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The Economics of Free Internet Access

by

MARCO HAAN*

In an increasing number of European countries, Internet service providers offer free Internet access. Telephone companies are willing to pay these providers based on the amount of traffic they generate. In this paper, we explain these phenomena. We argue that, by offering a contract that pays the provider a certain lump sum conditional on it providing free Internet access, the telephone company solves a double marginalization problem. We analyze this in a simple model in which only the Internet access market is studied, and in a richer model, where the regular telephone market is also taken into account. (JEL: L12, L22, L42)

1 Introduction

In an increasing number of European countries, Internet service providers (henceforth ISPs) offer free unlimited Internet access. With such a service, consumers can use the Internet without paying their service provider anything. In the UK, free Internet access was introduced by the electronics retailer Dixons in the fall of 1998. Its service, Freeserve, attracted 1.3 million subscribers in seven months (THE EDITORS [1999a] of The Economist). Less than a year after its introduction, it has spawned nearly 100 imitators in Britain alone (THE EDITORS [1999b] of The Economist). In the Netherlands, some small providers introduced free Internet access on a limited scale in the spring of 1999. World Online, the largest service provider, followed by lowering prices to zero in August of the same year (see THE EDITORS [1999c] of De Volkskrant). Other large providers followed within weeks (see, e.g., THE EDITORS [1999d] of De Telegraaf). Since then, dozens of new free-access providers have been introduced. Also in France, Germany, and Belgium, free Internet access has been either introduced or announced (THE EDITORS [1999a] of The Economist, VAN JOSE [1999]).

* Financial support from the Netherlands Organization for Scientific Research (NWO) is gratefully acknowledged. The author thanks Christa Bouwman, Thijs Knaap, Ruud Konig, Peter Kogerman, Yohanes Riyanto, Lambert Schoonbeek, Ton Steeneman, and Bjorn Volkerink for useful discussion and comments. Comments of seminar participants at the University of Groningen, Erasmus University Rotterdam, the Berlin Internet Economics Workshop and EARIE 2000 are also gratefully acknowledged.

Journal of Institutional and Theoretical Economics
A Theory of Ownership Arrangements 
and Smooth Transition to a Free Market Economy

by

GUOQIANG TIAN

This paper develops a theoretical model that determines the optimal ownership arrangement in an imperfect market and government institutional environment, especially in transitional economies. It studies the interdependence of institutional environments and ownership arrangements. The theory developed sheds some light on predicting how the transition from a command economy to a free market economy takes place. It shows that an ownership arrangement may not be changed effectively without changing economic and political institutional environments. (JEL: L2, L3, P5)

1 Introduction

This paper is motivated by the following questions: (1) What are the optimal ownership arrangement and property-rights structures during the transition to a free market economy? Is the private ownership arrangement necessarily the most efficient property-rights structure during the transition? (2) What is the optimal strategy for transition to a free market economy, i.e., what are the relations, timing, and procedures of liberalization, marketization, and privatization for a smooth transition? When and under what conditions would a social planner, such as a legislature, policymakers, and reformers, suggest privatizing? Should it be done at the early stages of transition? (3) Why has the collective-owned sector, especially the township and village enterprise (henceforth TVE) sector, and not the private sector, been the main contributor to China's rapid economic growth and become the unavoidable intermediate ownership arrangement for the transition from a command economy to a market economy? (4) Why is corruption generally more serious in transitional economies than in command and market economies? We will provide our answers to these questions by developing a property-rights theory for transition economies.

The transition of countries with centrally planned economies to a market orientation, which affects about one-third of the world's population, has been an unavoidable reality in recent years. This makes institutional transition a hot research field in the literature. The optimal property-rights structures during the transition and the pattern of the transition are, however, far from clear, and they may not be studied well by conventional theories, since some of their key assumptions are not satisfied by transitional economies. A basic question for a smooth transition is: when and how should massive privatization be implemented? The answer from the conventional wisdom is that clearly defined property rights are a prerequisite for economic prosperity. Since privatization restricts redistribution and improves incentives by shifting residual income and control to private investors, a rapid transformation of ownership should be desirable. A widely held belief is thus that rapid privatization is a necessary first step for the institutional transition from a centralized command economy to a decentralized private free market economy.

Because of this belief, many Eastern Bloc countries, especially the former Soviet Union, are attempting their transitions by massive privatization together with liberalization and marketization reforms, while China and Vietnam are moving towards the free market economy gradually, adopting a quite different path of transition by mainly implementing the liberalization and marketization reforms without any privatization until recently. Surprisingly, most countries with massive privatization have had serious problems with regard to economic performance and stability. From tables 1 and 2, one can see that: First, the countries with massive privatization, listed in groups 2 and 3 in the table, have experienced significant declines in output and high inflation, while China and Vietnam, without massive privatization, have enjoyed rapid economic growth and much lower inflation during their transitions. Second, among countries adopting the same strategy of mas-

---

1 Clearly defined property rights typically include three basic elements (see DEMSETZ [1967] and FURUBOTN and PEDROVIC [1974]): First, every property is assigned to a well-defined owner or owners with exclusive rights of ownership. Second, the owner of the property receives the residual income accruing from the assets. Third, the owner has the right to control or determine the use of the existing assets, to restructure the property, and to sell or lease it. Some economists argue that the most important aspect of ownership and property rights is the right to control (GROSSMAN and HART [1986], HART and MOORE [1990]).

2 BLANCHARD and KREMER [1997] also provide two figures that give a striking picture of the extremely large decline in output in the republics of the former Soviet Union.

3 Although China and some Eastern Bloc countries may be in different stages of the transition process, we may still be able to make such a comparison by noting the fact that China has consistently had a high rate of economic growth in last 20 years. China will probably continue to have a remarkable growth rate if it does not carry out massive privatization until its transition is in the advanced stages and the state-owned sector accounts for only a small proportion of GNP (say, 15%). Because of the new entry of massive nonstate enterprises, it may take only a few more years for China's state sector to reach that proportion.

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Journal of Institutional and Theoretical Economics
Table 1
Growth of GDP in Some Transitional Economies (%)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>China</td>
<td>5.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Vietnam</td>
<td>6.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Russia</td>
<td>6.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>4.9</td>
<td>3.3</td>
</tr>
<tr>
<td>Ukraine</td>
<td>4.6</td>
<td>3.8</td>
</tr>
<tr>
<td>Lithuania</td>
<td>5.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Mongolia</td>
<td>4.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>4.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Czech</td>
<td>4.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Hungary</td>
<td>4.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Poland</td>
<td>4.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Romania</td>
<td>4.6</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Key: * Information not available.

Table 2
Average Annual Inflation Rate in Some Transitional Economies (%)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.6</td>
<td>3.0</td>
<td>5.4</td>
<td>13.0</td>
<td>21.7</td>
<td>17.0</td>
</tr>
<tr>
<td>Vietnam</td>
<td>67.5</td>
<td>67.6</td>
<td>71.5</td>
<td>5.2</td>
<td>8.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Mongolia</td>
<td>0.00</td>
<td>208.6</td>
<td>321.0</td>
<td>183.5</td>
<td>145.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Russia</td>
<td>5.6</td>
<td>92.7</td>
<td>1,330</td>
<td>896.0</td>
<td>303.0</td>
<td>190.0</td>
</tr>
<tr>
<td>Georgia</td>
<td>3.3</td>
<td>78.5</td>
<td>913.0</td>
<td>3,126</td>
<td>18,000</td>
<td>160.0</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>4.0</td>
<td>111.6</td>
<td>1,157</td>
<td>2,195</td>
<td>452.0</td>
<td>635.0</td>
</tr>
<tr>
<td>Ukraine</td>
<td>4.0</td>
<td>91.2</td>
<td>1,210</td>
<td>4,735</td>
<td>842.0</td>
<td>375.0</td>
</tr>
<tr>
<td>Lithuania</td>
<td>8.4</td>
<td>224.7</td>
<td>1,020</td>
<td>390.2</td>
<td>72.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>22.0</td>
<td>333.5</td>
<td>82.0</td>
<td>72.8</td>
<td>89.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Czech</td>
<td>10.8</td>
<td>56.7</td>
<td>11.1</td>
<td>20.8</td>
<td>10.2</td>
<td>9.1</td>
</tr>
<tr>
<td>Hungary</td>
<td>29.0</td>
<td>34.2</td>
<td>22.2</td>
<td>22.5</td>
<td>19.0</td>
<td>28.2</td>
</tr>
<tr>
<td>Poland</td>
<td>586.0</td>
<td>70.3</td>
<td>43.0</td>
<td>35.3</td>
<td>32.2</td>
<td>27.8</td>
</tr>
<tr>
<td>Romania</td>
<td>5.1</td>
<td>174.5</td>
<td>210.9</td>
<td>256.0</td>
<td>131.0</td>
<td>32.3</td>
</tr>
</tbody>
</table>

mies, in which economic freedom is constrained and markets are absent, immature, or imperfect. A basic question the paper will answer is: what is the best way to own a capital asset for a given degree of perfection of the institutional environment? The framework provides a vehicle for analyzing how the economic and political institutional environment affects the optimal choice of ownership arrangements. In this way, our theory improves and generalizes conventional property-rights theory to include irregular institutional environments. It rationalizes ownership and property-rights arrangements, and relates the optimal ownership arrangement to the degree of liberalization and marketization (imperfection of institutional environments).

This property-rights theory is then used to answer the questions raised at the beginning of the paper. We identify the relations, timing, and procedures of liberalization, marketization, and privatization necessary for a smooth transition. Contrary to a widely held belief that rapid privatization is a necessary first step for the institutional transition from a centralized command economy to a decentralized free market economy, we argue that the first step for a smooth institutional transition should be to improve the institutional environment through implementing liberalization and marketization reforms, but not implement massive privatization. Liberalization is an essential first step for transition, and it can achieve a great deal even when other key features of an effective market are lacking, because it decentralizes production and trade decisions to enterprises and households, and directly addresses the two fundamental weaknesses of central planning: poor incentives and poor information. This results in the entry of massive non-state-owned firms, most of which are collective enterprises, into business. Because transitional economies lack a high level of economic freedom, remain centralized to varying degrees, and lack a mature market system, private ownership may disrupt, rather than facilitate, a smooth transition to a private market system. Instead, the collective ownership arrangement may be more efficient in intermediate degrees of economic liberalization and marketization, and thus may be an unavoidable intermediate ownership arrangement during the process of transition and development.

This conclusion can be supported by the experience of a high rate of economic growth in China with the reforms of liberalization and marketization, and the experience in some Eastern Bloc countries of sharply decreasing GNP in conjunction with rapid privatization. Thus, this result explains why collective enterprises, especially the TVEs, have developed so rapidly in China, and become a main contributor to rapid economic growth.

Four other explanations for the high efficiency of Chinese TVEs are found in the literature. The first, by WEITZMAN AND XU [1994], is sociological and uses traditional Chinese culture as an explanation. The second, by CHANG AND WANG [1995], is political and is based on the interaction of the central government and local governments. The third, by LI [1995], is a risk-sharing explanation that shows the rationality of collective ownership in a gray-market environment with ambiguous property rights. The fourth, by CHE AND QIAN [1998a], interprets the firm boundaries of TVEs at the community level rather than at the enterprise level. Our approach is different, and focuses on special resources through which administrative bureaucrats may have a comparative advantage in irregular economies. This also explains why corruption becomes a more serious problem in transitional economies than in command and market economies, since corruption must be regarded as a type of collective ownership arrangement (although it may be illegal). Our theory predicts that the opportunities for corruption decrease with improvement of the institutional environment.

The model constructed tries to capture the crucial features of imperfection in institutional environments of market and government. In addition to capital and labor, internal management ability and external management ability (mainly public-relations ability in procurement of government-owned or -controlled resources) are considered as inputs in the production process. The external management ability is important when government intervention is significant or when a market is absent or not well developed. In general, entrepreneurs have superior abilities in internal management, and bureaucratic managers have superior abilities in external management. The degree of liberalization and marketization or perfection of the institutional environment of market and government is indexed by a number $\varphi$, which is between zero and one, and captures the relative importance of these two abilities. The closer $\varphi$ is to zero, the more centralized, constrained, or imperfect is the institutional environment. When $\varphi$ is zero, the economic system reduces to a pure command economy in which every production activity is controlled by the central government and thus management ability is redundant. When $\varphi$ is one, the institutional environment is perfect and personal relations are unnecessary.

To show the optimality of the collective ownership arrangement, three types of ownership arrangements for production are set up for comparison: private ownership that can take advantage of internal management ability, state ownership that can take advantage of external management ability, and collective ownership that affords an opportunity for specialization and the possibility of taking advantage of both internal and external management abilities. Theorem 1 shows that, under some conditions placed on the opportunity incomes and profit shares of individuals, collective ownership dominates state and private ownership arrangements if the degree of liberalization and marketization is in the intermediate stages. We also show that private and state ownership arrangements can be superior for different degrees of institutional environments. Theorem 2, which is relatively straight-

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5 For theoretical and empirical evidence on the importance and effectiveness of liberalization see TIAN [1996] and THE WORLD BANK [1996].
forward, shows that private ownership dominates state and collective ownership arrangements if the degree of liberalization and marketization is sufficiently high, and that state ownership dominates private and collective ownership arrangements if the degree is sufficiently low. Theorem 3 further shows that the relative efficiency of internal and external management abilities can also affect the choice of optimal ownership structure given the degree of economic irregularity.

A similar approach can be found in the literature, showing that different classes of agents characterized by comparative advantages in different unmarketed resources can potentially be used to explain different organizational arrangements. REID [1977] may have been the first to use the idea in studying contractual structures in agricultural tenancy. He considered landlords as a class having a comparative advantage in acquiring market information, and hence in management, while tenants afford an advantage in labor supervision. ESWARAN and KOTWAL [1985] modeled Reid’s idea formally and studied how each contractual form (fixed wage contract, fixed rental contract, share contract) entails a different type of agent (landlord or tenant) providing nonmarketed factor inputs. They discussed the optimal contractual structures in terms of the landlords’ profit for specific parameters. Our model is different from those in Reid [1977] and Eswaran and Kotwal [1985] in two main aspects. First, we determine the relative efficiency of the private, state, and collective ownership arrangements for varying degrees of imperfection of the institutional environment. We take the total surplus as a criterion for determining the optimal ownership arrangement, which corresponds to the standard practice in property-rights theories of assuming that ex ante parties can conduct Coasian negotiations on the ownership form.7 Thus, the optimal ownership arrangement is determined by maximizing the ex ante joint payoffs to the parties. In contrast, the other models determine the preference for organizational form under the restriction of a private ownership arrangement, and thus the optimal organizational form is determined by maximizing the entrepreneur’s payoff instead of maximizing the ex ante joint payoffs to the two parties. Second, we specify general, mathematical conditions on parameters to determine the optimal ownership arrangement, whereas other authors do not provide such conditions.

There are other theories that are related to ours and take the same perspective in the economics literature, such as those in Laffont and Tirole [1993], Shleifer and Vishny [1993], [1994], Schmidt [1996], Hart, Shleifer, and Vishny [1997], Blanchard and Kremer [1997], and Che and Qian [1998b], to name a few. These papers develop various theories of the ownership of firms in general, and government ownership in particular, in transitional economies under incomplete contracts or asymmetric information. Some of them study the optimal ownership structure in a specific institutional environment and examine the conditions that determine the relative efficiency of public ownership versus private ownership. The main difference between my own approach and the approaches mentioned above is that my approach considers explicitly the optimal ownership structure as a function of the institutional environment Ψ so that we can study the strategy for the smooth transition to a market economy. For instance, our theory can be used to identify the relations, timing, and procedures of liberalization, marketization, and privatization for a smooth transition. Some (e.g., Blanchard and Kremer [1997]) provide explanations for the mode of transition: the big bang versus gradualism.

The remainder of the paper is organized as follows: Section 2 formally describes the model. Section 3 determines the optimal ownership structures for the varying degrees of imperfect institutional environments. Section 4 uses the property-rights theory developed in the paper to answer the questions raised in the beginning, and provides some policy implications. The concluding remarks will follow in section 5.

2 The Framework

In this section we present a simple model to identify the optimal ownership arrangement with a given institutional environment. For convenience in understanding the framework and arguments, we first define some terminology.

2.1 Some Definitions

An institution is usually defined as a set of behavioral rules that pertain to social, political, and economic behavior and are used to govern a variety of social interactions (see Schultz [1968], Ruttan [1978], and North [1990]). Davis and North [1970], [1971, 6f.] further considered two categories of institutions: institutional environment and institutional arrangement. An institutional environment is the set of fundamental political, social, and legal ground rules that establish the basis for production, exchange, and distribution. Rules governing elections, property rights, and the right of contract are examples of ground rules that make up an economic environment. An institutional arrangement is an arrangement between economic units that governs the ways in which these units can cooperate or compete. An ownership arrangement is an institutional arrangement that allocates the property rights to an individual, a group of individuals, or government. In this paper, we focus on the determination of the optimal ownership arrangement by taking economic institutional environments as exogenous. Since the main purpose of the paper is to study under what conditions a government should or should not privatize the state sector, this exogenously assumed on institutional environments is reasonable. Thus, we make no attempt to study changes in an institutional environment, although such changes have certainly occurred in transitional economies and the study of these changes is important in the transitional-economics literature. 8

7 For instance, Hart, Shleifer, and Vishny [1997] and Che and Qian [1998a], [1998b] have used the total surplus to evaluate the superiority of private or public ownership arrangements.

8 Davis and North [1971] adopted the same approach when they studied institutional change.
The distinction between an institutional environment and an institutional arrangement is important in understanding some of the debates raised in the transitional economics literature. For example, some economists regard liberalization, marketization, and privatization as the same. However, according to the above distinction, they are different. Economic liberalization usually refers to the loosening or elimination of government restrictions on economic transactions, including freeing prices, trade, and entry of various types of new firms. Marketization refers to the developing and creating of market-supporting institutions such as the legal system, financial institutions, taxation, and macroeconomic management systems. Privatization refers to privatizing existing state-owned or collectively owned enterprises, land, and other assets. According to the above distinction between institutional environments and institutional arrangements, liberalization and marketization should be regarded as processes for changing a centralized-planning economic institutional environment to a decentralized market environment, while privatization should be regarded as a process for changing a non-private ownership arrangement to a private ownership arrangement. Recognizing this distinction should help the reader understand the arguments given in this paper concerning why rapid privatization should not be implemented before institutional environments are improved. Note that, even when liberalization and privatization can be accomplished in a short time, marketization takes a much longer time, years or even decades, because it involves such a fundamental change in skills, organizations, and attitudes.

2.2 The Description of the Model

The model constructed is the simplest one that catches the crucial features of irregular economic institutional environments and can be used to determine the relative efficiency of private, state, and collective ownership arrangements for a given economic institutional environment.

There are two types of managers engaging in a production activity: an entrepreneur, denoted by \( e \), and a bureaucrat, denoted by \( b \). The entrepreneur may be an investor or a group of investors; the bureaucrat may be the local government or a manager appointed by an upper-level bureaucratic department to run a state-owned firm. The firm can be established by choosing one of three organizational forms to own a capital investment. In the first, \( e \) runs the firm privately; in the second, \( b \) runs the firm for the state; and in the third, \( e \) runs the firm jointly with \( b \). We designate the first case as a privately owned firm with a private ownership arrangement, the second as a publicly owned firm with a state ownership arrangement, and the third as a collectively owned firm with a collective ownership arrangement.

After choosing the organizational form, the enterprise makes a capital investment \( \hat{K} \). When the enterprise is private, the capital investment is made by the entrepreneur. When the enterprise is public, the capital investment is made by the state. However, when the firm is collective, the capital investment may be made solely by the local government, in which case the local government chooses the ownership, or solely by the entrepreneur, in which case the entrepreneur chooses the ownership, or jointly by both parties, in which case both of them choose the ownership; each of these three cases can be found in Chinese TVEs. There is a trade-off associated with collective ownership. On the one hand, it reduces incentives, but by the same token it allows exploitation of a larger scope of skills and affords an opportunity for specialization: each agent performs the task in which he has the comparative advantage. Chinese TVEs represent a typical example of such an arrangement, in which external management is provided by bureaucrats and internal management by entrepreneurs. TIAN [2000] investigated the organizational structure of TVEs in this spirit.

We also assume that, in an environment characterized by an imperfect market or structured bounded economic freedom or limited decentralization, in addition to the usual capital and labor, the level of profit from the investment depends on two other resources: internal management ability to make production decisions, and external management ability. The latter involves the ability to get personal access to scarce resources controlled by state bureaucratic departments, the ability to get preferential policy treatment, and the ability to solve various disputes with other production organizational units.

Internal management ability is crucial to the efficiency of production. In an incomplete-information market or imperfect market, searching for and adopting proper production techniques, as well as selecting and using proper inputs, is essential for successful production. The activities involve decision making based on sound technical and market information. Making a good choice of inputs requires knowledge of available inputs, their quality, and their prices. Making a good production decision depends on knowledge of government tax-subsidy programs and of production regulations and policies.

External management ability may also be of crucial importance when markets, especially factor markets, are absent or far from perfection and when economic freedom and decentralization are far from complete. Such personal relations with state bureaucracy crucially affect the economic success of an individual in an imperfect institutional environment. Many production activities fall largely under government control in such irregular institutional environments, and this forms the basis for administrative bureaucratic intervention in production. Indeed, supply bottlenecks and shortages are more likely to be present in factor markets when administrative bureaucrats control the supply of production inputs. For instance, most banks are still owned and controlled by the government in China and in other transitional Eastern Bloc countries. The prices and supply of many basic raw materials, such as iron and steel, electricity, and transportation services, are not fully free. One may be unable to procure the requisite inputs for production from

\[9\] WEITZMAN AND XU [1994] called collective ownership vaguely defined ownership, and LI [1995] called it ambiguous ownership, since control rights are not clearly defined in such ownerships.
factor markets. One may also need to have permission or quotas from administrative bureaucrats to purchase these inputs. The quota for purchasing some inputs is not always fixed, and the amounts of the rationed good a firm can obtain often depend on the firm’s procurement ability and on the state of relations with the bureaucratic administrators who control the resources. Many rules, regulations, and policies exist for controlling and guiding their production; these are either vaguely defined, or their scope is limited. Thus, there is a wide margin for interpretation, and therefore bureaucratic administrators have great discretion in applying these rules and regulations to a firm.

The ability to enter into and to enforce contracts is basic to market economies. However, contracts are costly to write and enforce, and in many cases they are incomplete because of large transaction costs. This problem is even worse in imperfect institutional environments. WILLIAMSON [1975], [1980], [1985] and GROSSMAN AND HART [1986] have shown that the government structure (in particular, the pattern of ownership of assets) matters in the presence of transaction costs. The authority in relations induced by the ownership of assets defines the status quo for the renegotiation of contracts when unforeseen contingencies occur. Since the infrastructure of the market system is established completely and the development of the legal system is far from complete in an imperfect institutional environment, a firm may not always get fair treatment when involved in contract disputes with other organizational units. All of these problems require a firm to have good relations with the relevant bureaucratic departments; thus, bureaucratic connections become extremely valuable within an imperfect institutional environment such as a transitional economy. Many transactions and production relations are personalized, and access to scarce inputs is a matter of privilege. External management ability becomes essential for successful production.

The importance of promoting good relations with bureaucratic departments of course depends on the degree of liberalization and marketization. With an increase in liberalization and marketization (φ), the role of external management ability decreases. Increasing φ implies that the market environment is improving, and consequently the importance of management ability is increasing and the importance of external management ability is decreasing. If φ = 1, the market is perfect and economic freedom is full, so that external management ability is not necessary to the production process.\(^\text{10}\)

\(^\text{10}\) Note that a pure command economy is only theoretically possible, and there never exists such an economy in the real world. However, because we are mainly interested in the case of 0 < φ < 1, and we do not derive our results exclusively for φ = 0, it is acceptable to include this unrealistic possibility for completeness.

\(^\text{11}\) To concentrate on our main objective and to maintain an appropriate level of abstraction, we make no attempt to discuss how to measure φ. Readers can find a way to measure such an index in TIM WORLD BANK [1996]. Roughly speaking, φ depends on an aggregator index of degrees of government intervention, restrictions on prices and trade, entry of new firms, missing labor and financial markets, imperfection of legal system, and other market elements.

The above explains the importance of internal management and external management abilities for effective production in imperfect institutional environments. The production function then can be written as

\[
q = F(R, M, L, K; φ),
\]

where F is assumed to be increasing and strictly concave in its first three arguments, homogeneous of degree one in its first four arguments, differentiable, and such that

\[
F(R, M, L, K, φ) = \begin{cases} 
&f(M, L, K) \quad \text{if } φ = 1, \\
&g(R, L, K) \quad \text{if } φ = 0.
\end{cases}
\]

It is also assumed that the relative importance of external management ability, i.e., the marginal rate of technical substitution of R for M, \(F_R/F_M\), is decreasing in φ, where \(F_R\) and \(F_M\) denote the partial derivatives of F with respect to R and M, respectively. This specification of production contains the conventional neoclassical production economy and a pure command economy as special cases. Note that, while the amounts of capital and labor inputs hired are relatively easy to observe, the levels of external and internal management abilities are hard to observe. This feature introduces a moral-hazard problem—specifically, shirking in the provision of internal and external management inputs in the event that they are not provided by the owner of the firm.

Both internal and external management inputs are time-consuming processes. The more time spent on internal (on external) management, the better the quality of management decisions (of public relations) is. We thus use the time devoted to such activities by a producer as a proxy for internal management input (external management input).

Since the entrepreneur either owns the firm or is appointed by owners of the firm, his ability to organize production activities and his incentives to work hard are, in general, higher than those of the bureaucrat, for well-known reasons. Thus, the entrepreneur has a comparative advantage in internal management. On the other hand, since the bureaucratic manager either controls production resources directly (if he is with a local government agency) or has good personal relations with government departments, he has a comparative advantage in external management. We quantify this notion by using four parameters, \(λ_{\text{emp}}\) and \(λ_{\text{e}}\) (respectively \(λ_{\text{emp}}\) and \(λ_{\text{e}}\)), denoting the internal management ability and external management ability of the entrepreneur (the bureaucratic manager). The unit of efficiency of internal management (respectively external management) of the bureaucratic manager (respectively entrepreneur) is assumed to be one hour of the entrepreneur’s (respectively bureaucratic manager’s) time. That is, we assume \(λ_{\text{emp}} = 1\) and \(λ_{\text{e}} = 1\). We also assume that one hour of the entrepreneur’s time devoted to external management is equivalent to only a fraction \(λ_{\text{emp}}\) of an hour devoted to external management by the bureaucratic manager, and one hour of the bureaucratic manager’s time devoted to management is equivalent to only a fraction \(λ_{\text{e}}\) of an hour devoted to management by the entrepreneur. Thus, \(0 < λ_{\text{emp}} < 1\) and \(0 < λ_{\text{e}} < 1\).
We assume that the entrepreneur and bureaucratic manager each have one unit of time that can be allocated between production and alternative activities. The opportunity income of the entrepreneur is given by \( u_e \), and that of the bureaucratic manager is given by \( u_b \). All opportunity incomes are assumed to be determined exogenously. The price of the labor input is denoted by \( w \). The price of the production good is normalized to be one.

Since the ownership arrangement is an institutional arrangement, the total surplus of two parties should be used as a criterion for comparing various ownership arrangements. Before deciding the strategy of institutional transition, the legislature, policy decision makers, or reformers, as social planners, first need to know which ownership arrangement is more efficient for a given degree of liberalization and marketization, and, in particular, determine under what conditions and when massive privatization should be implemented.

In the following, we determine the optimal ownership arrangement under a given economic institutional environment. Since the production function is assumed to be homogeneous of degree one in four inputs, without loss of generality we can assume that a firm just uses \( K \) units of capital input for production. The optimization problem is set up for each of the three ownership arrangements.

### 2.3 Private Ownership Arrangements

Under the private ownership arrangement, the entrepreneur uses capital \( K \), hires labor input \( L \), and allocates his time among personal relations, management, and his alternative activity in order to maximize his payoff. That is,

\[
\Pi^p_e = \max_{R,M,L} \left[ F(\lambda, R, M, L, K, \tilde{q}) - wL + (1 - R - M)u_e \right]
\]

for \( R \geq 0, M \geq 0, \) and \( R + M \leq 1 \). Note that the difference \( F(\lambda, R, M, L, K, \tilde{q}) - wL \) is the entrepreneur’s net income from production and the term \( (1 - R - M)u_e \) is the income from any alternative activity.

Under private ownership, the payoff of the bureaucrat is \( \Pi^b_p = u_b \). The total surplus under the private ownership arrangement is given by

\[
W_p = \Pi^p_e + \Pi^b_p = \Pi^p_e + u_b.
\]

### 2.4 State Ownership Arrangements

Under the state ownership arrangement, the bureaucrat runs the firm by using capital \( K \) and hiring labor input \( L \), and allocates his time among personal relations, management, and his alternative activity. The contribution made by a bureaucrat is

\[
\Pi_s(R, M, L, \tilde{q}) = F(R, \lambda_m, M, L, K, \tilde{q}) - wL + (1 - R - M)u_b
\]

for \( R \geq 0, M \geq 0, \) and \( R + M \leq 1 \). The difference \( F(R, \lambda_m, M, L, K, \tilde{q}) - wL \) is the bureaucrat’s contribution from production, and the term \( (1 - R - M)u_b \) is his contribution from any alternative service activity. The net contribution (the profits) made by the bureaucrat is then obtained by subtracting the bureaucrat’s opportunity income from \( \Pi_s \). These residual claimants of the asset will be shared by the bureaucrat and the individual. Let the share of the bureaucrat be \( \delta \) with \( 0 < \delta < 1 \); it measures the bureaucrat’s benefit from his contribution. The bureaucrat prefers to make a large contribution because it may help his political career and help him enjoy various physical benefits and perks such as driving a luxury company car, living in a palace apartment, eating and drinking in good restaurants, etc.

Thus, the bureaucrat’s maximization problem under the state ownership is given by

\[
(5) \quad \Pi^s_p = \max_{R,M,L} \left\{ \delta \left[ \Pi_s(R, M, L, \tilde{q}) - u_b \right] + u_b \right\} = \delta \max_{R,M,L} \Pi_s(R, M, L, \tilde{q}) + (1 - \delta)u_b = \delta \Pi^s + (1 - \delta)u_b,
\]

where

\[
\Pi^s_p + \max_{R,M,L} \Pi_s(R, M, L, \tilde{q}).
\]

### 2.5 Collective Ownership Arrangements

Under the collective ownership arrangement, the entrepreneur and bureaucratic manager run the firm jointly. The bureaucrat receives her share of the residual, either as allowed by government policy explicitly or as bribes. The organizational forms of Chinese TVEs justify this assumption. To model the comparative advantage of specialization, we assume that the entrepreneur provides management and the bureaucrat provides personal relations, and that they share the profit according to some given ratio, which depends on the bargaining power of each party.\(^{12}\)

\[
(6) \quad \Pi^c_e = (1 - \delta) \left( \Pi^s_e - u_b \right) + u_e.
\]

The total surplus under the state ownership arrangement is then given by

\[
(7) \quad W_c = \Pi^c_e + \Pi^c_p = \Pi^c_e + u_e.
\]

---

\(^{12}\) The determination of the profit share may depend on the relative efficiency of external management and internal management abilities (i.e., \( \lambda_m \) and \( \lambda_e \)), the relative importance of these abilities to other inputs, relative opportunity income, etc. It may also depend on \( q \). In general, the smaller \( q \) is, the greater the bargaining power a bureaucrat has, and thus the larger his profit share may be. One can see these dependences from the conditions given in theorems 1–3.
Define a conditional profit function \( \Pi \), which is obtained by optimally choosing the amount of the labor input for given \( R \) and \( M \):

\[
\Pi(R, M; \phi) = \max_L \{ F(R, M, L, K, \phi) - wL \}.
\]

Let \( 0 < \theta < 1 \) be the share of the entrepreneur. The conditional net income of the entrepreneur is given by

\[
\Pi^e(R, M; \phi) = \theta \Pi(R, M; \phi),
\]

and the conditional net income of the bureaucrat is given by

\[
\Pi^b(R, M; \phi) = (1 - \theta) \Pi(R, M; \phi).
\]

Given the conditional profit function and the bureaucrat’s external management ability \( R \), the entrepreneur allocates his time between management and his alternative activity to maximize

\[
\Pi^e = \max_M \{ \theta \Pi(R, M; \phi) + (1 - M)u_e \}.
\]

for \( 0 \leq M \leq 1 \). Similarly, given the conditional profit function and the entrepreneur’s internal management ability \( M \), the bureaucrat allocates his time between external management and his alternative activity to maximize

\[
\Pi^b = \max_R \{ (1 - \theta) \Pi(R, M; \phi) + (1 - R)u_b \}
\]

for \( 0 \leq R \leq 1 \).

The above maximization problems of the entrepreneur and bureaucrat, specified by equations (9) to (12), form a two-person noncooperative game with a Nash equilibrium solution. At a Nash equilibrium pair \((R^*, M^*)\), equations (11) and (12) are satisfied simultaneously. Since the production function \( F \) is strictly concave and continuous in \((R, M, L)\), the conditional profit functions given by equations (9) and (10) are concave and continuous in \((R, M)\) (see Diewert [1973]), and thus the payoff functions given in equations (11) and (12) are also concave and continuous in \((R, M)\). Since the strategy space of the game is \([0, 1] \times [0, 1]\), which is convex and compact, we know there is a Nash equilibrium that solves simultaneously the problems of the two agents (see Baye, Tian, and Zhou [1993]; Friedman [1977]).

The total surplus under the collective ownership arrangement is given by

\[
W_c = \Pi^e + \Pi^b.
\]

Once the total surplus under the three ownership arrangements is determined, the optimal ownership structure is the one that produces the largest total surplus, that is, the largest value among \( W_p \), \( W_r \), and \( W_c \).

3 Solutions and the Optimal Ownership Arrangement

For simplicity, we now restrict the production function to be of a form of the Cobb–Douglas production function so that we can solve the model explicitly by differentiation and characterize the solutions by the first-order conditions. Furthermore, following Eswaran and Kotwal [1985], we assume that the production function is specified by

\[
q = AR^{\alpha_1}M^{\alpha_2}L^{\alpha_3}K^{\alpha_4},
\]

where \( A > 0, \alpha_i > 0 \) for all \( i \), and \( \alpha_1 + \alpha_2 + \alpha_3 = 1 \).

Solving the maximization problem in (8),

\[
\max_L \{ AR^{\alpha_1}M^{\alpha_2}L^{\alpha_3}K^{\alpha_4} - wL \},
\]

we get the conditional profit function given \( R \) and \( M \), which is given by

\[
\Pi(R, M; \phi) = BR^{\alpha_1}M^{\alpha_2},
\]

where

\[
B = (1 - \alpha_2)(\alpha_2 w^{-1})^{-1},
\]

\[
\alpha_1 = \frac{1 - \phi \alpha_1}{1 - \alpha_2},
\]

\[
\alpha_2 = \frac{\phi \alpha_1}{1 - \alpha_2}.
\]

3.1 Solutions for the Private Ownership Arrangement

Using equation (16), the entrepreneur’s payoff maximization problem in (2) can be rewritten as

\[
\Pi^p = \max_{R, M} \{ AR^{\alpha_1}BR^{\alpha_2}M^{\alpha_3} + (1 - R - M)u_e \}
\]

for \( 0 \leq R, 0 \leq M \), and \( R + M \leq 1 \).

\[\text{As a referee pointed out, the main theoretical results given in theorems 1–3 below can be obtained under more general assumptions. In particular, the derived theorems do not rely on the assumption of a Cobb–Douglas production function. It is sufficient to assume that the production function is given by } F = F^2(f(M, R, \phi), L, K), \text{ where at the upper stage } F^2 \text{ can take any well-behaved form, and only at the lower stage need } f(M, R, \phi) \text{ take the Cobb–Douglas form.}\]
Case A. \( R + M = 1 \). The solution is given by
\[
R_p^* = \frac{a_1}{a_1 + a_2},
\]
\[
M_p^* = \frac{a_2}{a_1 + a_2}.
\]

Case B. \( R + M < 1 \). The solution is given by
\[
R_p^* = \left[ \lambda_{ab} u_p^{-1} a_1 B \left( \frac{a_2}{a_1} \right)^{a_2} \right]^{\frac{1}{1-a_1-a_2}},
\]
\[
M_p^* = \frac{a_2}{a_1} R_p^*.
\]

Substituting the interior solutions (24) and (23) into (20), we have
\[
\Pi_p^* = (1 - a_1 - a_2) a_1^{-1} u_e R_p^* + u_e
\]
\[
= (1 - a_1 - a_2) \left[ \left( \lambda_{ab} a_1^{-1} a_2 a_3 \right)^{1-a_1-a_2} \frac{a_3}{u_e} \right]^{1-a_1-a_2} u_e + u_e + u_b. \]

Thus, total surplus is given by
\[
W_p = (1 - a_1 - a_2) \left[ \lambda_{ab} a_1 a_2 a_3 b \right]^{1-a_1-a_2} \frac{a_3}{u_e} \right]^{1-a_1-a_2} u_e + u_e + u_b. \]

3.3 Solutions for the Collective Ownership Arrangement

Using equation (16), the entrepreneur’s conditional payoff maximization problem in (9) can be rewritten as
\[
\Pi_c^* = \max_{M} \left[ \theta B R^a M^{a_2} + (1 - M) u_e \right]
\]
for \( 0 \leq M \leq 1 \). Solving this problem, we have the entrepreneur’s reaction function:
\[
M = \min \left[ 1, \left( \frac{\theta u_e^{-1} a_2 B R^a}{a_2} \right)^{1-a_2} \right].
\]
The bureaucratic manager’s conditional payoff given \( M \)
\[
\Pi_c^b = \max_{R} \left[ (1 - \theta) B R^a M^{a_2} + (1 - R) u_b \right]
\]
for \( 0 \leq R \leq 1 \). Solving this problem, we have the bureaucrat’s reaction function:
\[
R = \min \left[ 1, \left( (1 - \theta) u_e^{-1} a_1 B R^a \right)^{1-a_2} \right].
\]
Solving these reaction functions for the interior Nash equilibrium, we have
\[
M_c^* = \left[ a_2 \theta (1 - a_1) (1 - \theta) a_1 \left( \frac{a_1 u_e}{a_2 u_b} \right) \right]^{1-a_1-a_2} \]
\[
R_c^* = \left( \frac{(1 - \theta) u_e a_1}{\theta u_b} \right) M_c^*.
\]

Substituting (39) and (38) into (34) and (36), we have
\[
W_c = \Pi_c^* + \Pi_c^b
\]
\[
= (1 - \theta) a_1 \theta a_2 \left[ B \theta a_2 (1 - \theta) a_1 a_2 b \right]^{1-a_1-a_2} \frac{1}{a_2} \times u_b^{1-a_1-a_2} \frac{a_1}{u_e^{1-a_1-a_2}} + u_e + u_b.
\]
3.4 Optimal Ownership Arrangements

Now we determine the optimal ownership arrangement within a given institutional environment. We discuss only the interior solution case; the results for the corner solution case can easily be obtained similarly. All proofs of theorems are given in the appendix. Our main result is given by theorem 1, which shows that the collective ownership arrangement is socially optimal when \( \varrho \) is somewhere around the middle of \((0, 1)\).

Theorem 1: For the Cobb-Douglas technology specified in (14), suppose \( \frac{\lambda_{mb}}{\theta^2} \leq \frac{u_b}{u_e} \leq \frac{(1-\theta)^2}{\lambda_{re}} \). Then, for all \( \varrho \) satisfying

\[
0 < \frac{\ln(1-\theta) - \ln \lambda_{re} u_b}{\ln(1-\theta) + \ln \lambda_{mb} u_e} < \varrho < \frac{\ln(1-\theta) - \ln \lambda_{re} u_b}{\ln(1-\theta) - \ln \lambda_{re} u_b},
\]

then the collective ownership arrangement dominates the private and state ownership arrangements. That is, \( W_c > \max \{ W_p, W_s \} \).

Theorem 2 below shows that state ownership is the dominant ownership arrangement when the degree of liberalization and marketization is sufficiently low (i.e., the institutional environment is sufficiently imperfect) and that private ownership is the dominant ownership arrangement when the degree of liberalization and marketization is sufficiently high (i.e., when \( \varrho \) is close to one).

Theorem 2: For the Cobb-Douglas technology specified in (14), if \( \lambda_{mb} \leq u_b / u_e \leq \lambda_{re} \), then the state ownership arrangement dominates private ownership if and only if \( \varrho \) satisfies the inequality

\[
0 \leq \varrho < \frac{\ln \frac{u_e}{\lambda_{re} u_b}}{\ln \frac{1}{\lambda_{mb} \lambda_{re}}} < 1.
\]

Furthermore, the state ownership arrangement dominates the private ownership and collective ownership arrangements when the degree of liberalization and marketization is sufficiently low. The private ownership arrangement dominates the state ownership and collective ownership arrangements when the degree of liberalization and marketization is sufficiently high. That is, \( W_s > \max \{ W_p, W_c \} \) when \( \varrho \) is sufficiently close to zero, and \( W_p > \max \{ W_s, W_c \} \) when \( \varrho \) is sufficiently close to one.

The above two theorems indicate that the optimal choice of ownership arrangements is an optimal response to the degree of liberalization and marketization. They show how the optimal ownership arrangements vary with \( \varrho \) when \( \varrho \) moves from 0 to 1. Figure 1 illustrates such changes in optimal ownership arrangements when \( \varrho \) moves from 0 to 1.

The above two theorems also show that the optimal choice of ownership arrangement depends on the degree of perfection of the institutional environment. Theorem 3 shows that the relative efficiency of internal management ability and external management ability affects the optimal ownership arrangement for a given degree of perfection of the institutional environment, \( \varrho \).

Define two critical values at which the collective ownership arrangement is switched to the private ownership arrangement and to the state ownership arrangement as follows:

\[
(42) \quad \lambda_{re} = \left( \frac{u_e}{u_b} \right) \left( \frac{1 - (1-\theta) a_1 - \theta a_2}{1 - a_1 - a_2} \right) \theta^{a_1\theta^{a_2}} (1-\theta)^{a_1} \right)^\frac{1}{a_1}
\]

and

\[
(43) \quad \lambda_{mb} = \left( \frac{u_b}{u_e} \right) \left( \frac{1 - (1-\theta) a_1 - \theta a_2}{1 - a_1 - a_2} \right) \theta^{a_1\theta^{a_2}} (1-\theta)^{a_1} \right)^\frac{1}{a_1}
\]

Theorem 3: For the Cobb-Douglas technology specified in (14), suppose that \( \lambda_{re} \leq 1 \) and \( \lambda_{mb} \leq 1 \). Then, the state ownership arrangement dominates the private ownership and collective ownership arrangements, i.e., \( W_s > \max \{ W_p, W_c \} \), if and only if \( \lambda_{mb} \geq \lambda_{re} \) and \( \left( \frac{\lambda_{mb} u_e}{u_b} \right)^{a_2} \leq \left( \frac{\lambda_{re} u_b}{u_e} \right)^{a_1} \); the private ownership arrangement dominates the state ownership and collective ownership arrangements,
and finally privatization – the last only when \( \varphi \) becomes sufficiently large. This is because, by theorems 1 and 2, a private ownership arrangement may not be appropriately established without reducing government intervention in production activities, and without improving economic freedom and market environments. Implementing changes in property rights, i.e., privatizing, regardless of the development of market institutions in the economy, is costly. The resulting private enterprises are not viable unless the economy is in the advanced stages of liberalization and marketization. Thus, unconditional mass privatization of state-owned firms may not be appropriate for an institutional transition. During the process of institutional transition in which an effectively functioning market system has not been properly established, and while there are still many barriers to economic freedom, collective ownership may be more efficient and lead to rapid development. As a result, the relative size of the state sector declines with the development of the transition and the resulting increase in the nonstate sector. Our theory further predicts that, with the continuing improvements of liberalization and especially marketization, more and more collective enterprises will lose their comparative advantage and begin to change their ownership to private, so that the relative size of the state-owned sector will continue to shrink. Only when the transition is in the advanced stages of liberalization and marketization and when the state-owned sector is only a small proportion of the economy (say, about 15% of GNP, the percentage for most developed countries) can one implement massive privatization.

These conclusions are consistent with the experience of China’s economic reform, and can be used to explain why collective enterprises (especially the TVEs), and not the private or the state sector, have been the engine of economic growth in China. The early stage of China’s economic reform and institutional transition can be characterized as improving the institutional environment through liberalization and marketization reforms. These reforms established the basic prerequisite conditions for an economic mechanism to perform well, such as economic freedom, decentralized decision making, and various incentive mechanisms. This resulted in rapid entry of various types of new firms, especially the quick development of collectively owned enterprises such as TVEs, because, by theorem 1, they are more efficient in intermediate degrees of economic liberalization and marketization. As a result, the collectively owned sector has become the main contributor to rapid economic growth in latest twenty years. Indeed, a recent article in a Chinese newspaper (China Economic Times, August 13, 1999) gave an estimate of \( \varphi \) by measuring the degrees of marketization in the labor market, financial market, and product market, as well as the degrees of economic freedom and government intervention through price control. The current value of \( \varphi \) in China is in the range

\[ \text{The empirical results of Jin and Qian (1998) also support the conclusion that collective ownership dominates the other two forms when the local government’s power is great and the market is underdeveloped.} \]
of 0.45 to 0.5. This may show, by the theory developed in the paper, why collective enterprises still dominate private enterprises in China, and why China’s economic reform is more successful in terms of economic performance and stability than some of the Eastern European countries.

As an application, our results can be used to explain why corruption is generally more serious in transitional economies than in command and market economies. Since corruption can be regarded as a type of collective ownership arrangement (joint ownership by bureaucrats and entrepreneurs), it can increase a firm’s productivity during the intermediate states of transition. This also explains why many well-known big corporations pursue joint ventures with Chinese state-owned enterprises: given China’s current degree of imperfection of institutional environment, q, they want to use bureaucratic managers to promote relations with government.

Our results may even be used to interpret some phenomena in industrialized economies. For instance, they can be used to explain the existence of state-owned, publicly owned, and mixed-ownership firms even in an industrialized economy. For a sector with a natural monopoly such as the utilities, the market is imperfect and there are a lot of government regulations. Thus, q is small and state-owned firms are likely to prevail.

The collective ownership arrangement is not only an important and more efficient property-rights structure during transition and development, but it is also an unavoidable intermediate property-rights arrangement and may exist throughout the early and intermediate stages of the transition. This is because marketization (changing the institutional environment to a market-oriented environment) is a long-term process, unlike privatization (changing the ownership arrangement to private ownership), which can be rapidly implemented. Establishing a mature market institution is a very time-consuming and difficult process. Merely implementing a liberalization policy (loosening restrictions on prices, opening production markets, or granting people economic freedom) is insufficient to create a mature market system. Such an institution also requires other supporting institutions such as financial institutions, public agencies, fiscal and monetary policy management systems, modern laws for firms, taxation (income distribution) systems, legal systems, antitrust systems, labor market systems, etc. Developing such supporting institutions takes years or even decades, because they involve fundamental changes in skills, organizations, and attitudes. Besides, political and social institutional environments, which also affect ownership arrangements, are hard to change. There are the usual problems of free riding, resistance from those who stand to lose from the change, and the high costs of learning new rules. Only when the market system is almost established and economic freedom is almost full do state-owned and collectively owned firms become less efficient so that massive privatization can be implemented.

The conclusion that the optimal ownership arrangement (whether state or private) depends on the institutional environment can be supported by looking at China’s experience in the institutional transition from a market to a centralized command economy beginning in the early 1950s, and then its reverse transition in the 1980s and 1990s. After the founding of the People’s Republic of China in 1949, the Chinese Communist Party did not change the economic system to state ownership directly (by simply expropriating private property), but indirectly, by changing institutional environments, gradually reducing economic freedom, intervening in the market, and controlling raw materials (the so-called industry and commerce remodeling movement), so that privately owned firms could not survive in the long run. These firms then had to be either forced out of business or changed into collective ownership arrangements with the central or local governments—a form of collectively owned firms called the “state and private jointly run firm” (gong-si-he-ying in Chinese). As the degree of Chinese government intervention became more severe, most enterprises transformed into state-owned enterprises, with the state-owned proportion of gross industrial product reaching 78% by the end of the Cultural Revolution in 1976. After the Cultural Revolution, China reversed this process, and moved from a centrally planned economy back to a market-oriented economy. Through economic liberalization and marketization reforms beginning in 1978, the significance of the state sector declined steadily even without any privatization until very recently, and many new non-state-owned enterprises, most of which are collectively owned because of their relatively high efficiency, entered into the economy to compete with existing state-owned enterprises. This made the economy change from a state-dominated economy to one in which the non-state-owned sector produced about 74% of GDP by 1999. With the further progress of economic liberalization and the continuing and increasing introduction of market-supporting institutions, the collectively owned enterprises are losing their comparative advantage, and by now many collectively owned enterprises, especially TVEs, have changed into privately owned enterprises. Notably, China has recently decided to speed up privatizing state-owned enterprises. Various policies for doing so have been proposed by the Chinese government. All of these events confirm our property-rights theory.

Interestingly, even for some countries with sudden changes in political orientation in Eastern Europe, privatization has not been as rapid as people thought. In his recent study, Perotti [1995] indicated that of the recent sales of state-owned firms to foreign firms in Hungary, remarkably, all are partial sales (so the result is a form of collective ownership), although the agreement typically provides for transfer of managerial control and a complete sale over time. Perotti [1995] also pointed out that most public sales in the United Kingdom are partial sales. These experiences show the same pattern of privatization as predicted by our theory: the transition is from a state ownership arrangement to a collective ownership arrangement, and then to a private ownership arrangement as a final objective.

15 For a detailed introduction to the Chinese economy, see Cheung [1982] and Perkins [1986].
Concluding Remarks

This paper has developed a theory of endogenous ownership arrangements that rationalizes the optimal choice of ownership arrangements among private ownership, collective ownership, and state ownership in an imperfect institutional environment. The contrast between the transition experiences in China and the former Eastern European countries provides the backdrop for this paper. The crucial condition is that some special resources, such as personal-relations input, are needed for effective production in the presence of irregular institutional environments. The theory predicts how the transition from a command economy to a free market economy takes place and offers some interesting insights into the transition from state to collective and finally to private ownership (and into the reverse transition).

By applying this theory of property rights, one can study and provide convincing answers to some important questions that may not be well explained by the traditional theories.

This theoretical framework goes beyond the existing literature in two key respects. First, our theory removes the assumptions of full economic freedom, decentralized decision making, and market perfection, which are imposed in the conventional property-rights theories. It improves and enriches the conventional theories to include general (regular and irregular) institutional environments in which the market may not be perfect and there are some barriers to economic freedom and decentralization. Furthermore, it brings the discussion of transitional economies into the familiar framework of the mainstream economics literature.

Secondly, it regards an ownership arrangement not as given, or chosen directly by a social planner, but as an efficient response to the degree of economic liberalization and marketization. The theory shows that collective ownership dominates state and private ownership in institutional environments where market underdevelopment and government influence coexist. External management ability, which can be best understood as rent-seeking ability, is a productive input not only at the firm level, but also at the macro level of the total economy, when the economic institutional environment is very irregular. Literature on rent seeking indicates that it is inefficient from the society’s perspective. However, this conclusion is essentially based on the key assumption that the institutional environment under consideration is regular. When this assumption is dropped, this conventional wisdom may no longer be true. When one studies the relative efficiency of an ownership arrangement for a given economic institutional environment \( \varphi \), it is important to distinguish the relative (local) efficiency of external management ability for a given institutional parameter \( \varphi \) and the absolute (global) inefficiency of external management ability over the whole domain of institutional parameters \( \varphi \). Even though rent seeking is inefficient compared to the case of \( \varphi = 1 \), it will be productive when \( \varphi \) is low. Theorem 1 shows that, for a given \( \varphi \) that is small, the collective ownership arrangement will be more efficient than the private ownership arrangement, although it is not an absolute (global) social optimum because of rent seeking on the whole domain of \( \varphi \). That is, when \( \varphi \) is small, private ownership will be less productive at both micro and macro levels. Indeed, for a given low \( \varphi \), how can the private ownership arrangement be more productive at the macro level when each individual privately owned firm is less productive than the other types of ownership arrangements at the micro level? That is logically impossible. This conclusion is robust and consistent with empirical evidence in China. In a transition economy with limited economic freedom and a less-developed market system, a private ownership arrangement may not be the most efficient one and a collective ownership arrangement may dominate it, since the prices for such resources as promoting personal relations and the procurement of inputs must be paid. Bureaucrats have a comparative advantage in pooling such resources, and their costs of doing so are therefore lower. The policy implications of this result are considerable in that it is especially relevant to transitional economies and to economies with imperfect markets. Since \( \varphi \) can increase only gradually, a collective ownership arrangement may exist for a long time, and rapid privatization is not the optimal choice in the intermediate stages of the transition.

I should emphasize that our main results show the relative efficiency, not the absolute efficiency, of an ownership arrangement under varying degrees of institutional environments. That is because the basic question asked in this paper is, under a given degree of economic institutional regularity \( \varphi \), what is the best way to own a capital asset. These results do not argue for an advantage of collective ownership arrangements. Rather, they indicate the importance of economic liberalization and marketization and, consequently, the importance of improving the overall institutional environment. Although collective ownership may dominate private ownership when the institutional environment is irregular, it does not do so when the environment is regular. Private ownership will become not only relatively but also absolutely efficient when the institutional environment is sufficiently regular. Indeed, transactions in irregular institutional environments carry high costs and require extra resources to promote procurement ability. Thus, private ownership is more efficient if the external management skill and the costs associated with government intervention are not required to conduct business. In the long run, clear property rights and widespread private ownership are necessary for markets to perform efficiently and equitably. Thus, our theory does not contradict standard property-rights theories, but rather recognizes that in the middle of a transition in an irregular economy, there are significant rewards to effective external management skill. To reach an efficient allocation of resources, private ownership is an appropriate mechanism. Thus, the eventual transition from a command economy to a free market economy will be optimal. This is why we want to make such a transition: so that private ownership arrangement will reach absolute social efficiency. But the question is how a smooth transition should be implemented. The answer from our theory and policy implication is that the appropriate procedure for reaching this goal may not be to privatize state-owned enterprises rapidly, but rather to improve the economic environment first. Liberalization and marketization can not only lead to the entry of many new firms, but also change the institutional environments to ones that are suitable for private ownership arrangements.
Since developing new markets and establishing a mature market system are time-consuming and costly, and complete and immediate privatization may not be the optimal choice for an economy with imperfect institutions. In the transitional period, collective ownership may be a more efficient response given the institutional environment, and thus should not be skipped. As institutions improve significantly, firms then should be privatized.

I also want to emphasize that a social planner does not play a role in the setting of our model; we use one only to discuss the policy implications of the main results: how to make a smooth transition and how to reach a preferred ownership arrangement. That is, the optimal ownership arrangements are not directly chosen by a social planner in our model, but they can be indirectly selected through changing the value of \( \varphi \), in which a social planner can, and should, play an important role. It is important to notice this distinction, since the ownership arrangement chosen by policymakers may be relatively inefficient if the institutional parameter \( \varphi \) is not changed appropriately.

A basic question answered in this paper is: What is the best way to own the capital asset \( K \) under a given degree of economic institutional regularity \( \varphi \)? After finding the relative efficiency of an ownership arrangement under varying degrees of imperfection in the economic institutional environment, one can reach a preferred ownership arrangement by changing \( \varphi \). Our theory argues that a powerful reformer or government agency, as a social planner, should adopt a policy of improving the economic institutional environment, but not simply change ownership arrangement directly, even though the agency wants to have a dominant private ownership arrangement. As \( \varphi \) improves, state ownership and then collective ownership become less and less relatively efficient, and private ownership becomes more efficient and can then develop more rapidly.

Finally, we mention some limitations of the paper. First, for simplicity, this paper does not explicitly consider markets for internal and external management resources. However, these markets and transactions are not completely ignored; they are summarized in \( \varphi \) and by their opportunity incomes. Secondly, since the paper mainly studies what is the best way to own capital \( K \), we do not consider a market for \( K \). Thirdly, our property-right theory only considers a single dominant ownership arrangement. Even so, it may be used to explain the coexistence of different ownership arrangements such as state-owned firms, collectively owned firms, and privately owned firms even in the same industry or area. Since the opportunity incomes of bureaucrats and entrepreneurs, the sharing rule, and the relative efficiency of management ability and of external management ability can also affect the optimal ownership arrangements, differences in these parameters among different individuals could lead to the coexistence of different ownership arrangements in the same areas or sectors.

An interesting question not studied in this paper is how to design an efficient and smooth process for institutional-environment transition, such as the evolution from a command economy to a market economy—i.e., how liberalization and marketization should be implemented. Another such question is the interaction of improving institutional environments and changing ownership arrangements. As in Davis and North [1971], \( \varphi \) has been treated here as an exogenous variable that describes the status of market perfection, economic freedom, and decentralization of an economy, while ownership institutional arrangement is an endogenous variable. A more accurate and appropriate model would treat market development as an endogenous variable. When the degree of economic freedom, government intervention, and decentralization improves, the market will develop and mature. Nevertheless, without economic freedom and reduced government intervention, just privatizing state-owned enterprises is unlikely to develop a mature market. Since the development of market-supporting systems is a very time-consuming process and this paper mainly focuses on the optimal ownership arrangement, one may treat the market development as an exogenous variable, especially over a short period.

Appendix

A.1 Proof of Theorem 1
First, show \( W_e > W_x \). By comparing (40) with (33), we see that it is sufficient to show

\[
\lambda_{mb}^{a_3} \frac{u_b}{u_e} < \left( 1 - \theta \right)^{a_2} \left( 1 - \theta \right)^{a_2} \frac{u_x}{u_e} \]

by noting that \( 1 - (1 - \theta) a_1 - \theta a_2 > 1 - a_1 - a_2 \).

Solving this inequality for \( \varphi \), we have

\[
\varphi \left[ \ln \frac{\lambda_{mb} u_e}{u_b} + \ln \frac{1 - \theta}{\theta} \right] < \ln (1 - \theta).
\]

Since \( \lambda_{mb} < \theta^{a_3} \frac{u_b}{u_e} < \theta \frac{u_b}{u_e} < \frac{u_b}{u_e} \), we have \( \lambda_{mb} u_e \times \frac{1 - \theta}{\theta} < 1 \) and thus

\[
\varphi > \frac{\ln (1 - \theta)}{\ln \frac{\lambda_{mb} u_e}{u_b} + \ln \frac{1 - \theta}{\theta}} = C > 0.
\]

To show \( W_c > W_{x} \), we compare (40) with (26). Now, \( W_c > W_{x} \) if

\[
\lambda_{mc}^{a_1} \left( \frac{u_c}{u_b} \right)^{a_2} (1 - \theta)^{a_1} \theta^{a_2}.
\]
Solving this inequality for $\varrho$, we have

$$\varrho \left[ \ln \frac{1 - \theta}{\theta} - \ln \frac{\lambda_{re} u_b}{u_e} \right] < \ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}.$$ 

Since $\frac{u_b}{u_e} < \frac{(1 - \theta)^2}{\lambda_{re}} < \frac{(1 - \theta)}{\lambda_{re}}$, we have $(1 - \theta) > \frac{\lambda_{re} u_b}{u_e}$ and thus $\frac{1 - \theta}{\theta} > \frac{\lambda_{re} u_b}{u_e}$.

Therefore, we have

$$\frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} - \ln \frac{\lambda_{re} u_b}{u_e}} = D < 1.$$ 

(45)

Finally, it must be shown that $\varrho$ satisfies both inequalities given by (44) and (45), i.e.,

$$D - C = \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}} - \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e} - \ln \frac{\lambda_{mb} u_e}{u_b}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}}$$

$$= \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}} - \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}}$$

$$= \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}} - \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}}$$

$$> 0.$$ 

Note that the denominator in the last inequality is negative. Also, $\ln (1 - \theta) - \frac{1}{2} \ln \frac{\lambda_{re} u_b}{u_e} > 0$ and $\ln \theta - \frac{1}{2} \ln \frac{\lambda_{mb} u_e}{u_b} > 0$ by assumption, and thus $\ln \frac{\lambda_{re} u_b}{u_e} < 0$ and $\ln \frac{\lambda_{mb} u_e}{u_b} < 0$. Therefore, we have $D - C > 0$. Thus, it is shown that $W_e > W_p$ for $\varrho$ satisfying the inequality

$$\frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}} < \varrho < \frac{\ln (1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln 1 - \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{mb} u_e}{u_b}}$$

when the other conditions are satisfied.

Q.E.D.

A.2 Proof of Theorem 2

By comparing (26) with (33), we have $W_e > W_p$ if and only if

$$\lambda_{mb} u_p^{a_1 + a_2} > \lambda_{re} u_p^{a_1} \lambda_{mb} u_e^{a_1}.$$ 

Note that $a_1 = \frac{(1 - \varrho)}{1 - \alpha_2} = \frac{(1 - \varrho)}{1 - \alpha_2}$, and $a_2 = \frac{(1 - \varrho)}{1 - \alpha_2} = \frac{(1 - \varrho)}{1 - \alpha_2}$. Solving the inequality in (46) for $\varrho$, we have

$$\varrho < \frac{\ln u_e}{\ln \frac{\lambda_{re} u_b}{\lambda_{mb} \lambda_{mb}}}.$$ 

Since $\frac{u_b}{u_e} > 1$ and $\frac{u_b}{u_e} \frac{\lambda_{mb}}{\lambda_{mb}} < 1$, we have

$$0 \leq \varrho < \frac{\ln u_e}{\ln \frac{\lambda_{re} u_b}{\lambda_{mb} \lambda_{mb}}} = \frac{\ln \frac{\lambda_{re} u_b}{\lambda_{mb} \lambda_{mb}}}{\ln u_e} + \ln \frac{\lambda_{mb}}{\lambda_{mb}} \leq 1.$$ 

Thus, $W_e > W_p$ if and only if the above inequality holds.

Now we show the second part of the theorem. That is, it needs to be shown that $W_e > W_p$ when $\varrho$ is sufficiently close to 0 and $W_p > W_e$ when $\varrho$ is sufficiently close to 1. By comparing (40) with (33) and (26), we see that $W_e > W_p$ if and only if

$$\lambda_{mb} u_p^{a_1} \left( \frac{1 - (1 - \varrho)}{1 - \alpha_2 - \alpha_2} \right)^{a_1 - a_2} (1 - \varrho)^{a_1} \theta^{a_2},$$ 

and $W_p > W_e$ if and only if

$$\lambda_{re} u_p^{a_1} \left( \frac{1 - (1 - \varrho)}{1 - \alpha_2 - \alpha_2} \right)^{a_1 - a_2} (1 - \varrho)^{a_1} \theta^{a_2}.$$
When $q \to 0$, we have $a_1 \to b$, $a_2 \to 0$, $\lambda_{mb}^q \to 1$. Then

$$
\left( \begin{array}{c}
\frac{u_b}{u_e} \\
\frac{u_e}{u_b}
\end{array} \right) \left( \begin{array}{c}
1 - (1 - \theta) a_1 - \theta a_2 \\
1 - a_1 - a_2
\end{array} \right)^{1 - a_1 - a_2} (1 - \theta)^{a_1} \cdot \theta^{a_2} \\
\left[ \begin{array}{c}
1 - (1 - \theta) b \\
1 - \beta
\end{array} \right]^{1 - \beta} \left( \begin{array}{c}
1 - \theta b \\
1 - \beta
\end{array} \right) ^{1 - \beta} \phi(\theta) \leq 1
$$

because $\phi(0) = 1$ and $\phi(\theta)$ is strictly decreasing (since $\phi'(\theta) < 0$). Thus, we have $W_e > W_c$ when $q$ is sufficiently close to 0.

On the other hand, when $q \to 1$, $a_1 \to 0$ and $a_2 \to b$. Then

$$
\left( \begin{array}{c}
\frac{u_b}{u_e} \\
\frac{u_e}{u_b}
\end{array} \right) \left( \begin{array}{c}
1 - (1 - \theta) a_1 - \theta a_2 \\
1 - a_1 - a_2
\end{array} \right)^{1 - a_1 - a_2} (1 - \theta)^{a_1} \cdot \theta^{a_2} \\
\left[ \begin{array}{c}
1 - (1 - \theta) b \\
1 - \beta
\end{array} \right]^{1 - \beta} \left( \begin{array}{c}
1 - \theta b \\
1 - \beta
\end{array} \right) ^{1 - \beta} \phi(\theta) \leq 1
$$

because $\phi(1) = 1$ and $\phi(\theta)$ is strictly increasing (since $\phi'(\theta) > 0$). Thus, we have $W_p > W_c$ when $q$ is sufficiently close to one.

Thus, $W_e > \max\{W_p, W_c\}$ when $q \to 0$, and $W_p > \max\{W_p, W_c\}$ when $q \to 1$. Q.E.D.

A.3 Proof of Theorem 3

By the inequality

$$
\left[ \begin{array}{c}
1 - (1 - \theta) a_1 - \theta a_2 \\
1 - a_1 - a_2
\end{array} \right]^{1 - a_1 - a_2} \theta^{a_2} (1 - \theta)^{a_1} \\
\leq \frac{u_b}{u_e} \left[ \begin{array}{c}
1 - (1 - \theta) a_1 - \theta a_2 \\
1 - a_1 - a_2
\end{array} \right]^{1 - a_1 - a_2} \theta^{a_2} (1 - \theta)^{a_1}
$$

one can easily verify that $\lambda_{mb} \leq 1$ and $\lambda_{se} \leq 1$. We already know that $W_p > W_c$ if and only if $\lambda_{se} > \lambda_{mb}$, while $W_p < W_c$ if and only if $\lambda_{se} > \lambda_{mb}$ and $W_p > W_c$ if and only if

$$
\lambda_{mb}^q u_b^{(a_1 + a_2)} > \lambda_{se} u_e^{(a_1 + a_2)}.
$$

Rearranging the above inequality, we have

$$
\lambda_{mb}^q u_b^{(a_1 + a_2)} > \lambda_{se} u_e^{(a_1 + a_2)}.
$$

Thus, we have $W_p > \max\{W_p, W_c\}$ if and only if $\lambda_{mb} \geq \lambda_{se}$, and

$$
\lambda_{mb}^q u_b^{(a_1 + a_2)} \geq (\frac{\lambda_{mb}^q u_b}{u_e}) \cdot \theta^{a_2} (1 - \theta)^{a_1};
$$

$W_p > \max\{W_p, W_c\}$ if and only if $\lambda_{se} \geq \lambda_{mb}$ and

$$
\lambda_{mb}^q u_b^{(a_1 + a_2)} \leq ((\frac{\lambda_{mb}^q u_b}{u_e}) \cdot \theta^{a_2} (1 - \theta)^{a_1});
$$

and

$W_p > \max\{W_p, W_c\}$ if and only if $\lambda_{se} \leq \lambda_{mb}$ and $\lambda_{mb} \leq \lambda_{mb}$.

Q.E.D.
Should the Treasury Price-Discriminate?
A Procedure for Computing Hypothetical Bid Functions

by
DANIEL HELLER and YVAN LENGWILER

Ever since FRIEDMAN [1959], it has been debated whether the Treasury should sell bonds in a uniform or in a discriminatory auction. Empirical research on this topic has been confined to experiments in which both auctions were used. But these experiments inherently contain an identification problem, since differences cannot be attributed to the auction format alone. We develop a method for generating counterfactual data on discriminatory auctions, using real data from uniform-price Treasury bond auctions in Switzerland. Our method allows us to investigate the performance of the two auctions without relying on experiments and without the identification problem. (JEL: D 44, H 63)

1 Introduction

For decades, governments have been auctioning off fixed-income securities to finance their debt. Despite the importance of Treasury auctions in terms of value, so-called multi-unit auctions have so far received fairly little academic attention. While auction theory has been a prolific field in economics, it has focused mostly on single-unit auctions such as auctions for a painting, a contract, or drilling rights to an oil field. Multi-unit auctions are different in that the good being auctioned is divisible. Starting with WILSON [1979], it has been shown in a number of papers that the conclusions reached in single-unit auction theory do not necessarily carry over to multi-unit auctions, see BACK and ZENDER [1993], NOUSSAIR [1995], TENORIO [1997], LENGWILER [1998], ENGELBRECHT-WIGGANS and KAHN [1998a, 1998b].

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The Economics of Free Internet Access

by

MARCO HAAN*

In an increasing number of European countries, Internet service providers offer free Internet access. Telephone companies are willing to pay these providers based on the amount of traffic they generate. In this paper, we explain these phenomena. We argue that, by offering a contract that pays the provider a certain lump sum conditional on providing free Internet access, the telephone company solves a double marginalization problem. We analyze this in a simple model in which only the Internet access market is studied, and in a richer model, where the regular telephone market is also taken into account. (JEL: L12, L22, L42)

1 Introduction

In an increasing number of European countries, Internet service providers (henceforth ISPs) offer free unlimited Internet access. With such a service, consumers can use the Internet without paying their service provider anything. In the UK, free Internet access was introduced by the electronics retailer Dixons in the fall of 1998. Its service, Freeserve, attracted 1.3 million subscribers in seven months (The Economist [1999a] of The Economist). Less than a year after its introduction, it has spawned nearly 100 imitators in Britain alone (The Editors [1999b] of The Economist). In the Netherlands, some small providers introduced free Internet access on a limited scale in the spring of 1999. World Online, the largest service provider, followed by lowering prices to zero in August of the same year (see The Editors [1999c] of De Volkskrant). Other large providers followed within weeks (see, e.g., The Editors [1999d] of De Telegraaf). Since then, dozens of new free-access providers have been introduced. Also in France, Germany, and Belgium, free Internet access has been either introduced or announced (The Editors [1999a] of The Economist, Van Jole [1999]).

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Journal of Institutional and Theoretical Economics
A Theory of Ownership Arrangements and Smooth Transition to a Free Market Economy

by

GUOQIANG TIAN*

This paper develops a theoretical model that determines the optimal ownership arrangement in an imperfect market and government institutional environment, especially in transitional economies. It studies the interdependence of institutional environments and ownership arrangements. The theory developed sheds some light on predicting how the transition from a command economy to a free market economy takes place. It shows that an ownership arrangement may not be changed effectively without changing economic and political institutional environments. (JEL: L 2, L 3, P 5)

1 Introduction

This paper is motivated by the following questions: (1) What are the optimal ownership arrangement and property-rights structures during the transition to a free market economy? Is the private ownership arrangement necessarily the most efficient property-rights structure during the transition? (2) What is the optimal strategy for transition to a free market economy, i.e., what are the relations, timing, and procedures of liberalization, marketization, and privatization for a smooth transition? When and under what conditions would a social planner, such as a legislature, policymakers, and reformers, suggest privatizing? Should it be done at the early stages of transition? (3) Why has the collective-owned sector, especially the township and village enterprise (henceforth TVE) sector, and not the private sector, been the main contributor to China's rapid economic growth and become the unavoidable intermediate ownership arrangement for the transition from a command economy to a market economy? (4) Why is corruption generally more serious in transitional economies than in command and market economies? We will provide our answers to these questions by developing a property-rights theory for transition economies.

The transition of countries with centrally planned economies to a market orientation, which affects about one-third of the world's population, has been an unavoidable reality in recent years. This makes institutional transition a hot research field in the literature. The optimal property-rights structures during the transition and the pattern of the transition are, however, far from clear, and they may not be studied well by conventional theories, since some of their key assumptions are not satisfied by transitional economies. A basic question for a smooth transition is: when and how should massive privatization be implemented? The answer from the conventional wisdom is that clearly defined property rights are a prerequisite for economic prosperity.

Since privatization restricts redistribution and improves incentives by shifting residual income and control to private investors, a rapid transformation of ownership should be desirable. A widely held belief is thus that rapid privatization is a necessary first step for the institutional transition from a centralized command economy to a decentralized private free market economy.

Because of this belief, many Eastern Bloc countries, especially the former Soviet Union, are attempting their transitions by massive privatization together with liberalization and marketization reforms, while China and Vietnam are moving towards the free market economy gradually, adopting a quite different path of transition by mainly implementing the liberalization and marketization reforms without any privatization until recently. Surprisingly, most countries with massive privatization have had serious problems with regard to economic performance and stability. From tables 1 and 2, one can see that: First, the countries with massive privatization, listed in groups 2 and 3 in the table, have experienced significant declines in output and high inflation; while China and Vietnam, without massive privatization, have enjoyed rapid economic growth and much lower inflation during their transitions. Second, among countries adopting the same strategy of mass-

---

* This is a revision of an earlier paper entitled "Breaking Up is Hard to do: The Theory of Property Rights in Transitional Economies." I would like to thank two anonymous referees, Ping Lin, Yingyi Qian, and participants at the 1996 AEA Meeting, the Far Eastern Meeting of Econometric Society 1997, and the Second Annual Conference of the International Society for New Institutional Economics for valuable comments. Financial support from the Texas Advanced Research Program as well as from the Bush Program in the Economics of Public Policy, the Private Enterprise Research Center, and the Lewis Faculty Fellowship at Texas A&M University is gratefully acknowledged.

1 Clearly defined property rights typically include three basic elements (see Demsetz [1967] and Fukuyama and Prowse [1974]): First, every property is assigned to a well-defined owner or owners with exclusive rights of ownership. Second, the owner of the property receives the residual income accruing from the assets. Third, the owner has the right to control or determine the use of the existing assets, to restructure the property, and to sell or lease it. Some economists argue that the most important aspect of ownership and property rights is the right to control (Grossman and Hart [1986], Hart and Moore [1990]).

2 Blanchard and Kehrer [1997] also provide two figures that give a striking picture of the extremely large decline in output in the republics of the former Soviet Union.

3 Although China and some Eastern Bloc countries may be in different stages of the transition process, we may still be able to make such a comparison by noting the fact that China has consistently had a high rate of economic growth in last 20 years. China will probably continue to have a remarkable growth rate if it does not carry out massive privatization until its transition is in the advanced stages and the state-owned sector accounts for only a small proportion of GNP (say, 15%). Because of the new entry of massive nonstate enterprises, it may take only a few more years for China's state sector to reach that proportion.
Table 1
Growth of GDP in Some Transitional Economies (%)

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<td>5.5</td>
<td>11.1</td>
<td>3.9</td>
<td>8.0</td>
<td>13.6</td>
<td>13.4</td>
<td>11.8</td>
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<td>-</td>
<td>4.4</td>
<td>4.5</td>
<td>6.0</td>
<td>8.6</td>
<td>8.1</td>
<td>8.6</td>
</tr>
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<td>3.0</td>
<td>-3.6</td>
<td>-5.0</td>
<td>-14.5</td>
<td>-8.7</td>
<td>-12.6</td>
</tr>
<tr>
<td>Georgia</td>
<td>6.8</td>
<td>1.2</td>
<td>-14.8</td>
<td>-20.1</td>
<td>-40.3</td>
<td>-31.6</td>
<td>-28.2</td>
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<td>-8.7</td>
<td>-30.0</td>
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<td>-a</td>
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<td>-24.3</td>
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<td>-39.3</td>
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<td>-9.9</td>
<td>-7.6</td>
<td>-1.3</td>
<td>3.3</td>
</tr>
<tr>
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<td>-6.0</td>
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<tr>
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<td>1.8</td>
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<td>-14.2</td>
<td>-6.4</td>
<td>-0.5</td>
<td>2.6</td>
</tr>
<tr>
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<td>-4.3</td>
<td>-2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Poland</td>
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<td>-7.0</td>
<td>2.6</td>
<td>5.8</td>
<td>5.5</td>
</tr>
<tr>
<td>Romania</td>
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<td>1.0</td>
<td>-5.6</td>
<td>-12.9</td>
<td>-13.8</td>
<td>1.3</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Key: -a Information not available.

Table 2
Average Annual Inflation Rate in Some Transitional Economies (%)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>China</td>
<td>1.6</td>
<td>3.0</td>
<td>5.4</td>
<td>13.0</td>
<td>21.7</td>
<td>17.0</td>
</tr>
<tr>
<td>Vietnam</td>
<td>67.5</td>
<td>67.6</td>
<td>17.5</td>
<td>5.2</td>
<td>8.0</td>
<td>17.0</td>
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<tr>
<td>Mongolia</td>
<td>0.00</td>
<td>208.6</td>
<td>321.0</td>
<td>183.5</td>
<td>145.0</td>
<td>75.0</td>
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<tr>
<td>Russia</td>
<td>5.6</td>
<td>92.7</td>
<td>1,533.0</td>
<td>896.0</td>
<td>303.0</td>
<td>190.0</td>
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<tr>
<td>Georgia</td>
<td>3.3</td>
<td>78.5</td>
<td>913.0</td>
<td>3,126.0</td>
<td>18,000.0</td>
<td>160.0</td>
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<tr>
<td>Tajikistan</td>
<td>4.0</td>
<td>111.6</td>
<td>1,157.0</td>
<td>2,195.0</td>
<td>452.0</td>
<td>635.0</td>
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<tr>
<td>Ukraine</td>
<td>4.0</td>
<td>91.2</td>
<td>1,210.0</td>
<td>4,735.0</td>
<td>842.0</td>
<td>375.0</td>
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<tr>
<td>Lithuania</td>
<td>8.4</td>
<td>224.7</td>
<td>1,020.3</td>
<td>390.2</td>
<td>72.0</td>
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<tr>
<td>Bulgaria</td>
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<td>333.5</td>
<td>82.0</td>
<td>72.8</td>
<td>89.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Czech</td>
<td>10.8</td>
<td>56.7</td>
<td>11.1</td>
<td>20.8</td>
<td>10.2</td>
<td>9.1</td>
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<tr>
<td>Hungary</td>
<td>29.0</td>
<td>34.2</td>
<td>22.9</td>
<td>22.5</td>
<td>19.0</td>
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<tr>
<td>Poland</td>
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<td>43.0</td>
<td>35.3</td>
<td>32.2</td>
<td>27.8</td>
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<tr>
<td>Romania</td>
<td>5.1</td>
<td>174.5</td>
<td>210.9</td>
<td>256.0</td>
<td>131.0</td>
<td>32.3</td>
</tr>
</tbody>
</table>


In some privatization, the countries listed in group 2, which had more centralized economies before the transition, suffered a more serious decline in output and a higher inflation than the countries listed in group 3, which had less centralized economies. Third, the differences in transition results do not seem to depend on the culture, but depend on the degree of imperfection of the institutional environment. Although Mongolia has the same Eastern culture as China and Vietnam, the transition result has been different because of differences in transition strategies as well as institutional environment. The transitions in China and Vietnam have been much smoother.

China has experienced a robust economy: the average annual growth rate of GNP was about 9.5% from 1979 to 2000, which made China the fastest-growing economy in the world. With average annual growth of over 20%, the nonstate sector now accounts for over 70% of GNP. Interestingly, collectively owned enterprises constitute about 75% of this sector and have become the main engine of China's rapid economic growth, though it does not enjoy clearly defined property rights (see Jefferson and Rawski [1994]). This experience of gradual reform coupled with rapid economic growth has puzzled many economists: why has China grown so fast when the conditions thought to be necessary for growth were absent (Blanchard and Fischer [1993, 41])?

The contrast between the transition experiences in the vigorous Chinese non-state sector operating under the constraint of poorly defined property rights and the lethargic economic performance in some of the former Eastern Bloc countries after rapid privatization presents an obvious challenge for the standard theory and arouses some suspicions about its generality and range of applicability. Indeed, the conclusion that private ownership is the optimal property-rights arrangement is based on a set of assumptions that may not be satisfied in transitional or other irregular economies. The classical theory assumes that the institutional environments under consideration are regular in the sense that they provide a high level of economic freedom and decentralization, as well as the existence of a highly mature and perfect market system. However, economic reality seldom adhers very closely to these assumptions. While they may be approximately correct for advanced industrialized economies, they are extremely unsuitable to command economies, transitional economies, economies characterized primarily by state ownership, and economies with a high degree of government intervention that hinders many socially worthwhile transactions and restricts economic freedom. Thus, there is a need to develop a more general theoretical framework that can be used to explain phenomena not only for regular economies but also for irregular ones with imperfect institutional environments.

In this paper we develop a theoretical framework that attempts to capture the essence of determining optimal ownership arrangements in imperfect institutional environments of both market and government, especially in transitional econo-
mies, in which economic freedom is constrained and markets are absent, immature, or imperfect. A basic question the paper will answer is: what is the best way to own a capital asset for a given degree of perfection of the institutional environment? The framework provides a vehicle for analyzing how the economic and political institutional environment affects the optimal choice of ownership arrangements. In this way, our theory improves and generalizes conventional property-rights theory to include irregular institutional environments. It rationalizes ownership and property-rights arrangements, and relates the optimal ownership arrangement to the degree of liberalization and marketization (imperfection of institutional environments).

This property-rights theory is then used to answer the questions raised at the beginning of the paper. We identify the relations, timing, and procedures of liberalization, marketization, and privatization necessary for a smooth transition. Contrary to a widely held belief that rapid privatization is a necessary first step for the institutional transition from a centralized command economy to a decentralized free market economy, we argue that the first step for a smooth institutional transition should be to improve the institutional environment through implementing liberalization and marketization reforms, but not implement massive privatization. Liberalization is an essential first step for transition, and it can achieve a great deal even when other key features of an effective market are lacking, because it decentralizes production and trade decisions to enterprises and households, and directly addresses the two fundamental weaknesses of central planning: poor incentives and poor information. This results in the entry of massive non-state-owned firms, most of which are collective enterprises, into business. Because transitional economies lack a high level of economic freedom, remain centralized to varying degrees, and lack a mature market system, private ownership may disrupt, rather than facilitate, a smooth transition to a private market system. Instead, the collective ownership arrangement may be more efficient in intermediate degrees of economic liberalization and marketization, and thus may be an unavoidable intermediate ownership arrangement during the process of transition and development.

This conclusion can be supported by the experience of a high rate of economic growth in China with the reforms of liberalization and marketization, and the experience in some Eastern Bloc countries of sharply decreasing GNP in conjunction with rapid privatization. Thus, this result explains why collective enterprises, especially the TVEs, have developed so rapidly in China, and become a main contributor to rapid economic growth.

Four other explanations for the high efficiency of Chinese TVEs are found in the literature. The first, by WEITZMAN AND XU [1994], is sociological and uses traditional Chinese culture as an explanation. The second, by CHANG AND WANG [1995], is political and is based on the interaction of the central government and local governments. The third, by Li [1995], is a risk-sharing explanation that shows the rationality of collective ownership in a gray-market environment with ambiguous property rights. The fourth, by CHE AND QIAN [1998a], interprets the firm boundaries of TVEs at the community level rather than at the enterprise level. Our approach is different, and focuses on special resources through which administrative bureaucrats may have a comparative advantage in irregular economies. This also explains why corruption becomes a more serious problem in transitional economies than in command and market economies, since corruption can be regarded as a type of collective ownership arrangement (although it may be illegal). Our theory predicts that the opportunities for corruption decrease with improvement of the institutional environment.

The model constructed tries to capture the crucial features of imperfection in institutional environments of market and government. In addition to capital and labor, internal management ability and external management ability (mainly public-relations ability in procurement of government-owned or -controlled resources) are considered as inputs in the production process. The external management ability is important when government intervention is significant or when a market is absent or not well developed. In general, entrepreneurs have superior abilities in internal management, and bureaucratic managers have superior abilities in external management. The degree of liberalization and marketization of perfection of the institutional environment of market and government is indexed by a number \( \varphi \), which is between zero and one, and captures the relative importance of these two abilities. The closer \( \varphi \) is to zero, the more centralized, constrained, or imperfect is the institutional environment. When \( \varphi \) is zero, the economic system reduces to a pure command economy in which every production activity is controlled by the central government and thus management ability is redundant. When \( \varphi \) is one, the institutional environment is perfect and personal relations are unnecessary.

To show the optimality of the collective ownership arrangement, three types of ownership arrangements for production are set up for comparison: private ownership that can take advantage of internal management ability, state ownership that can take advantage of external management ability, and collective ownership that affords an opportunity for specialization and the possibility of taking advantage of both internal and external management abilities. Theorem 1 shows that, under some conditions placed on the opportunity incomes and profit shares of individuals, collective ownership dominates state and private ownership arrangements if the degree of liberalization and marketization is in the intermediate stages. We also show that private and state ownership arrangements can be superior for different degrees of institutional environments. Theorem 2, which is relatively straight-

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5 For theoretical and empirical evidence on the importance and effectiveness of liberalization see TIAN [1996] and THE WORLD BANK [1996].
forward, shows that private ownership dominates state and collective ownership arrangements if the degree of liberalization and marketization is sufficiently high, and that state ownership dominates private and collective ownership arrangements if the degree is sufficiently low. Theorem 3 further shows that the relative efficiency of internal and external management abilities can also affect the choice of optimal ownership structure given the degree of economic irregularity.

A similar approach can be found in the literature, showing that different classes of agents characterized by comparative advantages in different unmarked resources can potentially be used to explain different organizational arrangements. Reid [1977] may have been the first to use the idea in studying contractual structures in agricultural tenancy. He considered landlords as a class having a comparative advantage in acquiring market information, and hence in management, while tenants afford an advantage in labor supervision. Eswaran and Kotwal [1985] modeled Reid’s idea formally and studied how each contractual form (fixed wage contract, fixed rental contract, or share contract) entails a different type of agent (landlord or tenant) providing nonmarketed factor inputs. They discussed the optimal contractual structures in terms of the landlords’ profit for specific parameters. Our model is different from those in Reid [1977] and Eswaran and Kotwal [1985] in two main aspects. First, we determine the relative efficiency of the private, state, and collective ownership arrangements for varying degrees of imperfection of the institutional environment. We take the total surplus as a criterion for determining the optimal ownership arrangement, which corresponds to the standard practice in property-rights theories of assuming that ex ante parties can conduct Coasian negotiations on the ownership form. Thus, the optimal ownership arrangement is determined by maximizing the ex ante joint payoffs to the parties. In contrast, the other models determine the preference for organizational form under the restriction of a private ownership arrangement, and thus the optimal organizational form is determined by maximizing the entrepreneur’s payoff instead of maximizing the ex ante joint payoffs to the two parties. Second, we specify general mathematical conditions on parameters to determine the optimal ownership arrangement, whereas other authors do not provide such conditions.

There are other theories that are related to ours and take the same perspective in the economics literature, such as those in Laffont and Tirole [1993], Shleifer and Vishny [1993], [1994], Schmidt [1996], Hart, Shleifer, and Vishny [1997], Blanchard and Kremer [1997], and Che and Qian [1998a], to name a few. These papers develop various theories of the ownership of firms in general, and government ownership in particular, in transitional economies under incomplete contracts or asymmetric information. Some of these study the optimal ownership structure in a specific institutional environment and examine the conditions that determine the relative efficiency of public ownership versus private ownership. The main difference between my own approach and the approaches mentioned above is that my approach considers explicitly the optimal ownership structure as a function of the institutional environment so that we can study the strategy for the smooth transition to a market economy. For instance, our theory can be used to identify the relations, timing, and procedures of liberalization, marketization, and privatization for a smooth transition. Some (e.g., Blanchard and Kremer [1997]) provide explanations for the mode of transition: the big bang versus gradualism.

The remainder of the paper is organized as follows: Section 2 formally describes the model. Section 3 determines the optimal ownership structures for the varying degrees of imperfect institutional environments. Section 4 uses the property-rights theory developed in the paper to answer the questions raised in the beginning, and provides some policy implications. The concluding remarks will follow in section 5.

2 The Framework

In this section we present a simple model to identify the optimal ownership arrangement with a given institutional environment. For convenience in understanding the framework and arguments, we first define some terminology.

2.1 Some Definitions

An institution is usually defined as a set of behavioral rules that pertain to social, political, and economic behavior and are used to govern a variety of social interactions (see Schultz [1968], Ruttan [1978], and North [1990]). Davis and North [1970], [1971, etc.] further considered two categories of institutions: institutional environment and institutional arrangement. An institutional environment is the set of fundamental political, social, and legal ground rules that establish the basis for production, exchange, and distribution. Rules governing elections, property rights, and the right of contract are examples of ground rules that make up an economic environment. An institutional arrangement is an arrangement between economic units that governs the ways in which these units can cooperate or compete. An ownership arrangement is an institutional arrangement that allocates the property rights to an individual, a group of individuals, or government. In this paper, we focus on the determination of the optimal ownership arrangement by taking economic institutional environments as exogenous. Since the main purpose of the paper is to study under what conditions a government should or should not privatize the state sector, this exogeneity assumption on institutional environments is reasonable. Thus, we make no attempt to study changes in an institutional environment, although such changes have certainly occurred in transitional economies and the study of these changes is important in the transitional-economics literature.

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[7] For instance, Hart, Shleifer, and Vishny [1997] and Che and Qian [1998a], [1998b] have used the total surplus to evaluate the superiority of private or public ownership arrangements.

[8] Davis and North [1971] adopted the same approach when they studied institutional change.
The distinction between an institutional environment and an institutional arrangement is important in understanding some of the debates raised in the transitional economics literature. For example, some economists may regard liberalization, marketization, and privatization as the same. However, according to the above distinction, they are different. Economic liberalization usually refers to the loosening or elimination of government restrictions on economic transactions, including freeing prices, trade, and entry of various types of new firms. Marketization refers to the developing and creating of market-supporting institutions such as the legal system, financial institutions, taxation, and macroeconomic management systems. Privatization refers to privatizing existing state-owned or collectively owned enterprises, land, and other assets. According to the above distinction between institutional environments and institutional arrangements, liberalization and marketization should be regarded as processes for changing a centralized-planning economic institutional environment to a decentralized market environment, while privatization should be regarded as a process for changing a nonprofit ownership arrangement to a private ownership arrangement. Recognizing this distinction should help the reader understand the arguments given in this paper concerning why rapid privatization should not be implemented before institutional environments are improved. Note that, even when liberalization and privatization can be accomplished in a short time, marketization takes a much longer time, years or even decades, because it involves such a fundamental change in skills, organizations, and attitudes.

2.2 The Description of the Model

The model constructed is the simplest one that catches the crucial features of irregular economic institutional environments and can be used to determine the relative efficiency of private, state, and collective ownership arrangements for a given economic institutional environment.

There are two types of managers engaging in a production activity: an entrepreneur, denoted by \( e \), and a bureaucrat, denoted by \( b \). The entrepreneur may be an investor or a group of investors; the bureaucrat may be the local government or a manager appointed by an upper-level bureaucratic department to run a state-owned firm. The firm can be established by choosing one of three organizational forms to own a capital investment. In the first, \( e \) runs the firm privately; in the second, \( b \) runs the firm for the state; and in the third, \( e \) runs the firm jointly with \( b \). We designate the first case as a privately owned firm with a private ownership arrangement, the second as a publicly owned firm with a state ownership arrangement, and the third as a collectively owned firm with a collective ownership arrangement.

After choosing the organizational form, the enterprise makes a capital investment \( I \). When the enterprise is private, the capital investment is made by the entrepreneur. When the enterprise is public, the capital investment is made by the state. However, when the firm is collective, the capital investment may be made solely by the local government, in which case the local government chooses the ownership, or solely by the entrepreneur, in which case the entrepreneur chooses the ownership, or jointly by both parties, in which case both of them choose the ownership; each of these three cases can be found in Chinese TVEs.\(^9\) There is a trade-off associated with collective ownership. On the one hand, it reduces incentives, but by the same token it allows exploitation of a larger scope of skills and affords an opportunity for specialization: each agent performs the task in which he has the comparative advantage. Chinese TVEs represent a typical example of such an arrangement, in which external management is provided by bureaucrats and internal management by entrepreneurs. TIAN [2000] investigated the organizational structure of TVEs in this spirit.

We also assume that, in an environment characterized by an imperfect market or structured bounded economic freedom or limited decentralization, in addition to the usual capital and labor, the level of profit from the investment depends on two other resources: internal management ability to make production decisions, and external management ability. The latter involves the ability to get personal access to scarce resources controlled by state bureaucratic departments, the ability to get preferential policy treatment, and the ability to solve various disputes with other production organizational units.

Internal management ability is crucial to the efficiency of production. In an incomplete-information market or imperfect market, searching for and adopting proper production techniques, as well as selecting and using proper inputs, is essential for successful production. The activities involve decision making based on sound technical and market information. Making a good choice of inputs requires knowledge of available inputs, their quality, and their prices. Making a good production decision depends on knowledge of government tax-subsidy programs and of production regulations and policies.

External management ability may also be of crucial importance when markets, especially factor markets, are absent or far from perfection and when economic freedom and decentralization are far from complete. Such personal relations with state bureaucracy crucially affect the economic success of an individual in an imperfect institutional environment. Many production activities fall largely under government control in such irregular institutional environments, and this forms the basis for administrative bureaucratic intervention in production. Indeed, supply bottlenecks and shortages are more likely to be present in factor markets when administrative bureaucrats control the supply of production inputs. For instance, most banks are still owned and controlled by the government in China and in other transitional Eastern Bloc countries. The prices and supply of many basic raw materials, such as iron and steel, electricity, and transportation services, are not fully free. One may be unable to procure the requisite inputs for production from

\(^9\) WEITZMAN and XU [1994] called collective ownership vaguely defined ownership, and LI [1995] called it ambiguous ownership, since control rights are not clearly defined in such ownerships.
factor markets. One may also need to have permission or quotas from administrative bureaucrats to purchase these inputs. The quota for purchasing some inputs is not always fixed, and the amounts of the rationed good a firm can obtain often depend on the firm’s procurement ability and on the state of relations with the bureaucratic administrators who control the resources. Many rules, regulations, and policies exist for controlling and guiding their production; these are either vaguely defined, or their scope is limited. Thus, there is a wide margin for interpretation, and therefore bureaucratic administrators have great discretion in applying these rules and regulations to a firm.

The ability to enter into and to enforce contracts is basic to market economies. However, contracts are costly to write and enforce, and in many cases they are incomplete because of large transaction costs. This problem is even worse in imperfect institutional environments. Williamson (1975), (1980), (1985) and Grossman and Hart (1988) have shown that the government structure (in particular, the pattern of ownership of assets) matters in the presence of transaction costs. The authority in relations induced by the ownership of assets defines the status quo for the renegotiation of contracts when unforeseen contingencies occur. Since the infrastructure of the market system is established completely and the development of the legal system is still from complete in an imperfect institutional environment, a firm may not always get fair treatment when involved in contract disputes with other organizational units. All of these problems require a firm to have good relations with the relevant bureaucratic departments; thus, bureaucratic connections become extremely valuable within an imperfect institutional environment such as a transitional economy. Many transactions and production relations are personalized, and access to scarce inputs is a matter of privilege. External management ability becomes essential for successful production.

The importance of promoting good relations with bureaucratic departments of course depends on the degree of liberalization and marketization. With an increase in liberalization and marketization (q), the role of external management ability decreases. Increasing q means that the market environment is improving, and consequently the importance of management ability is increasing and the importance of external management ability is decreasing. If q = 1, the market is perfect and economic freedom is full, so that external management ability is not necessary to the production process.

(1) \[ q = F(R, M, L, K, \varphi), \]

where F is assumed to be increasing and strictly concave in its first three arguments, homogeneous of degree one in its first four arguments, differentiable, and such that

\[
F(R, M, L, K, \varphi) = \begin{cases} 
  f(M, L, K) & \text{if } \varphi = 1, \\
  g(R, L, K) & \text{if } \varphi = 0.
\end{cases}
\]

It is also assumed that the relative importance of external management ability, i.e., the marginal rate of substitution of F for M, \( F_p / F_M \), is decreasing in \( \varphi \), where \( F_p \) and \( F_M \) denote the partial derivatives of F with respect to R and M, respectively. This specification of production contains the conventional neoclassical production function and a pure command economy as special cases. Note that, while the amounts of capital and labor inputs hired are relatively easy to observe, the levels of external and internal management abilities are hard to observe. This feature introduces a moral-hazard problem – specifically, shirking in the provision of internal and external management inputs in the event that they are not provided by the owner of the firm.

Both internal and external management inputs are time-consuming processes. The more time spent on internal (on external) management, the better the quality of management decisions (of public relations) is. We thus use the time devoted to such activities by a producer as a proxy for internal management input (external management input).

Since the entrepreneur either owns the firm or is appointed by owners of the firm, his ability to organize production activities and his incentives to work hard are, in general, higher than those of the bureaucrat, for well-known reasons. Thus, the entrepreneur has a comparative advantage in internal management. On the other hand, since the bureaucratic manager either controls production resources directly (if he is with a local government agency) or has good personal relations with government departments, he has a comparative advantage in external management. We quantify this notion by using four parameters, \( \lambda_{\text{int}} \) and \( \lambda_{\text{ext}} \) (respectively \( \lambda_{\text{int}} \) and \( \lambda_{\text{ext}} \)), denoting the internal management ability and external management ability of the entrepreneur (the bureaucratic manager). The unit of efficiency of internal management (respectively external management) of the bureaucratic manager (respectively entrepreneur) is assumed to be one hour of the entrepreneur’s (respectively bureaucratic manager’s) time. That is, we assume \( \lambda_{\text{int}} = 1 \) and \( \lambda_{\text{ext}} = 1 \). We also assume that one hour of the entrepreneur’s time devoted to management is equivalent to only a fraction \( \lambda_{\text{int}} \) of an hour devoted to external management by the bureaucratic manager, and one hour of the bureaucratic manager’s time devoted to management is equivalent to only a fraction \( \lambda_{\text{ext}} \) of an hour devoted to management by the entrepreneur. Thus, \( 0 < \lambda_{\text{int}} < 1 \) and \( 0 < \lambda_{\text{ext}} < 1 \).

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10 Note that a pure command economy is only theoretically possible, and there never exists such an economy in the real world. However, because we are mainly interested in the case of \( 0 \leq \varphi < 1 \) and we do not derive our results exclusively for \( \varphi = 0 \), it is acceptable to include this unrealistic possibility for completeness.

11 To concentrate on our main objective and to maintain an appropriate level of abstraction, we make no attempt to discuss how to measure \( \varphi \). Readers can find a way to measure such an index in The World Bank (1996). Roughly speaking, \( \varphi \) depends on an aggregator index of degrees of government intervention, restrictions on prices and trade, entry of new firms, missing labor and financial markets, imperfection of legal system, and other market elements.
We assume that the entrepreneur and bureaucratic manager each have one unit of time that can be allocated between production and alternative activities. The opportunity income of the entrepreneur is given by $u_e$, and that of the bureaucratic manager is given by $u_b$. All opportunity incomes are assumed to be determined exogenously. The price of the labor input is denoted by $w$. The price of the production good is normalized to be one.

Since the ownership arrangement is an institutional arrangement, the total surplus of two parties should be used as a criterion for comparing various ownership arrangements. Before deciding the strategy of institutional transition, the legislature, policy decision makers, or reformers, as social planners, first need to know which ownership arrangement is more efficient for a given degree of liberalization and marketization, and, in particular, determine under what conditions and when massive privatization should be implemented.

In the following, we determine the optimal ownership arrangement under a given economic institutional environment. Since the production function is assumed to be homogeneous of degree one in four inputs, without loss of generality we can assume that the firm just uses $K$ units of capital input for production. The optimization problem is set up for each of the three ownership arrangements.

### 2.3 Private Ownership Arrangements

Under the private ownership arrangement, the entrepreneur uses capital $K$, hires labor input $L$, and allocates his time among personal relations, management, and his alternative activity in order to maximize his payoff. That is,

$$\Pi_p^e = \max_{R,M,L,K} \left[ \frac{G(\lambda_e R, M, L, K, \varphi)}{R M L} - wL + (1 - R - M)u_e \right]$$

for $R \geq 0, M \geq 0$, and $R + M \leq 1$. Note that the difference $G(\lambda_e R, M, L, K, \varphi) - wL$ is the entrepreneur's net income from production and the term $(1 - R - M)u_e$ is the income from any alternative activity.

Under private ownership, the payoff of the bureaucrat is $\Pi_p^b = u_b$. The total surplus under the private ownership arrangement is given by

$$W_p = \Pi_p^e + \Pi_p^b = \Pi_p^e + u_b.$$

### 2.4 State Ownership Arrangements

Under the state ownership arrangement, the bureaucrat runs the firm by using capital $K$ and hiring labor input $L$, and allocates his time among personal relations, management, and his alternative activity. The contribution made by a bureaucrat is

$$\Pi_s (R, M, L; \varphi) = G(R, \lambda_b M, L, K, \varphi) - wL + (1 - R - M)u_b$$

for $R \geq 0, M \geq 0$, and $R + M \leq 1$. The difference $G(R, \lambda_b M, L, K, \varphi) - wL$ is the bureaucrat's contribution from production, and the term $(1 - R - M)u_b$ is his contri-

### 2.5 Collective Ownership Arrangements

Under the collective ownership arrangement, the entrepreneur and bureaucratic manager run the firm jointly. The bureaucrat receives her share of the residual, either as allowed by government policy explicitly or as bribes. The organizational forms of Chinese TVEs justify this assumption. To model the comparative advantage of specialization, we assume that the entrepreneur provides management and the bureaucrat provides personal relations, and that they share the profit according to some given ratio, which depends on the bargaining power of each party.\(^{12}\)

\(^{12}\) The determination of the profit share may depend on the relative efficiency of external management and internal management abilities (i.e., $\lambda_b$ and $\lambda_e$), the relative importance of these abilities to other inputs, relative opportunity income, etc. It may also depend on $\varphi$. In general, the smaller $\varphi$ is, the greater the bargaining power a bureaucrat has, and thus the larger his profit share may be. One can see these dependences from the conditions given in theorems 1-3.
Define a conditional profit function \( \Pi \), which is obtained by optimally choosing the amount of the labor input for given \( R \) and \( M \):

\[
\Pi(R, M; \phi) = \max_L \left[ F(R, M, L, \bar{K}, \phi) - wL \right].
\]

Let \( 0 < \beta < 1 \) be the share of the entrepreneur. The conditional net income of the entrepreneur is given by

\[
\Pi^e(R, M; \phi) = \theta \Pi(R, M; \phi),
\]

and the conditional net income of the bureaucrat is given by

\[
\Pi^b(R, M; \phi) = (1 - \theta) \Pi(R, M; \phi).
\]

Given the conditional profit function and the bureaucrat's external management ability \( K \), the entrepreneur allocates his time between management and his alternative activity to maximize

\[
\Pi_c^e = \max_M \left[ \theta \Pi(R, M; \phi) + (1 - M)u_e \right].
\]

for \( 0 \leq M \leq 1 \). Similarly, given the conditional profit function and the entrepreneur’s internal management ability \( M \), the bureaucrat allocates his time between external management and his alternative activity to maximize

\[
\Pi_c^b = \max_R \left[ (1 - \theta) \Pi(R, M; \phi) + (1 - R)u_b \right]
\]

for \( 0 \leq R \leq 1 \).

The above maximization problems of the entrepreneur and bureaucrat, specified by equations (9) to (12), form a two-person noncooperative game with a Nash equilibrium solution. At a Nash equilibrium pair \((R^*, M^*)\), equations (11) and (12) are satisfied simultaneously. Since the production function \( F \) is strictly concave and continuous in \((R, M, L)\), the conditional profit functions given by equations (9) and (10) are concave and continuous in \((R, M)\) (see Duetter [1973]), and thus the payoff functions given in equations (11) and (12) are also concave and continuous in \((R, M)\). Since the strategy space of the game is \([0, 1] \times [0, 1]\), which is convex and compact, we know there is a Nash equilibrium that solves simultaneously the problems of the two agents (see Baye, Tian, and Zhou [1993]; Friedman [1977]).

The total surplus under the collective ownership arrangement is given by

\[
W_c = \Pi_c^e + \Pi_c^b.
\]

Once the total surplus under the three ownership arrangements is determined, the optimal ownership structure is the one that produces the largest total surplus, that is, the largest value among \( W_c \), \( W_e \), and \( W_b \).


3 Solutions and the Optimal Ownership Arrangement

For simplicity, we now restrict the production function to be of a form of the Cobb-Douglas production function so that we can solve the model explicitly by differentiation and characterize the solutions by the first-order conditions. Furthermore, following Eswaran and Kotwal [1985], we assume that the production function is specified by

\[
q = AR^{\alpha_1}M^{\alpha_2}L^{\alpha_3}K^{\alpha_4},
\]

where \( A > 0, \alpha_i > 0 \) for all \( i \), and \( \alpha_1 + \alpha_2 + \alpha_3 = 1 \).

Solving the maximization problem in (8),

\[
\max_L \left[ AR^{\alpha_1}M^{\alpha_2}L^{\alpha_3}K^{\alpha_4} - wL \right],
\]

we get the conditional profit function given \( R \) and \( M \), which is given by

\[
\Pi(R, M; \phi) = BR^{\alpha_1}M^{\alpha_2},
\]

where

\[
B = \frac{(1 - \alpha_2)(\alpha_2 w^{-1})^{1 - \alpha_2}}{1 - \alpha_2} \frac{1}{A^{1 - \alpha_1} K^{1 - \alpha_4}},
\]

\[
\alpha_1 = \frac{(1 - \beta) \alpha_3}{1 - \alpha_2},
\]

\[
\alpha_4 = \frac{\alpha_1}{1 - \alpha_2}.
\]

3.1 Solutions for the Private Ownership Arrangement

Using equation (16), the entrepreneur's payoff maximization problem in (2) can be rewritten as

\[
\Pi_c^e = \max_{R, M} \left[ A^{\alpha_1}B R^{\alpha_1}M^{\alpha_2} + (1 - R - M)u_e \right]
\]

for \( 0 \leq R, 0 \leq M, \) and \( R + M \leq 1 \).

13 As a referee pointed out, the main theoretical results given in theorems 1–3 below can be obtained under more general assumptions. In particular, the derived theorems do not rely on the assumption of a Cobb-Douglas production function. It is sufficient to assume that the production function is given by \( F = F^0(f(M, R, \phi), L, K) \), where at the upper stage \( F^0 \) can take any well-behaved form, and only at the lower stage need \( f(M, R, \phi) \) take the Cobb-Douglas form.
Case A. \( R + M = 1 \). The solution is given by
\[
R^*_e = -\frac{a_1}{a_1 + a_2},
\]
\[
M^*_e = a_2 \frac{a_1}{a_1 + a_2}.
\]

Case B. \( R + M < 1 \). The solution is given by
\[
R^*_e = \frac{a_1}{a_1 + a_2} - \frac{a_1}{a_1 + a_2} \left( \frac{a_2}{a_1} \right)^{-\frac{1}{1-a_1-a_2}},
\]
\[
M^*_e = \frac{a_2}{a_1 + a_2} R^*_e.
\]

Substituting the interior solutions (24) and (25) into (20), we have
\[
\Pi_e^*_e = \left(1 - a_1 - a_2\right) a_1^{-\frac{1}{1-a_1-a_2}} R^*_e + u_e,
\]
\[
= \left(1 - a_1 - a_2\right) \left[ \frac{a_2}{a_1} \right] R^*_e + u_e.
\]

Thus, total surplus is given by
\[
W_e = \left(1 - a_1 - a_2\right) \left[ \frac{a_2}{a_1} \right] R^*_e + u_e + u_a.
\]

3.3 Solutions for the Collective Ownership Arrangement

Using equation (16), the entrepreneur’s conditional payoff maximization problem in (9) can be rewritten as
\[
\Pi_e^* = \max M R \left[ \theta B R^a R^m + \left(1 - M \theta R^m\right) u_e \right]
\]
for \(0 \leq M \leq 1\). Solving this problem, we have the entrepreneur’s reaction function:
\[
M = \min \left[ \min \left( \frac{1}{\theta B R^a R^m + \left(1 - M \theta R^m\right) u_e} \right) \right].
\]

The bureaucratic manager’s conditional payoff given \(M\) is
\[
\Pi_e^* = \max_M \left[ \theta B R^a R^m + \left(1 - M \theta R^m\right) u_e \right]
\]
for \(0 \leq M \leq 1\). Solving this problem, we have the bureaucrat’s reaction function:
\[
R = \min \left[ \min \left( \frac{1}{\theta B R^a R^m + \left(1 - M \theta R^m\right) u_e} \right) \right].
\]

Solving these reaction functions for the interior Nash equilibrium, we have
\[
M_e^* = \left( \frac{a_2}{a_1} u_e R^a \left( \frac{a_2}{a_1} \right)^{-\frac{1}{1-a_1-a_2}} \right),
\]
\[
R_e^* = \left( \frac{1 - \theta}{\theta u_e a_1} \right) M_e^*.
\]

Substituting (39) and (38) into (34) and (36), we have
\[
W_e = \Pi_e^* + \Pi_e^*_e
\]
\[
= \left(1 - \left(1 - \theta a_1 - \theta a_2 a_1\right) B R^a R^m a_2 \left( \frac{a_2}{a_1} \right)^{-\frac{1}{1-a_1-a_2}} \right) \left[ \frac{a_2}{a_1} \right] R^*_e + u_e + u_a.
\]
3.4 Optimal Ownership Arrangements

Now we determine the optimal ownership arrangement within a given institutional environment. We discuss only the interior solution case; the results for the corner solution case can easily be obtained similarly. All proofs of theorems are given in the appendix. Our main result is given by theorem 1, which shows that the collective ownership arrangement is socially optimal when \( \varphi \) is somewhere around the middle of \((0, 1)\).

**Theorem 1:** For the Cobb–Douglas technology specified in (14), suppose \( \frac{\lambda_{mb}}{\theta^2} < \frac{u_b}{u_e} < \frac{\lambda_{re}}{\varphi} \). Then, for all \( \varphi \) satisfying

\[
0 < \frac{\ln(1-\theta)}{\theta} - \frac{\ln(1-\theta) - \ln \frac{\lambda_{re}}{\lambda_{mb}}}{u_b - u_e} < 1,
\]

the collective ownership arrangement dominates the private and state ownership arrangements. That is, \( W_r > \max \{ W_p, W_c \} \).

Theorem 2 below shows that state ownership is the dominant ownership arrangement when the degree of liberalization and marketization is sufficiently low (i.e., the institutional environment is sufficiently imperfect) and that private ownership is the dominant ownership arrangement when the degree of liberalization and marketization is sufficiently high (i.e., when \( \varphi \) is close to one).

**Theorem 2:** For the Cobb–Douglas technology specified in (14), if \( \lambda_{mb} \leq u_e / u_b \leq 1 \), then the state ownership arrangement dominates private ownership if and only if \( \varphi \) satisfies the inequality

\[
0 \leq \varphi < \frac{\ln \frac{u_e}{\lambda_{mb} u_b}}{\ln(1-\theta) - \ln \frac{\lambda_{re}}{\lambda_{mb}} < 1}.
\]

Furthermore, the state ownership arrangement dominates the private ownership and collective ownership arrangements when the degree of liberalization and marketization is sufficiently low. The private ownership arrangement dominates the state ownership and collective ownership arrangements when the degree of liberalization and marketization is sufficiently high. That is, \( W_r > \max \{ W_p, W_c \} \) when \( \varphi \) is sufficiently close to zero, and \( W_r > \max \{ W_p, W_c \} \) when \( \varphi \) is sufficiently close to one.

The above two theorems also show that the optimal choice of ownership arrangement depends on the degree of perfection of the institutional environment. Theorem 3 shows that the relative efficiency of internal management ability and external management ability affects the optimal ownership arrangement for a given degree of perfection of the institutional environment, \( \varphi \).

Define two critical values at which the collective ownership arrangement is switched to the private ownership arrangement and to the state ownership arrangement as follows:

\[
\lambda_{mb}^{-1} = \left( \frac{u_e}{u_b} \right) \left[ \frac{1 - (1-\theta) a_1 a_2}{1 - a_1 - a_2} \right]^{1-a_1-a_2} \theta^{a_2(1-\theta)^a_1},
\]

and

\[
\lambda_{mb}^{-1} = \left( \frac{u_e}{u_b} \right) \left[ \frac{1 - (1-\theta) a_1 a_2}{1 - a_1 - a_2} \right]^{1-a_1-a_2} \theta^{a_2(1-\theta)^a_1}.
\]

**Theorem 3:** For the Cobb–Douglas technology specified in (14), suppose that \( \lambda_{mb} \leq 1 \) and \( \lambda_{mb} \leq 1 \). Then, the state ownership arrangement dominates the private ownership and collective ownership arrangements, i.e., \( W_r > \max \{ W_p, W_c \} \), if and only if \( \lambda_{mb} \geq \lambda_{mb}^{-1} \) and \( \left( \frac{\lambda_{mb} u_e}{u_b} \right)^{a_2} \geq \left( \frac{\lambda_{mb} u_b}{u_e} \right)^{a_2} \); the private ownership arrangement dominates the state ownership and collective ownership arrangements,
i.e., \( w_2 > \max \{ w_1, w_3 \} \), if and only if \( \lambda_{np} \geq \lambda_{nb} \) and \( \left( \frac{\lambda_{np} w_2}{u_3} \right)^{\alpha_2} \leq \left( \frac{\lambda_{nb} w_3}{u_3} \right)^{\alpha_3} \); and the collective ownership arrangement dominates the state ownership and private ownership arrangements, i.e., \( w_2 > \max \{ w_1, w_3 \} \), if and only if \( \lambda_{np} \leq \lambda_{nb} \) and \( \lambda_{nb} \leq \lambda_{nh} \).

Theorem 3 demonstrates a partition of the parametric space of the internal management and external management abilities. For low values of \( \lambda_{np} \) and \( \lambda_{nb} \), collective ownership will likely prevail, since they can take advantage of specialization of abilities. If \( \lambda_{np} \) is large and \( \lambda_{nb} \) is small, that is, if the bureaucrats lack internal management ability and the private entrepreneur’s external management ability is not comparably poor, then the private ownership arrangement will likely prevail. This is true for those sectors in which government intervention is low or external management is not important. Examples of such sectors include those having a small scale of production, service sectors, and labor-intensive sectors. If \( \lambda_{np} \) is small and \( \lambda_{nb} \) is large, that is, if the entrepreneur lacks external management ability and the bureaucrats’ internal management ability is not comparably poor, the state ownership arrangement will likely prevail.

4 Answers to the Questions Raised and Policy Implications

Now we apply our theory to answer the questions raised at the beginning of the paper and draw some policy implications.

Theorems 1 and 2 specify completely the optimal ownership arrangement and property-right structures during the transition. They tell us that when the degree of economic liberalization and marketization is very low, the state ownership arrangement dominates the private and collective ownership arrangements, and when it is intermediate, the collective ownership arrangement likely dominates. When institutional environments are close to regular, our theory gives the same conclusion as standard theories: private ownership is the optimal ownership arrangement. Thus, our results indicate that the private ownership arrangement may not be the optimal property-right structure in the early and intermediate stages of the process of transition and development.

Theorems 1 and 2 also shed some light on the strategy for making the transition from a command economy to a free market economy. They tell us why the relations, timing, and procedures of liberalization, marketization, and privatization should be, and how one should make changes in ownership arrangements for a smooth transition, as well as under what conditions and how a social planner should privatize the state sector. In order for private ownership to be most efficient and to have a smooth institutional transition, one should first improve the institutional environment, i.e., increase \( \rho \) by implementing liberalization and marketization reforms, but not implement massive privatization at the early stages of transition. More specifically, one should first implement liberalization, then marketization, and finally privatization—the last only when \( \rho \) becomes sufficiently large. This is because, by theorems 1 and 2, a private ownership arrangement may not be appropriately established without reducing government intervention in production activities, and without improving economic freedom and market environments. Implementing changes in property rights, i.e., privatizing, regardless of the development of market institutions in the economy, is costly. The resulting private enterprises are not viable unless the economy is in the advanced stages of liberalization and marketization. Thus, unconditional mass privatization of state-owned firms may not be appropriate for an institutional transition. During the process of institutional transition in which an effectively functioning market system has not been properly established, and while there are still many barriers to economic freedom, collective ownership may be more efficient and lead to rapid development. As a result, the relative size of the state sector declines with the development of the transition and the resulting increase in the nonstate sector. Our theory further predicts that, with the continuing improvements of liberalization and especially marketization, more and more collective enterprises will lose their comparative advantage and begin to change their ownership to private, so that the relative size of the state-owned sector will continue to shrink. Only when the transition is in the advanced stages of liberalization and marketization and when the state-owned sector is only a small proportion of the economy (say, about 15% of GNP, the percentage for most developed countries) can one implement massive privatization.

These conclusions are consistent with the experience of China’s economic reform, and can be used to explain why collective enterprises (especially the TVEs), and not the private or the state sector, have been the engine of economic growth in China. The early stage of China’s economic reform and institutional transition can be characterized as improving the institutional environment through liberalization and marketization reforms. These reforms established the basic prerequisite conditions for an economic mechanism to perform well, such as economic freedom, decentralized decision making, and various incentive mechanisms. This resulted in rapid entry of various types of new firms, especially the quick development of collectively owned enterprises such as TVEs, because, by theorem 1, they are more efficient in intermediate degrees of economic liberalization and marketization.

As a result, the collectively owned sector has become the main contributor to rapid economic growth in the last twenty years. Indeed, a recent article in a Chinese newspaper (China Economic Times, August 13, 1999) gave an estimate of \( \rho \) by measuring the degrees of marketization in the labor market, financial market, and product market, as well as the degrees of economic freedom and government intervention through price control. The current value of \( \rho \) in China is in the range...

\[\text{\footnotesize \cite{Jin and Qian 1998}}\] The empirical results of Jin and Qian [1998] also support the conclusion that collective ownership dominates the other two forms when the local government’s power is great and the market is underdeveloped.
of 0.45 to 0.5. This may show, by the theory developed in the paper, why collective enterprises still dominate private enterprises in China, and why China's economic reform is more successful in terms of economic performance and stability than some of the Eastern European countries.

As an application, our results can be used to explain why corruption is generally more serious in transitional economies than in command and market economies. Since corruption can be regarded as a type of collective ownership arrangement (joint ownership by bureaucrats and entrepreneurs), it can increase a firm's productivity during the intermediate states of transition. This also explains why many well-known big corporations pursue joint ventures with Chinese state-owned enterprises: given China's current degree of imperfection of institutional environment, they want to use bureaucratic managers to promote relations with government.

Our results may even be used to interpret some phenomena in industrialized economies. For instance, they can be used to explain the existence of state-owned, publicly owned, and mixed-ownership firms even in an industrialized economy. For a sector with a natural monopoly such as the utilities, the market is imperfect and there are a lot of government regulations. Thus, \( \varphi \) is small and state-owned firms are likely to prevail.

The collective ownership arrangement is not only an important and more efficient property-rights structure during transition and development, but it is also an unavoidable intermediate property-rights arrangement and may exist throughout the early and intermediate stages of the transition. This is because marketization (changing the institutional environment to a market-oriented environment) is a long-term process, unlike privatization (changing the ownership arrangement to private ownership), which can be rapidly implemented. Establishing a mature market institution is a very time-consuming and difficult process. Merely implementing a liberalization policy (loosening restrictions on prices, opening production markets, or granting people economic freedom) is insufficient to create a mature market system. Such an institution also requires other supporting institutions such as financial institutions, public agencies, fiscal and monetary policy management systems, modern laws for firms, taxation (income distribution) systems, legal systems, antitrust systems, labor market systems, etc. Developing such supporting institutions takes years or even decades, because they involve fundamental changes in skills, organizations, and attitudes. Besides, political and social institutional environments, which also affect ownership arrangements, are hard to change. There are the usual problems of free riding, resistance from those who stand to lose from the change, and the high costs of learning new rules. Only when the market system is almost established and economic freedom is almost full do state-owned and collectively owned firms become less efficient so that massive privatization can be implemented.

The conclusion that the optimal ownership arrangement (whether state or private) depends on the institutional environment can be supported by looking at China's experience in the institutional transition from a market to a centralized command economy beginning in the early 1950s, and then its reverse transition in the 1980s and 1990s. After the founding of the People's Republic of China in 1949, the Chinese Communist Party did not change the economic system to state ownership directly (by simply expropriating private property), but indirectly, by changing institutional environments, gradually reducing economic freedom, intervening in the market, and controlling raw materials (the so-called industry and commerce remodeling movement), so that privately owned firms could not survive in the long run. These firms then had to be either forced out of business or changed into collective ownership arrangements with the central or local governments—a form of collectively owned firms called the "state and private jointly run firm" (gong-qi-he-ying in Chinese). As the degree of Chinese government intervention became more severe, most enterprises transformed into state-owned enterprises, with the state-owned proportion of gross industrial product reaching 78% by the end of the Cultural Revolution in 1976. After the Cultural Revolution, China reversed this process, and moved from a centrally planned economy back to a market-oriented economy. Through economic liberalization and marketization reforms beginning in 1978, the significance of the state sector declined steadily even without any privatization until very recently, and many new non-state-owned enterprises, most of which are collectively owned because of their relatively high efficiency, entered into the economy to compete with existing state-owned enterprises. This made the economy change from a state-dominated economy to one in which the non-state-owned sector produced about 74% of GNP by 1999. With the further progress of economic liberalization and the continuing and increasing introduction of market-supporting institutions, the collectively owned enterprises are losing their comparative advantage, and by now many collectively owned enterprises, especially TVEs, have changed into privately owned enterprises. Notably, China has recently decided to speed up privatizing state-owned enterprises. Various policies for doing so have been proposed by the Chinese government. All of these events confirm our property-rights theory.

Interestingly, even for some countries with sudden changes in political orientation in Eastern Europe, privatization has not been as rapid as people thought. In his recent study, Perotti [1995] indicated that of the recent sales of state-owned firms to foreign firms in Hungary, remarkably, all are partial sales (so the result is a form of collective ownership), although the agreement typically provides for transfer of managerial control and a complete sale over time. Perotti [1995] also pointed out that most public sales in the United Kingdom are partial sales. These experiences show the same pattern of privatization as predicted by our theory: the transition is from a state ownership arrangement to a collective ownership arrangement, and then to a private ownership arrangement as a final objective.

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15 For a detailed introduction to the Chinese economy, see Cheung [1982] and Perkins [1986].
Concluding Remarks

This paper has developed a theory of endogenous ownership arrangements that rationalizes the optimal choice of ownership arrangements among private ownership, collective ownership, and state ownership in an imperfect institutional environment. The contrast between the transition experiences in China and the former Eastern European countries provides the backdrop for this paper. The crucial condition is that some special resources, such as personal-relations input, are needed for effective production in the presence of irregular institutional environments. The theory predicts how the transition from a command economy to a free market economy takes place and offers some interesting insights into the transition from state to collective and finally to private ownership (and into the reverse transition). By applying this theory of property rights, one can study and provide convincing answers to some important questions that may not be well explained by the traditional theories.

This theoretical framework goes beyond the existing literature in two key respects. First, our theory removes the assumptions of full economic freedom, decentralized decision making, and market perfection, which are imposed in the conventional property-rights theories. It improves and enriches the conventional theories to include general (regular and irregular) institutional environments in which the market may not be perfect and there are some barriers to economic freedom and decentralization. Furthermore, it brings the discussion of transitional economies into the familiar framework of the mainstream economics literature.

Secondly, it regards an ownership arrangement not as given, or chosen directly by a social planner, but as an efficient response to the degree of economic liberalization and marketization. The theory shows that collective ownership dominates state and private ownership in institutional environments where market underdevelopment and government influence coexist. External management ability, which can be best understood as rent-seeking ability, is a productive input not only at the firm level, but also at the macro level of the total economy, when the economic institutional environment is very irregular. Literature on rent seeking indicates that it is inefficient from the society's perspective. However, this conclusion is essentially based on the key assumption that the institutional environment under consideration is regular. When this assumption is dropped, this conventional wisdom may no longer be true. When one studies the relative efficiency of an ownership arrangement for a given economic institutional environment $q$, it is important to distinguish the relative (local) efficiency of external management ability for a given institutional parameter $q$ and the absolute (global) inefficiency of external management ability over the whole domain of institutional parameters $q$. Even though rent seeking is inefficient compared to the case of $q = 1$, it will be productive when $q$ is low. Theorem 1 shows that, for a given $q$ that is small, the collective ownership arrangement will be more efficient than the private ownership arrangement, although it is not an absolute (global) social optimum because of rent seeking on the whole domain of $q$. That is, when $q$ is small, private ownership will be less productive at both micro and macro levels. Indeed, for a given low $q$, how can the private ownership arrangement be more productive at the macro level when each individual privately owned firm is less productive than the other types of ownership arrangements at the micro level? That is logically impossible. This conclusion is robust and consistent with empirical evidence in China. In a transition economy with limited economic freedom and a less-developed market system, a private ownership arrangement may not be the most efficient one and a collective ownership arrangement may dominate it, since the prices for such resources as promoting personal relations and the procurement of inputs must be paid. Bureaucrats have a comparative advantage in pooling such resources, and their costs of doing so are therefore lower. The policy implications of this result are considerable in that it is especially relevant to transitional economies and to economies with imperfect markets. Since $q$ can increase only gradually, a collective ownership arrangement may exist for a long time, and rapid privatization is not the optimal choice in the intermediate stages of the transition.

I should emphasize that our main results show the relative efficiency, not the absolute efficiency, of an ownership arrangement under varying degrees of institutional environments. That is because the basic question asked in this paper is, under a given degree of economic institutional regularity $q$, what is the best way to own a capital asset. These results do not argue for an advantage of collective ownership arrangements. Rather, they indicate the importance of economic liberalization and marketization and, consequently, the importance of improving the overall institutional environment. Although collective ownership may dominate private ownership when the institutional environment is irregular, it does not do so when the environment is regular. Private ownership will become not only relatively but also absolutely efficient when the institutional environment is sufficiently regular. Indeed, transactions in irregular institutional environments carry high costs and require extra resources to promote procurement ability. Thus, private ownership is more efficient if the external management skill and the costs associated with government intervention are not required to conduct business. In the long run, clear property rights and widespread private ownership are necessary for markets to perform efficiently and equitably. Thus, our theory does not contradict standard property-rights theories, but rather recognizes that in the middle of a transition in an irregular economy, there are significant rewards to effective external management skill. To reach an efficient allocation of resources, private ownership is an appropriate mechanism. Thus, the eventual transition from a command economy to a free market economy will be optimal. This is why we want to make such a transition: so that private ownership arrangement will reach absolute social efficiency. But the question is how a smooth transition should be implemented. The answer from our theory and policy implication is that the appropriate procedure for reaching this goal may not be to privatize state-owned enterprises rapidly, but rather to improve the economic environment first. Liberalization and marketization can not only lead to the entry of many new firms, but also change the institutional environments to ones that are suitable for private ownership arrangements.
Since developing new markets and establishing a mature market system are time-consuming and costly, complete and immediate privatization may not be the optimal choice for an economy with imperfect institutions. In the transitional period, collective ownership may be a more efficient response given the institutional environment, and thus should not be skipped. As institutions improve significantly, firms then should be privatized.

I also want to emphasize that a social planner does not play a role in the setting of our model; we use one only to discuss the policy implications of the main results: how to make a smooth transition and how to reach a preferred ownership arrangement. That is, the optimal ownership arrangements are not directly chosen by a social planner in our model, but they can be indirectly selected through changing the value of $\phi$, in which a social planner can, and should, play an important role. It is important to notice this distinction, since the ownership arrangement chosen by policymakers may be relatively inefficient if the institutional parameter $\phi$ is not changed appropriately.

A basic question answered in this paper is: What is the best way to own the capital asset $K$ under a given degree of economic institutional regularity $\phi$? After finding the relative efficiency of an ownership arrangement under varying degrees of imperfection in the economic institutional environment, one can reach a preferred ownership arrangement by changing $\phi$. Our theory argues that a powerful reformer or government agency, as a social planner, should adopt a policy of improving the economic institutional environment, but not simply change ownership arrangement directly, even though the agency wants to have a dominant private ownership arrangement. As $\phi$ improves, state ownership and then collective ownership become less and less relatively efficient, and private ownership becomes more efficient and can then develop more rapidly.

Finally, we mention some limitations of the paper. First, for simplicity, this paper does not explicitly consider markets for internal and external management resources. However, these markets and transactions are not completely ignored; they are summarized in $\phi$ and by their opportunity incomes. Secondly, since the paper mainly studies what is the best way to own capital $K$, we do not consider a market for $K$. Thirdly, our property-right theory only considers a single dominant ownership arrangement. Even so, it may be used to explain the coexistence of different ownership arrangements such as state-owned firms, collectively owned firms, and privately owned firms even in the same industry or area. Since the opportunity incomes of bureaucrats and entrepreneurs, the sharing rule, and the relative efficiency of management ability and of external management ability can also affect the optimal ownership arrangements, differences in these parameters among different individuals could lead to the coexistence of different ownership arrangements in the same areas or sectors.

An interesting question not studied in this paper is how to design an efficient and smooth process for institutional-environment transition, such as the evolution from a command economy to a market economy — i.e., how liberalization and marketization should be implemented. Another such question is the interaction of improving institutional environments and changing ownership arrangements. As in Davis and North [1971], $\phi$ has been treated here as an exogenous variable that describes the status of market perfection, economic freedom, and decentralization of an economy, while ownership institutional arrangement is an endogenous variable. A more accurate and appropriate model would treat market development as an endogenous variable. When the degree of economic freedom, government intervention, and decentralization improves, the market will develop and mature. Nevertheless, without economic freedom and reduced government intervention, just privatiing state-owned enterprises is unlikely to develop a mature market. Since the development of market-supporting systems is a very time-consuming process and this paper mainly focuses on the optimal ownership arrangement, one may treat the market development as an exogenous variable, especially over a short period.

Appendix

A.1 Proof of Theorem 1

First, show $W_e > W_c$. By comparing (40) with (33), we see that it is sufficient to show

$$\phi\left(\frac{u_x}{u_b}\right)^{\alpha} < \left(1-\theta\right)^{\alpha} \left(1-\theta\right)^{\alpha}$$

by noting that $1-(1-\theta)\alpha_1 - \theta \alpha_2 > 1-\alpha_1 - \alpha_2$.

Solving this inequality for $\phi$, we have

$$\phi \left[ \ln \frac{\lambda_{ne} u_e}{u_b} + \ln \left(1-\theta\right) \right] < \ln(1-\theta).$$

Since $\lambda_{ne} < \theta - \theta u_e < \theta u_e < \theta - \theta u_e$, we have $\frac{\lambda_{ne} u_e}{u_b} < 1-\theta < 1$ and thus

$$\phi > \frac{\ln(1-\theta)}{\ln \frac{\lambda_{ne} u_e}{u_b} + \ln \left(1-\theta\right)} = C > 0.$$

To show $W_e > W_c$, we compare (40) with (26). Now, $W_e > W_c$ if

$$\phi \left(\frac{u_x}{u_b}\right)^{\alpha} < \left(1-\theta\right)^{\alpha} \left(1-\theta\right)^{\alpha}.$$
Solving this inequality for \( \varphi \), we have

\[
\varphi \left[ \ln \frac{1 - \theta - \ln \frac{\lambda_{re} u_b}{u_e}}{\theta} - \ln \frac{\lambda_{re} u_b}{u_e} \right] < \ln(1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}.
\]

Since \( \frac{u_b}{u_e} < \frac{(1 - \theta)^2}{\lambda_{re}} \), we have \( (1 - \theta) > \frac{\lambda_{re} u_b}{u_e} \) and thus \( \frac{1 - \theta}{\theta} > \frac{\lambda_{re} u_b}{u_e} \). Therefore, we have

\[
\varphi < \frac{\ln(1 - \theta) - \ln \frac{\lambda_{re} u_b}{u_e}}{\ln \frac{1 - \theta}{\theta} - \ln \frac{\lambda_{re} u_b}{u_e}} = D < 1.
\]

Finally, it must be shown that \( \varphi \) satisfies both inequalities given by (44) and (45), i.e.,

\[
D - C = \ln(1 - \theta) - \frac{\ln(1 - \theta)}{\ln \frac{1 - \theta}{\theta} + \ln \frac{\lambda_{re} u_b}{u_e}} - \frac{\ln(1 - \theta)}{\ln \frac{1 - \theta}{\theta} + \ln \frac{\lambda_{re} u_b}{u_e}} \ln \frac{\lambda_{re} u_b}{u_e} = \left[ \ln(1 - \theta) - \frac{1}{2} \ln \frac{\lambda_{re} u_b}{u_e} \right] \ln \frac{\lambda_{re} u_b}{u_e}
\]

\[
= \left[ \ln(1 - \theta) - \frac{1}{2} \ln \frac{\lambda_{re} u_b}{u_e} \right] \ln \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{re} u_b}{u_e} - \ln \frac{\lambda_{re} u_b}{u_e} - \ln \frac{\lambda_{re} u_b}{u_e} = 0.
\]

Thus, \( W_b > W_e \) if and only if \( 0 < \varphi < \ln \frac{\lambda_{re} u_b}{u_e} \).

A.2 Proof of Theorem 2

By comparing (26) with (33), we have \( W_b > W_e \) if and only if

\[
\alpha_2 \frac{u_b}{u_e} \alpha_0 > \alpha_1 \frac{u_b}{u_e} \alpha_0.
\]

Note that \( \alpha_1 = \frac{1 - \theta}{\lambda_{re}} \alpha_2 = (1 - \theta) \beta \) and \( \alpha_2 = \frac{\alpha_0}{\alpha_1} = \frac{\alpha_1}{1 - \alpha_2} \). Here \( \beta = \frac{\alpha_1}{1 - \alpha_2} \). Solving the inequality in (46) for \( \varphi \), we have

\[
\varphi \ln \frac{\lambda_{re} u_b}{u_e} < \ln \frac{\lambda_{re} u_b}{u_e}.
\]

Since \( \frac{u_b}{u_e} \lambda_{re} > 1 \) and \( \frac{u_b}{u_e} \lambda_{re} < 1 \), we have

\[
0 < \varphi < \ln \frac{\lambda_{re} u_b}{u_e} = \ln \frac{\lambda_{re} u_b}{u_e} + \ln \frac{\lambda_{re} u_b}{u_e} \leq 1.
\]

Thus, \( W_b > W_e \) if and only if the above inequality holds.

Now we show the second part of the theorem. That is, it needs to be shown that \( W_b > W_e \) when \( \varphi \) is sufficiently close to 0 and \( W_b > W_e \) when \( \varphi \) is sufficiently close to 1. By comparing (40) with (33) and (26), we see that \( W_b > W_e \) if and only if

\[
\alpha_2 \frac{u_b}{u_e} \alpha_0 \left( 1 - \frac{(1 - \theta) \alpha_1 \theta \alpha_2}{1 - \alpha_1 - \alpha_2} \right) < \left( 1 - \theta \right) \alpha_0 \theta \alpha_0,
\]

and \( W_b > W_e \) if and only if

\[
\alpha_2 \frac{u_b}{u_e} \alpha_0 \left( 1 - \frac{(1 - \theta) \alpha_1 \theta \alpha_2}{1 - \alpha_1 - \alpha_2} \right) < \left( 1 - \theta \right) \alpha_0 \theta \alpha_0.
\]
When $q \rightarrow 0$, we have $a_1 \rightarrow \beta$, $a_2 \rightarrow 0$, $\lambda_{ab} \rightarrow 1$. Then

\[
\left. \frac{u_k}{u_e} \right| \begin{pmatrix}
1 - (1 - \theta) a_1 - \theta a_2 / 1 - a_1 - a_2 \\
(1 - \theta) a_1 - \theta a_2 / 1 - a_1 - a_2
\end{pmatrix}^{1 - a_1 - a_2} \left[ 1 - (1 - \theta) \beta / 1 - \beta \right]^{1 - \theta} \theta \beta = \phi(\theta) < 1
\]

because $\phi(0) = 1$ and $\phi'(\theta)$ is strictly decreasing (since $\phi'(\theta) < 0$). Thus, we have $W_r > W_c$ when $q$ is sufficiently close to zero.

On the other hand, when $q \rightarrow 1$, $a_1 \rightarrow 0$ and $a_2 \rightarrow \beta$. Then

\[
\left. \frac{u_k}{u_e} \right| \begin{pmatrix}
1 - (1 - \theta) a_1 - \theta a_2 / 1 - a_1 - a_2 \\
\theta a_1 - \theta a_2 / 1 - a_1 - a_2
\end{pmatrix}^{1 - a_1 - a_2} \left[ 1 - (1 - \theta) \beta / 1 - \beta \right]^{1 - \theta} \theta \beta = \phi(\theta) < 1
\]

because $\phi(1) = 1$ and $\phi'(\theta)$ is strictly increasing (since $\phi'(\theta) > 0$). Thus, we have $W_r > W_c$ when $q$ is sufficiently close to one.

Thus, $W_r, \max \{W_r, W_c\}$ when $q \rightarrow 0$, and $W_r, \max \{W_r, W_c\}$ when $q \rightarrow 1$.

Q.E.D.

A.3 Proof of Theorem 3

By the inequality

\[
\left[ 1 - (1 - \theta) a_1 - \theta a_2 / 1 - a_1 - a_2 \right]^{1 - a_1 - a_2} \left[ 1 - (1 - \theta) \beta / 1 - \beta \right]^{1 - \theta} \theta \beta = \phi(\theta)
\]

one can easily verify that $\lambda_{ab} \leq 1$ and $\lambda_{cr} \leq 1$. We already know that $W_r > W_c$ if and only if $\lambda_{cr} > \lambda_{ab}$, $W_r, W_c$ if and only if $\lambda_{cr} = \lambda_{ab}$, and $W_r > W_c$ if and only if

\[
\lambda_{ab} \leq \lambda_{cr} \leq \lambda_{ab} + \lambda_{cr}
\]

one can easily verify that $\lambda_{ab} \leq 1$ and $\lambda_{cr} \leq 1$. We already know that $W_r > W_c$ if and only if $\lambda_{cr} > \lambda_{ab}$, $W_r, W_c$ if and only if $\lambda_{cr} = \lambda_{ab}$, and $W_r > W_c$ if and only if

\[
\lambda_{ab} \leq \lambda_{cr} \leq \lambda_{ab} + \lambda_{cr}
\]

Rearranging the above inequality, we have

\[
\left. \frac{u_k}{u_e} \right| \begin{pmatrix}
\lambda_{ab} u_k / u_b \\
\lambda_{cr} u_k / u_e
\end{pmatrix}^{1 - a_1 - a_2} \left[ 1 - (1 - \theta) \beta / 1 - \beta \right]^{1 - \theta} \theta \beta = \phi(\theta)
\]

have $W_r, \max \{W_r, W_c\}$ if and only if $\lambda_{cr} > \lambda_{ab}$, and have $W_r, W_c$ if and only if $\lambda_{cr} = \lambda_{ab}$, and have $W_r > W_c$ if and only if $\lambda_{cr} < \lambda_{ab}$.

Q.E.D.

\[
\frac{u_k}{u_e} \left. \right| \begin{pmatrix}
\lambda_{ab} u_k / u_b \\
\lambda_{cr} u_k / u_e
\end{pmatrix}^{1 - a_1 - a_2} \left[ 1 - (1 - \theta) \beta / 1 - \beta \right]^{1 - \theta} \theta \beta = \phi(\theta)
\]

References


Should the Treasury Price-Discriminate?
A Procedure for Computing Hypothetical Bid Functions

by

DANIEL HELLER AND YVAN LENGWILER

Ever since Friedman [1959], it has been debated whether the Treasury should sell bonds in a uniform or in a discriminatory auction. Empirical research on this topic has been confined to experiments in which both auctions were used. But these experiments inherently contain an identification problem, since differences cannot be attributed to the auction format alone. We develop a method for generating counterfactual data on discriminatory auctions, using real data from uniform-price Treasury bond auctions in Switzerland. Our method allows us to investigate the performance of the two auctions without relying on experiments and without the identification problem. (JEL: D44, H63)

1 Introduction

For decades, governments have been auctioning off fixed-income securities to finance their debt. Despite the importance of Treasury auctions in terms of value, so-called multi-unit auctions have so far received fairly little academic attention. While auction theory has been a prolific field in economics, it has focused mostly on single-unit auctions such as auctions for a painting, a contract, or drilling rights to an oil field. Multi-unit auctions are different in that the good being auctioned is divisible. Starting with Wilson [1979], it has been shown in a number of papers that the conclusions reached in single-unit auction theory do not necessarily carry over to multi-unit auctions, see Back and Zender [1993], Noussair [1995], Tenorio [1997], Lengwiler [1998], Engelbrecht-Wiggans and Kahn [1998a], [1998b].

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