- Zheng Furui & Xie Yuanhai, "Some Thoughts on Improving the Contract Responsibility System" (in Chinese). Research in Economics and Management, No.4, 1989, pp.59-61; translated in JPRS-CAR-89-119, 11 December 1989, pp.12-14.
- Zhou Guirong, "Tightening the Control over Contracted Enterprises" (in Chinese). Enterprise Management, No.9, 1989, pp.29-30.
- Zhou Liquan, "Stimulation and Restrains: Transition of Enterprise Functioning System" (in Chinese). Economic Research, No. 9, 1989, pp.62-69.
- Zhou Shulian, "Reform of the Planned Economy and the Planning System", in G. Totten, and Zhou Shulian (eds) China's Economic Reform: Administering the Introduction of the Market Mechanism, Boulder: Westview Press, 1992, pp.19-32.
- Zhou Shulian, "Enterprise Reform and the Two-Power Separation Theory", in G. Totten, and Zhou Shulian (eds) China's Economic Reform: Administering the Introduction of the Market Mechanism, Boulder: Westview Press, 1992, pp.137-156.
- Zou, L., "Ownership Structure and Efficiency: An Incentive Mechanism Approach," Journal of Comparative Economics, Vol.16, No.3, September 1992(a), pp.399-431.
- Zou, L., "Threat-based Incentive Mechanisms under Moral Hazard and Adverse Selection," Journal of Comparative Economics, Vol.16, March 1992 (b), pp.47-74.