

Property Rights and the Nature of Chinese Collective Enterprises¹

Guoqiang Tian

Texas A&M University, College Station, Texas 77843

E-mail: GTIAN@TAMU.EDU

Received March 15, 1999; revised March 6, 2000

Tian, Guoqiang—Property Rights and the Nature of Chinese Collective Enterprises

This paper offers a rationale for gradual privatization in transitional economies through studying property rights structures and the nature of Chinese collective enterprises. First, we pose a puzzle for existing theories of property rights, and then we provide a theoretical model for determining the optimal ownership arrangements for transitional economies. This theory argues that ownership arrangements should be functions of the varying degrees of imperfection of the institutional environment. Hence, collective enterprises actually may dominate private ownership in the middle of transition. Thus, to make the transition process smooth, the economic environment before massive privatization must be improved first. *J. Comp. Econ.*, June 2000, **28**(2), pp. 247–268. Texas A&M University, College Station, Texas 77843. © 2000 Academic Press

Key Words: institutional transition; property rights; optimal ownership arrangements; imperfect economic environments; Chinese township-village enterprises.

Journal of Economic Literature Classification Numbers: L2, L3, P5.

1. INTRODUCTION

The conventional wisdom in the property rights literature 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 in economics is thus that rapid privatization is

¹ I thank two anonymous referees and, especially, Professor John Bonin, the Editor of the journal, for extensive comments and suggestions that improved significantly the presentation of the paper. 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, the Lewis Faculty Fellowship, and the Program to Enhance Scholarly and Creative Activities at Texas A&M University, is gratefully acknowledged.

a necessary first step for the institutional transition from a centralized command economy to a decentralized free market economy. However, the evidence on actual privatization in transitional economies presents a very different picture.

On one hand, rapid privatization in some of the Eastern European and former Soviet Bloc countries has been associated with continued economic turmoil and significant declines in output. On the other hand, China has experienced a robust economy as the average annual growth rate of GNP was about 9.5% from 1979 to 1998. The non-state sector has been the main engine in China's economy; with an average annual growth rate of over 20%, it now accounts for about 74% of the GNP. Interestingly, collectively owned enterprises comprise about 70% of this sector. Although these enterprises do not have clearly defined property rights (Jefferson and Rawski, 1994), their economic efficiency is very close to that of privately owned enterprises in China (Svejnar, 1990). This experience of gradual reform coupled with rapid economic growth puzzled many economists. Why has China grown so fast when the conditions thought to be necessary for growth were absent?² Does China's rapid economic growth over the past 20 years, without large-scale privatization, challenge the conventional wisdom, particularly when it is contrasted with the floundering economies of many former Eastern Bloc countries? This puzzle provides the backdrop for our study of property rights and the nature of Chinese collective enterprises.

A Chinese collective enterprise is characterized by two main features, property rights are vaguely defined and there is significant involvement of government officials. The purpose of this paper is twofold. First, we discuss the nature of Chinese collectively owned enterprises and the property rights structure of Chinese Township-Village Enterprises (TVEs), which make up the majority. Second, we develop a theoretical framework to deal with government involvement in these enterprises. Following the approach adopted by Davis and North (1971, pp. 6–7), we consider two categories of institutions, the institutional environment and an institutional arrangement.³ We focus on the determination of the optimal choice of ownership arrangements by taking the economic institutional environment as exogenous.⁴ The conclusion that private ownership is the

² For instance, such a question was raised in Blanchard and Fischer (1993, p. 4).

³ The 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 the ground rules that make up the 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 a government. The distinction between the institutional environment and an institutional arrangement is important to the understanding of some of the debates raised in the transitional economics literature.

⁴ Thus, this paper will make no attempt to study changes in the economic environment, although such changes certainly occur in transition economies and the study of these changes is important in the transitional economics literature.

optimal property rights arrangement is based on a set of presumptions that may not be satisfied by transitional and other irregular economic environments, in which economic freedom is constrained and markets are absent, immature, or imperfect. Our theory generalizes conventional property rights theory to include irregular economies. It identifies a firm's optimal ownership arrangement relative to the degrees of economic freedom, decentralization, and market perfection. 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.

The theoretical framework addresses some issues in transitional economies that may not be explained well by the traditional theory, e.g., the current state of affairs in countries in the middle of transition. Contrary to the 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, the theory shows that the first step for institutional transition should be to improve the economic environment before proceeding with large-scale privatization. Improvements include allowing individuals to pursue their own self-interest, allowing freedom of economic choice, adopting decentralized decision making and a market system, and using incentive mechanisms. Tian (1997) argued that these are four prerequisite conditions for an economy to function well. This theory explains why collective enterprises, especially the Township and Village Enterprises (TVEs), have developed more rapidly than privately owned enterprises, in China. There are five alternative explanations for the high efficiency of Chinese TVEs found in the literature. The first is sociological and uses traditional Chinese culture as an explanation (Weitzman and Xu, 1994). The second is political (Chang and Wang, 1994) and is based on the interaction of the central and local governments. The third is a risk-sharing explanation by Li (1996), which shows the rationality of collective ownership arrangement in a gray market environment with ambiguous property rights. The fourth, given by Che and Qian (1998), interprets the firm boundaries of TVEs at the community level rather than at the enterprise level. The fifth is the principal-agent approach of Hsiao et al. (1998), which assumes double-sided moral hazard between the local government and the TVE. Our approach focuses on special resources in which administrative bureaucrats may have a comparative advantage in irregular economies.

In addition to capital investment and management ability, the ability to procure government-owned or -controlled resources is considered to be an input in the production process. This skill is important when government intervention is significant or when a market is absent or not well developed. In general, private entrepreneurs have superior abilities in management and bureaucrats have superior abilities in procurement. The status or degree of perfection of the institutional environment of both the market and the government is summarized by a number ρ , which is between zero and one and captures the relative importance of

procurement abilities. The institutional environment is more centralized, constrained, or imperfect, the closer ρ is to zero. When ρ is one, the institutional environment is perfect and procurement ability may be unnecessary. We show that private ownership dominates collective ownership if the degree of perfection of the institutional environment of the market and the government is sufficiently high. We also prove that, under some conditions on opportunity incomes and profit shares of individuals, collective ownership dominates private ownership when the institutional environment is significantly irregular.

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 this idea in studying contractual structure in agricultural tenancy. He considered landlords as a class to have 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, i.e., fixed wage contract, fixed rental contract, and share contract, entails a different type of agent, i.e., landlord or tenant, providing unmarketed factor inputs. These authors discussed the optimal contractual structures in terms of the landlords' profit for some specific parameters. Our model is different from the models in Reid (1977), Eswaran and Kotwal (1985), and Hsiao et al. (1998) in two main respects. First, we determine the relative superiority of the private ownership arrangement and collective ownership arrangements for varying degrees of imperfection of the institutional environment. The other models determine the relative superiority of organizational form under the restriction of a private ownership arrangement. Second, we specify general, mathematical conditions on the parameters to determine the optimal ownership arrangement whereas other authors do not provide such conditions. A further advantage of our model compared to that of Hsiao et al. (1998) is that we derive some sensitivity static results concerning the relative strength of the explanation variables or parameters.

The remainder of the paper is organized as follows. Section 2 discusses the nature of Chinese collective enterprises. Section 3 describes the model formally. Section 4 considers the determination of the optimal choice of ownership arrangements. Section 5 presents some sensitivity static results. Discussions and concluding remarks will follow in Section 6.

2. THE NATURE OF THE CHINESE COLLECTIVE ENTERPRISES

Chinese collective enterprises, in general, and TVEs in particular, do not have clearly defined property rights. Clearly defined property rights typically include three basic elements (Demsetz, 1967; Furubotn and Pejovich, 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 asset. 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. If any of these three conditions is not satisfied, property rights are said to be ambiguously or vaguely defined. However, 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).

A TVE is an industrial or commercial enterprise regulated by the government at the town-village level. TVEs can be classified into two groups by ownership structures, collective TVEs, which are owned by the community or administrated by the town-village government, and non-collective TVEs, such as individual, partnership, cooperative stock-sharing, stock-sharing, and joint venture enterprises. We focus on the former and discuss vaguely defined property rights. In addition to the vagueness caused by collective ownership of TVEs, there are three other factors causing uncertainty in the property rights of collective TVEs. First, changes in the administration division system, such as the replacement of district systems with town-village systems in the early 1980's, may change the structure. Second, changes of local government leaders who represent local capital may change ownership rights. Third, investment and distribution decisions are not made by the people of the community but rather by the community administration, mainly the chief leaders.

TVEs have some or all of the following characteristics. First, the TVE has no well-defined owners, although a TVE is conceptually owned by the people of a community. There exists no well-defined relation-to-person shares. Therefore, by the standard definition of property rights, the TVE has no well-defined owners. Second, in the majority of TVEs, funds are drawn mainly from the assets of the people of the community, although some are drawn from government loans. Only a small portion of TVEs, the so-called red-hatted collective TVEs, are individual, partnership, or cooperative stock-sharing enterprises which, in order to obtain low interest rate loans or for ideological reasons, are registered as collective enterprises. Third, the people of the community cannot share directly in the profits of the local TVEs. Only the employees are compensated in the form of wages. Fourth, most TVEs are controlled by their community's administrations, particularly the chief leaders. The chief leader can appoint the manager of a TVE and may participate in production decision making. Fifth, TVE capital cannot be transferred or sold. When an individual leaves a community, he automatically loses common ownership of that TVE.

Note that the first condition of well-defined property rights is not satisfied because of the first two characteristics. Furthermore, the second condition is not satisfied due to the third characteristic. Finally, the third condition is not satisfied because of the fourth and fifth characteristics, i.e., the residual control rights of TVEs are vaguely defined. Thus, the property rights of TVE in the Chinese non-state sector are ambiguous.

The puzzle is, why have TVEs been growing faster than privately owned enterprises, which have clearly defined property rights, since China's marketization reform? By conventional property rights theory, the TVEs should be less efficient than privately owned enterprises due to the vagueness in property rights. Hence, they should develop more slowly under reforms characterized by economic liberalization and decision decentralization. However, contrary to the traditional property rights theory, the TVEs have been growing more rapidly than privately owned enterprises. We will provide an explanation for this puzzle in the next section.

3. THE MODEL

This section develops a formal model to rationalize gradual privatization and to analyze the reasons that TVEs have developed faster than privately owned enterprises at the current state of transition in China. The model incorporates the crucial features of imperfect markets, bounded economic freedom, and decentralization because of enormous involvement of government officials.

3.1. Description of the Model

Consider a private entrepreneur, denoted by e , and a bureaucrat, denoted by b . The private entrepreneur may be an investor or a group of investors; the bureaucrat may be the local government or an administrator. The private entrepreneur can establish the firm by choosing one of two organizational forms. In one, e runs the firm privately, and in the other, e runs the firm jointly with b . We designate the first as a privately owned firm with a private ownership arrangement and the second as a collectively owned firm with a collective ownership arrangement.⁵

After choosing the organizational form, the enterprise makes a capital investment \bar{K} . When the enterprise is private, the capital investment is made by the entrepreneur. 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. Without loss of generality, we assume that $\bar{K} = 1$. We also assume that, in an imperfect market or a structured bounded economic freedom or a limited decentralization environment, the level of profit from the investment depends on two other resources, management's ability to make production decisions and procurement ability. The latter involves the ability to obtain government-owned or -controlled production factors, the ability to get preferential policy treatment,

⁵ Weitzman and Xu (1994) called collective ownership vaguely defined ownership, and Li (1996) called it ambiguous ownership since control rights are not clearly defined.

and the ability to solve various disputes with other production organizational units.

Management ability is crucial to the efficiency of production. In an incomplete information market or an imperfect market, searching and adopting proper production techniques and selecting and using proper inputs are 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 the available inputs, their quality, and prices. Making a good production decision depends on knowledge of government tax-subsidy programs and of production regulations and policies.

Procurement ability may be of even greater importance when markets, especially factor markets, are absent or far from perfect and when the degree of economic freedom and decentralization is far from complete. Many production activities fall largely under government control in such irregular economic 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 example, most banks are still owned and controlled by the government in China. 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 factor markets. One may also need to get 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 rational good a firm can obtain often depends on the firm's procurement ability and the status of the firm's relations with the bureaucratic administrators who control the resources. Many rules, regulations, and policies exist for controlling and guiding firms' production; these either are vaguely defined or limited in scope. 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. Since the infrastructure of the market system has not been established completely and the development of the legal system is far from complete, a firm may not always get fair treatment when it is involved in contract disputes with other organizational units. All of these problems require a firm to have good relations with the respective bureaucratic departments; thus, bureaucratic connections are extremely valuable within an imperfect institutional environment such as a transition economy.

In an irregular economic environment, many transactions and production relations are personalized and access to scarce inputs is a matter of privilege. Procurement ability becomes essential for successful production. Of course, the

importance of promoting good relations with bureaucratic departments also depends on the degree of market perfection, economic freedom, and decentralization. With the increase in the maturity of the market system and economic freedom, the role of procurement ability will decrease. We use ρ , with $0 \leq \rho \leq 1$, to denote the degree of market perfection, economic freedom, and decentralization, which is introduced to capture the relative importance of the procurement ability. If $\rho = 0$, the economic environment is extremely irregular, i.e., markets are absent or extremely imperfect or there is no economic freedom and decentralization, and thus procurement ability is very important. Increasing ρ implies that the market environment is improving, and consequently, the importance of procurement ability is decreasing. If $\rho = 1$, the market is perfect and economic freedom is full so that procurement ability is not a necessary input for the production process.⁶

We assume that effective production in imperfect institutional environments needs to use three types of resources, capital investment, management ability M , and procurement ability R . The conditional profit function from the investment for parametrically given R and M can be denoted by a function, $\Pi(R, M, \rho)$, which is assumed to be increasing, continuous, and concave in its first two arguments.⁷ We assumed that this function can be written as $\Pi(R, M; 1) \equiv \pi(M)$ and that the relative importance of procurement ability to management ability, i.e., Π_R/Π_M , is decreasing as ρ increases, where Π_R and Π_M denote partial derivatives of Π with respect to R and M , respectively.

Both management and procurement inputs are time-consuming processes. The more time spent on management and procurement, the better the quality of management decisions and procurement ability. Therefore, we use the time devoted to such activities by a producer as a proxy for management input and procurement input. We assume that each of the private entrepreneurs and bureaucrats has one unit of time that can be allocated between production and alternative activities.

Since the bureaucrat either controls production resources directly, if he is with a local government agency, or has good relations with government departments, he has a comparative advantage in procurement ability. We quantify this notion by using a parameter, λ , denoting the procurement ability of the private entrepreneur. We assume that one hour of the private entrepreneur's time devoted to procurement ability is equivalent to only a fraction λ of the hour devoted to procurement by the bureaucrat. Thus, $0 < \lambda < 1$. The opportunity income of the

⁶ To concentrate on our main objective and to keep an appropriately abstract level, we make no attempt to discuss how to measure ρ . Roughly speaking, ρ depends on an aggregate index of degrees of government intervention, missing labor and financial markets, lack of legal system, and other market elements.

⁷ This is true if the original production function is strictly concave and continuous (Diewert, 1973).

private 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.

3.2. Private Ownership Arrangements

Under the private ownership arrangement, the private entrepreneur makes one unit of capital investment, which is used to purchase resources such as labor and capital inputs, and allocates his time among procurement, management, and his alternative activity in order to maximize his expected income. That is,

$$\Pi_p^e = \max_{R, M} [\Pi(\lambda R, M; \rho) + (1 - R - M)u_e] \quad (1)$$

for $R \geq 0$, $M \geq 0$, and $R + M \leq 1$. Note that the term $\Pi(\lambda R, M; \rho)$ is the entrepreneur's net income or profit from production, and the term $(1 - R - M)u_e$ is the income from any alternative activity.

Under private ownership, the expected income of the bureaucrat is $\Pi_p^b = u_b$. The expected social welfare under the private ownership arrangement is

$$W_p = \Pi_p^e + \Pi_p^b = \Pi_p^e + u_b. \quad (2)$$

Remark 1. This private ownership structure prevents a firm from obtaining help in procurement from government officials. That is, we assume that a private firm cannot pay a fee to hire a government official to do the procurement. We exclude such a possibility for two reasons. First, hiring a government official is illegal in China. Although the phenomena of such corruption and degeneration are often found, private entrepreneurs must bear a higher risk of administrative, monetary, or even criminal penalties, which prevents most of them from acting in this way. Second, even if the corruption and degeneration are common and there is a black market for government procurement, the price or cost of the procurement is much higher than in the firm run jointly by the bureaucrat and entrepreneur since the cost of procurement is internalized.⁸ That is, the transition cost in such a black market is higher than in the merging market so that the Coase Theorem is not applicable.

3.3. Collective Ownership Arrangements

Under the collective ownership arrangement, the private entrepreneur and bureaucrat run the firm jointly. The bureaucrat receives his share of the residual income as in Chinese TVEs. To model the comparative advantage of specializa-

⁸ During a recent personal investigation in China, the author was told that a privately run firm finds it very hard to survive in the inland region of China because of various fees paid to the local government or officials. Hence, many people, including many of the author's friends, went to the southeast coastal region of China to run businesses because government intervention is much less prevalent there than in the inland region.

tion, we assume that the private entrepreneur provides management and the bureaucrat provides procurement skills, and that they share the profit according to some given ratio, which depends on the bargaining power of each party.⁹ Let $0 < \theta < 1$ be the share of the private entrepreneur. The conditional net income of the entrepreneur is given by

$$\Pi^e(R, M; \rho) = \theta\Pi(R, M; \rho), \quad (3)$$

and the conditional net income of the bureaucrat is given by

$$\Pi^b(R, M; \rho) = (1 - \theta)\Pi(R, M; \rho). \quad (4)$$

Given the bureaucrat's procurement ability R , the private entrepreneur will allocate his time between management and his alternative activity to maximize

$$\Pi_c^e = \max_M [\theta\Pi(R, M; \rho) + (1 - M)u_e] \quad (5)$$

for $0 \leq M \leq 1$. Similarly, given the entrepreneur's management M , the bureaucrat will allocate his time between procurement skill and his alternative activity to maximize

$$\Pi_c^b = \max_R [(1 - \theta)\Pi(R, M; \rho) + (1 - R)u_e] \quad (6)$$

for $0 \leq R \leq 1$.

The above maximization problems of the entrepreneur and bureaucrat, specified by Eqs. (3) to (6), form a two-person non-cooperative game with a Nash equilibrium solution. At a Nash equilibrium pair (R^*, M^*) , Eqs. (5) and (6) are satisfied simultaneously. Since the conditional profit functions given by Eqs. (3) and (4) are concave and continuous in (R, M) , the payoff functions given in Eqs. (5) and (6) 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 (cf. Baye et al. (1993) and Friedman (1977)).

Expected social welfare under the collective ownership arrangement is

$$W_c = \Pi_c^e + \Pi_c^b. \quad (7)$$

⁹ The determination of the profit share may depend on the bargaining power of the two parties, the magnitude of the relative efficiency of procurement ability, the relative importance of management and procurement abilities to capital investment, and the relative opportunity income. It may also depend on ρ . In general, the smaller ρ is, the bigger the bargaining power of a bureaucrat is; thus, he may get a larger profit share. These dependencies are exhibited on the conditions given for Theorems 1 through 3. The share can also be chosen endogenously in a way that maximizes expected social welfare. We will discuss this in Section 4.

Remark 2. Although property rights in the private ownership arrangement are clearly well defined, property rights of the collective ownership arrangement may be ambiguous. Indeed, property rights may not have well-defined relation-to-person shares among people in the community if the bureaucrat represents the local government. Although it is clearly identified by profit share $(1 - \theta)$, the residual control rights of such a collective ownership arrangement also may be vaguely defined since the bureaucrat, who may be regarded as the local government or an administrative manager appointed by the chief leader of the local government, runs the firm jointly with the entrepreneur. The bureaucrat not only contributes his procurement ability but also may participate in the production decision making. Thus, the firm is partially controlled by the bureaucrat, and therefore, the residual control rights may be ambiguous.

Once the expected social welfare under the two ownership arrangements is determined, the optimal ownership arrangement will be given by the ownership arrangement that provides the highest social welfare.

4. SOLUTIONS AND OPTIMAL OWNERSHIP ARRANGEMENT

We restrict the conditional profit function to be the Cobb–Douglas form so that we can solve explicitly the model by the differentiation approach. That is, the conditional profit function is assumed to be given by

$$\Pi(R, M; \rho) = AR^{(1-\rho)\alpha_1}M^{\alpha_2}, \quad (8)$$

where $A > 0$, $\alpha_i > 0$ for all i , and $\alpha_1 + \alpha_2 < 1$. Denote $\alpha_3 = 1 - \alpha_1 - \alpha_2$, which can be regarded as the relative importance of capital input.

4.1. Solutions for a Private Ownership Arrangement

With the conditional profit function given by (8), the private entrepreneur's income maximization problem in (1) becomes

$$\Pi_p^e = \max_{R, M} [\lambda^{(1-\rho)\alpha_1} AR^{(1-\rho)\alpha_1} M^{\alpha_2} + (1 - R - M)u_e] \quad (9)$$

for $0 \leq R$, $0 \leq M$, and $R + M \leq 1$.

Case A. $R + M = 1$. The solution is given by

$$R_p^* = \frac{(1 - \rho)\alpha_1}{(1 - \rho)\alpha_1 + \alpha_2}, \quad (10)$$

$$M_p^* = \frac{\alpha_2}{(1 - \rho)\alpha_1 + \alpha_2}. \quad (11)$$

Case B. $R + M < 1$. The solution is given by

$$R_p^* = \left[\lambda^{(1-\rho)\alpha_1} u_e^{-1} (1-\rho)\alpha_1 B \left(\frac{\alpha_2}{(1-\rho)\alpha_1} \right)^{\alpha_2} \right]^{1/(1-(1-\rho)\alpha_1-\alpha_2)}, \quad (12)$$

$$M_p^* = \frac{\alpha_2}{(1-\rho)\alpha_1} R_p^*. \quad (13)$$

Substituting the interior solutions (12) and (13) into (9), we have

$$\begin{aligned} \Pi_p^e &= (1 - (1 - \rho)\alpha_1 - \alpha_2)\alpha_1^{-1} u_e R_p^* + u_e \\ &= (1 - (1 - \rho)\alpha_1 - \alpha_2) [\lambda^{(1-\rho)\alpha_1} B [(1 - \rho)\alpha_1]^{(1-\rho)\alpha_1} \alpha_2^{\alpha_2}]^{1/(1-(1-\rho)\alpha_1-\alpha_2)} \\ &\quad \times u_e^{-((1-\rho)\alpha_1 + \alpha_2/1-(1-\rho)\alpha_1-\alpha_2)} + u_e. \end{aligned} \quad (14)$$

Thus, expected social welfare is given by

$$\begin{aligned} W_p &= (1 - (1 - \rho)\alpha_1 - \alpha_2) [\lambda^{(1-\rho)\alpha_1} B [(1 - \rho)\alpha_1]^{(1-\rho)\alpha_1} \alpha_2^{\alpha_2}]^{1/(1-(1-\rho)\alpha_1-\alpha_2)} \\ &\quad \times u_e^{-((1-\rho)\alpha_1 + \alpha_2/1-(1-\rho)\alpha_1-\alpha_2)} + u_e + u_b. \end{aligned} \quad (15)$$

4.2. Solutions for a Collective Ownership Arrangement

With the conditional profit function given by (8), the private entrepreneur's conditional income maximization problem in (3) becomes

$$\Pi_c^e = \max_M [\theta BR^{(1-\rho)\alpha_1} M^{\alpha_2} + (1-M)u_e] \quad (16)$$

for $0 \leq M \leq 1$. Solving this problem, we have the entrepreneur's reaction function:

$$M = \min\{1, [\theta u_e^{-1} \alpha_2 B R^{(1-\rho)\alpha_1}]^{(1/1-\alpha_2)}\}. \quad (17)$$

The bureaucratic manager's conditional income given M is

$$\Pi_c^b = \max_R [(1-\theta)BR^{(1-\rho)\alpha_1} M^{\alpha_2} + (1-R)u_b] \quad (18)$$

for $0 \leq R \leq 1$. Solving this problem, we have the bureaucrat's reaction function:

$$R = \min\{1, [(1-\theta)u_b^{-1}(1-\rho)\alpha_1 B M^{\alpha_2}]^{1/(1-(1-\rho)\alpha_1)}\}. \quad (19)$$

Solving these reaction functions for the interior Nash equilibrium, we have

$$M_c^* = \left[u_e^{-1} \alpha_2 B \theta^{1-(1-\rho)\alpha_1} (1-\theta)^{(1-\rho)\alpha_1} \left(\frac{(1-\rho)\alpha_1 u_e}{\alpha_2 u_b} \right)^{(1-\rho)\alpha_1} \right]^{1/(1-(1-\rho)\alpha_1-\alpha_2)}, \quad (20)$$

$$R_c^* = \left(\frac{(1-\theta)u_e(1-\rho)\alpha_1}{\theta u_b \alpha_2} \right) M_c^*. \quad (21)$$

Substituting (20) and (21) into (16) and (18), we have

$$\begin{aligned} W_c = \Pi_c^e + \Pi_c^b &= [1 - (1-\theta)(1-\rho)\alpha_1 - \theta\alpha_2] \\ &\times [B\theta^{\alpha_2}(1-\theta)^{(1-\rho)\alpha_1}[(1-\rho)\alpha_1]^{(1-\rho)\alpha_1}\alpha_2^{\alpha_2}]^{1/(1-(1-\rho)\alpha_1-\alpha_2)} \\ &\times u_b^{-(1-\rho)\alpha_1/(1-(1-\rho)\alpha_1-\alpha_2)} u_e^{-\alpha_2/(1-(1-\rho)\alpha_1-\alpha_2)} + u_e + u_b. \end{aligned} \quad (22)$$

When the economic environment is imperfect to some degree and procurement ability is relatively more important than management ability, an optimal ownership share, θ^* , can be chosen endogenously in a way that maximizes the expected social welfare W_c . To find θ^* , we take logarithms on both sides of (22), differentiate $\ln W_c$ with respect to θ , and set it equal to zero. Hence, we have the following first-order condition:

$$\begin{aligned} f(\theta) := [\alpha_2 - (1-\rho)\alpha_1]\theta^2 - \alpha_2[1 - (1-\rho)\alpha_1]\theta \\ + \alpha_2[1 - (1-\rho)\alpha_1] = 0. \end{aligned} \quad (23)$$

Note that $f(0) = \alpha_2[1 - (1-\rho)\alpha_1] > 0$, and $f(1) = \alpha_2 - (1-\rho)\alpha_1 < 0$ if $(1-\rho)\alpha_1 > \alpha_2$, i.e., if $\alpha_1 > \alpha_2$ and $\rho < (\alpha_1 - \alpha_2/\alpha_1)$. Thus, there is some $0 < \theta^* < 1$ such that $f(\theta^*) = 0$. In fact, solving Eq. (23), we find the exact optimal ownership share θ^* , which is given by

$$\theta^* = \frac{\alpha_2[1 - (1-\rho)\alpha_1] - [\alpha_2(1-\alpha_2)(4(1-\rho)\alpha_1 - 3\alpha_2)]^{1/2}}{2[\alpha_2 - (1-\rho)\alpha_1]}. \quad (24)$$

4.3. Optimal Ownership Arrangements

We consider only the interior solution case; the results for the corner solution case can be similarly obtained. Theorem 1 shows that private ownership would be the dominant ownership arrangement when the institutional environment is sufficiently perfect, i.e., when ρ is close to one.

THEOREM 1. *For the Cobb–Douglas technology specified in (8), the private ownership arrangement dominates the collective ownership arrangement when the economic environment is close to regular. That is, $W_p > W_c$ when ρ is sufficiently close to 1.*

Proof. By comparing (15) with (22) $W_p > W_c$ if and only if

$$\lambda^{(1-\rho)\alpha_1} > \left(\frac{u_e}{u_b}\right)^{(1-\rho)\alpha_1} \left(\frac{1 - (1-\theta)(1-\rho)\alpha_1 - \theta\alpha_2}{1 - (1-\rho)\alpha_1 - \alpha_2}\right)^{1-(1-\rho)\alpha_1-\alpha_2} \times (1-\theta)^{(1-\rho)\alpha_1}\theta^{\alpha_2}.$$

When $\rho \rightarrow 1$, $(1-\rho)\alpha_1 \rightarrow 0$ and $\lambda^{(1-\rho)\alpha_1} \rightarrow 1$. Then,

$$\left(\frac{u_e}{u_b}\right)^{(1-\rho)\alpha_1} \left(\frac{1 - (1-\theta)(1-\rho)\alpha_1 - \theta\alpha_2}{1 - (1-\rho)\alpha_1 - \alpha_2}\right)^{1-(1-\rho)\alpha_1-\alpha_2} \times (1-\theta)^{(1-\rho)\alpha_1}\theta^{\alpha_2} \rightarrow \left[\frac{1-\theta\alpha_2}{1-\alpha_2}\right]^{1-\alpha_2} \theta^{\alpha_2}.$$

Since $\phi(\theta) := [1 - \theta\alpha_2/1 - \alpha_2]^{1-\alpha_2}\theta^{\alpha_2} < 1$. By noting that $\phi(1) = 1$ and $\phi(\theta)$ is strictly increasing, because $\phi'(\theta) > 0$, we have $W_p > W_c$ when $p \rightarrow 1$. Q.E.D.

This theorem holds for any ownership share θ , including the optimal share θ^* , which maximizes the expected social welfare of the collective ownership arrangement. The result is independent of the other parameters, such as α_1 , α_2 , λ , u_e , and u_b .

Theorem 2 shows that the collective ownership arrangement may be optimal when ρ is small enough.

THEOREM 2. *For the Cobb–Douglas technology specified in (8), suppose $\lambda < (u_e/u_b)(1-\theta)^2$. Then, when*

$$0 < \rho < \frac{\ln(1-\theta) - \ln(\lambda u_b/u_e)}{\ln(1-\theta)/\theta - \ln(\lambda u_b/u_e)} < 1,$$

the collective ownership arrangement will dominate the private ownership arrangement.

Proof. To show $W_c > W_p$, we compare (22) with (15). Now $W_c > W_p$ if

$$\lambda^{(1-\rho)\alpha_1} < \left(\frac{u_e}{u_b}\right)^{(1-\rho)\alpha_1} (1-\theta)^{\alpha_1}\theta^{\alpha_2}.$$

Solving this inequality for ρ , we have

$$\rho \left[\ln \frac{1-\theta}{\theta} - \ln \frac{\lambda u_b}{u_e} \right] < \ln(1-\theta) - \ln \frac{\lambda u_b}{u_e}.$$

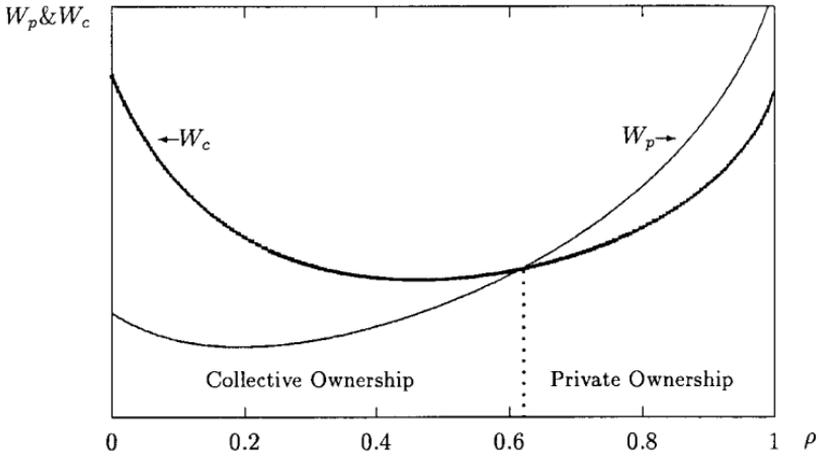


FIG. 1. Effect of ρ on optimal ownership arrangements (parameter values: $\alpha_1 = 2/5$, $\alpha_2 = 2/5$, $\alpha_3 = 1/5$, $u_c = 1$, $u_b = 1$, $\theta = 1/2$, $\lambda = 1/3$, $A = 11/2$, and $K = 1$).

Since $(u_b/u_e) < (1 - \theta)^2/\lambda < (1 - \theta)/\lambda$, we have $(1 - \theta) > (\lambda u_b/u_e)$ and thus $(1 - \theta/\theta) > (\lambda u_b/u_e)$. Therefore, we have

$$\rho < \frac{\ln(1 - \theta) - \ln(\lambda u_b/u_e)}{\ln(1 - \theta)/\theta - \ln(\lambda u_b/u_e)} < 1. \quad (25)$$

Thus, we have shown that $W_c > W_p$ when

$$\rho < \frac{\ln(1 - \theta) - \ln(\lambda u_b/u_e)}{\ln(1 - \theta)/\theta - \ln(\lambda u_b/u_e)}.$$

Q.E.D.

Theorems 1 and 2 indicate that the optimal choice of ownership arrangement is an efficient response to the institutional economic environment. Theorem 2 rationalizes the choice of the collective ownership arrangement when economic environments are irregular. These results indicate that, when the degree of economic freedom and decentralization is low and the market is highly imperfect, procurement ability may become more valuable and collective ownership arrangements may be more likely to prevail. When economic environments are close to regular, our results agree with traditional property rights theory.

Figure 1 illustrates the changes in optimal ownership arrangements when ρ moves from 0 to 1 for specified values of the parameters. In Fig. 1, the threshold level at which the ownership arrangement shifts from collective ownership to private ownership arrangement is about 0.61. Such a result conforms with the transition experience in China. A recent article in *China Economic Times* (August 13, 1999) provides an estimate of ρ by measuring the degrees of

marketization in labor markets, financial markets, and product markets, in addition to the degrees of economic freedom and government intervention on prices control. The estimate of the current degree of marketization, ρ , is in the range 0.45 to 0.5 in China. This may explain why collective enterprises still dominate private enterprises. Since ρ is close to the threshold level, the private sector will dominate the other sectors in five to ten years if China continues with its current speed of transition.

Theorem 3 demonstrates that the relative efficiency of procurement ability affects the optimal ownership arrangement for a given degree of irregularity, ρ . Collective ownership is the superior ownership arrangement when the private entrepreneur's relative efficiency of procurement ability is low.

Define a critical value at which the collective ownership arrangement is switched to the private ownership arrangement. This critical value is

$$\bar{\lambda} = \left(\frac{u_e}{u_b} \right) \left[\left(\frac{1 - (1 - \theta)(1 - \rho)\alpha_1 - \theta\alpha_2}{1 - (1 - \rho)\alpha_1 - \alpha_2} \right)^{1 - (1 - \rho)\alpha_1 - \alpha_2} \times \theta^{\alpha_2} (1 - \theta)^{(1 - \rho)\alpha_1} \right]^{(1/(1 - \rho)\alpha_1)} \quad (26)$$

THEOREM 3. *For the Cobb–Douglas technology specified in (8), suppose $\bar{\lambda} \leq 1$. Then the collective ownership arrangement would dominate the private ownership arrangement if and only if $\lambda \leq \bar{\lambda}$.*

Theorem 3 demonstrates the importance of the critical value of the procurement ability that depends on the parameters of the model. For any $\lambda < \bar{\lambda}$, collective ownership is optimal because it uses the bureaucrat's procurement ability. This result explains the co-existence of state-owned, public-owned, and mixed-owned firms. The bureaucrats' procurement ability is important and necessary for effective production in the presence of a high degree of government intervention and constrained economic freedom.

5. SENSITIVITY RESULTS

Five comparative static exercises are undertaken to examine the effects on this critical value of λ of changes in the degree of irregularity of economic environments, i.e., the effect of variations in ρ , changes in the sharing rule, i.e., the effect of variations in θ , changes in the relative opportunity incomes of the private entrepreneur and bureaucrat, i.e., the effect of variations in u_b/u_e , changes in the relative importance of procurement ability to capital input, i.e., the effect of variations in α_3/α_1 , and changes in the relative importance of management ability to capital input, i.e., the effect of variations in α_3/α_2 . As $\bar{\lambda}$ falls, the collective ownership arrangement becomes dominant.

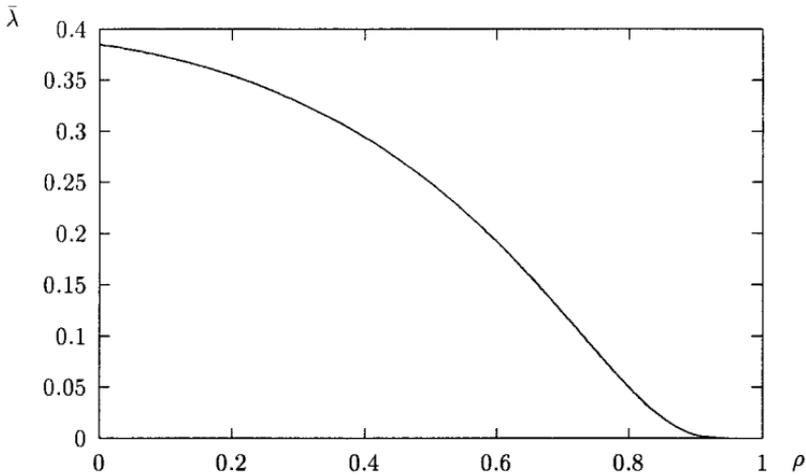


FIG. 2. Effect of ρ on the critical values of $\bar{\lambda}$ (parameter values: $\alpha_1 = 2/5$, $\alpha_2 = 2/5$, $\alpha_3 = 1/5$, $u_c = 1$, $u_b = 1$, and $\theta = 1/3$).

First, consider changes in the degree of irregularity of economic environments. Figure 2 illustrates that as ρ increases from zero to one for specified values of the other parameters, $\bar{\lambda}$ decreases. The optimal ownership arrangement shifts from collective ownership to private ownership as $\bar{\lambda}$ decreases. This result is consistent with the experience of China's economic reform and also sheds some light on how to make the transition from a command economy to a free market economy. The early stage of China's economic reform and institutional transition can be characterized by economic liberalization. This reform established and improved the basic prerequisite conditions for economic mechanisms to perform well, e.g., increasing the degree of economic freedom, adopting decentralized decision making and using various incentive mechanisms. This leads a quick development of collective enterprises, especially TVEs. These non-state and non-private enterprises became the main force for rapid growth in the Chinese economy. With continuing improvements of economic environments, many collective enterprises are now losing their relative comparative advantage and are beginning to change their ownership through privatization.

Second, consider changes in the sharing rule. Figure 3 illustrates the effect when θ changes from zero to one for specified values of other parameters. When the profit share for the private entrepreneur, θ , is low, an increase in the share will increase $\bar{\lambda}$. Thus, the domain over which private ownership is optimal will contract because an increase in the share of the entrepreneur will increase the entrepreneur's incentive to jointly run the firm. When θ reaches a critical value, the domain over which collective ownership is optimal reaches a maximum. As θ increases further, optimal ownership will shift to the private ownership arrangement. This occurs because a continued increase in the share of the entre-

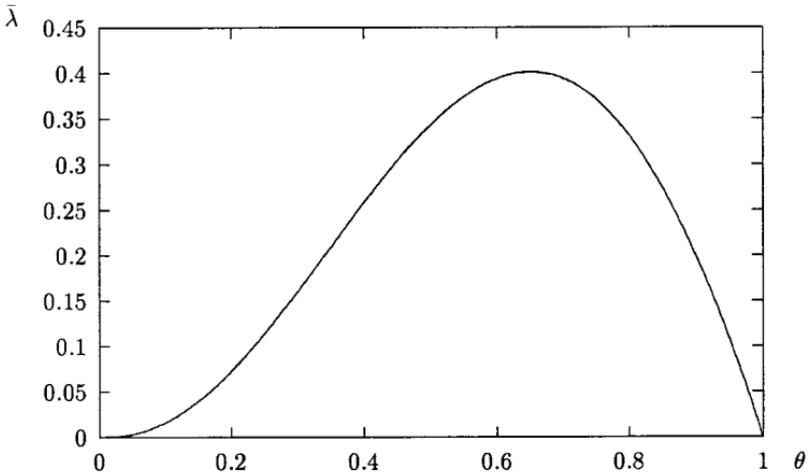


FIG. 3. Effect of θ on the critical values of $\bar{\lambda}$ (parameter values: $\alpha_1 = 2/5$, $\alpha_2 = 2/5$, $\alpha_3 = 1/5$, $u_e = 1$, $u_b = 1$, and $\rho = 3/5$).

preneur will decrease the share of the bureaucrat and, consequently, decrease the bureaucrat's incentive to run the firm jointly. From Fig. 3, when θ is very small or very large, either the entrepreneur or the bureaucrat does not have a sufficient incentive to form the partnership, and thus collective ownership will not occur. Only when suitably equitable shares are prescribed will the private entrepreneur and the bureaucrat both have the appropriate incentives to form a collective ownership arrangement.

Third, consider changes in the ratio of opportunity incomes given by u_e/u_b . Figure 4 indicates, for specified values of the other parameters, that as the relative opportunity income of the private entrepreneur increases, $\bar{\lambda}$ increases because the entrepreneur's opportunity cost of running the firm becomes larger. Thus, private ownership decreases and collective ownership increases.

Figure 5 illustrates changes in the relative importance of capital to procurement ability, i.e., the effect of variations in α_3/α_1 , for specified values of other parameters. An increase in the relative importance of procurement ability to capital, that is, a decrease in α_3/α_1 , increases $\bar{\lambda}$ because it increases the private entrepreneur's incentive to run the firm jointly with the bureaucrat. The extent to which collective ownership is optimal increases, replacing private ownership. When the government intervenes more in some region or sector, government relations become more important and, thus, collective ownership will dominate private ownership. This result explains why there are more collectively owned and state-owned firms in sectors in which the government intervenes more and enforces many regulations so that the relative procurement ability becomes more important, and why collective ownership has been a dominant ownership arrangement in China in recent years.

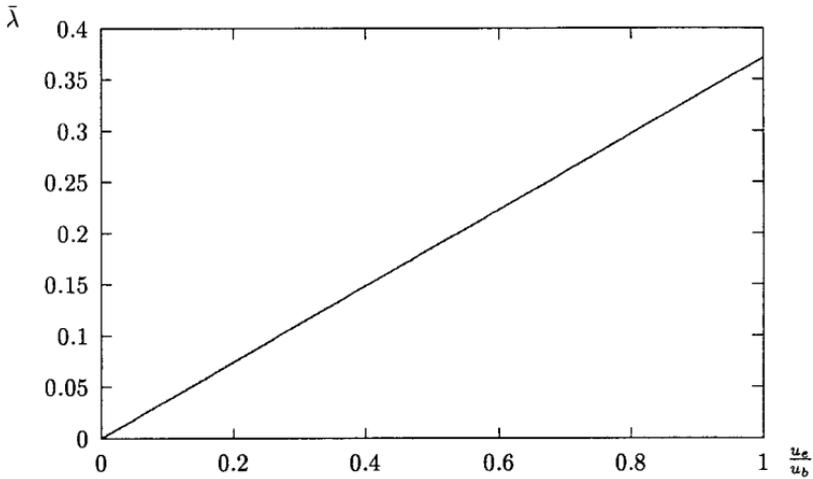


FIG. 4. Effect of u_e/u_b on the critical values of $\bar{\lambda}$ (parameter values: $\alpha_1 = 2/5$, $\alpha_2 = 2/5$, $\alpha_3 = 1/5$, $\rho = 3/5$, and $\theta = 3/4$).

Figure 6 illustrates changes in the relative importance of capital to management ability, i.e., the effect of variations in α_3/α_2 , for specified values of other parameters. An increase in the relative importance of management ability to capital, that is, a decrease in α_3/α_2 , decreases $\bar{\lambda}$. The extent of private ownership will increase and the collective ownership arrangement will give way to private ownership.

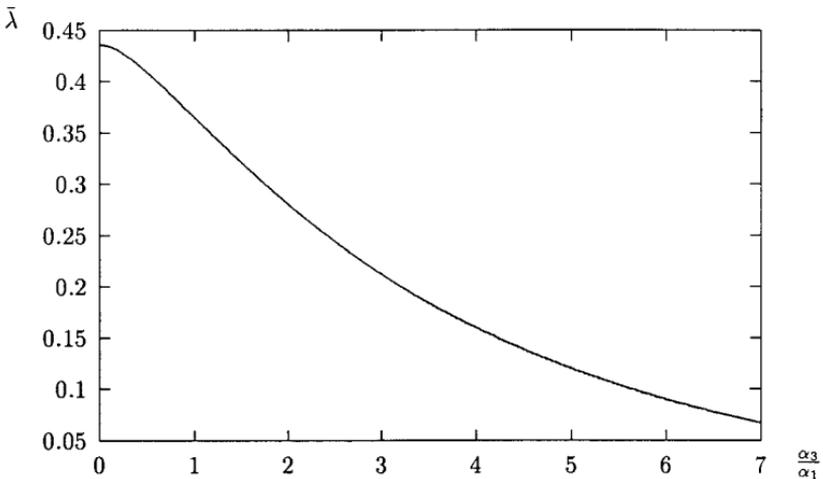


FIG. 5. Effect of α_3/α_1 on the critical values of $\bar{\lambda}$ (parameter values: $\alpha_1 + \alpha_3 = 3/5$, $\alpha_2 = 2/5$, $u_e = 1$, $u_b = 1$, $\rho = 2/5$, and $\theta = 1/2$).

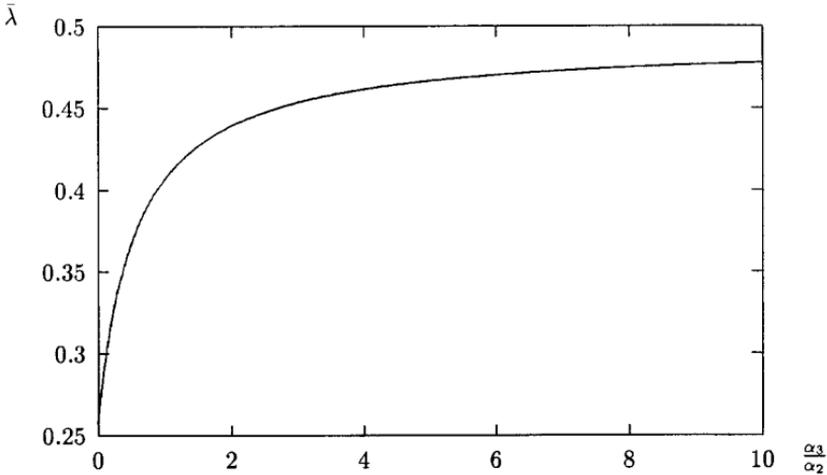


FIG. 6. Effect of α_3/α_2 on the critical values of $\bar{\lambda}$ (parameter values: $\alpha_2 + \alpha_3 = 3/5$, $\alpha_2 = 2/5$, $u_c = 1$, $u_b = 1$, $\rho = 2/5$, and $\theta = 3/4$).

6. CONCLUSION

This paper explains a puzzle for existing theories of property rights, namely, property rights do not seem to be well defined in many highly successful transitional economies, and provides a formal model rationalizing gradual privatization. The crucial condition is that some unmarketed resources, such as procurement skills, are needed for effective production in the presence of irregular economic environments. The results show that collective ownership will dominate private ownership when the institutional environment is significantly imperfect but that private ownership will dominate collective ownership when the institutional environment is sufficiently perfect. This conclusion is consistent with the available evidence on transition processes from China and some other countries.

The property rights theory developed in this paper is an endogenous ownership theory in which the optimal arrangement is related to the degree of economic institutional imperfection. Hence, ownership arrangement can not be changed effectively without changing economic environments. As a result, a private ownership arrangement should not be established without reducing government intervention in production activities and without improving economic freedom and market environments. Therefore, the private ownership arrangement is not an efficient response to imperfect institutional environments. Hence, unconditional mass privatization is not appropriate for a transitional economy.

These results do not argue for the advantages of collective ownership arrangements. Rather, they indicate the importance of economic freedom and decentralization, and consequently, the importance of improving the economic environ-

ment. Although collective ownership may dominate private ownership when the economic environment is significantly irregular, collective ownership will not dominate private ownership within a regular economic environment. In fact, transactions in irregular economic environments carry high costs and require extra resources to promote procurement ability. Thus, private ownership will be more efficient if procurement ability is unnecessary because institutional environments are nearly perfect. Therefore, our theory does not contradict standard theories but rather generalizes them to include imperfect institutional environments. To reach an efficient allocation of resources, private ownership is the appropriate mechanism. However, the appropriate procedure for reaching this goal may not be to privatize state-owned firms rapidly, but rather to improve the economic environment first. 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. As institutions improve, firms should be privatized.

Although this theory considers only a single dominant ownership arrangement, it may be used to explain the co-existence of collectively owned firms and privately owned firms, even in the same industry or the same area. Since the opportunity incomes of bureaucrats and private entrepreneurs, production technologies, the sharing rule, and procurement skills affect the optimal ownership arrangements, differences in these parameters among different individuals could lead to the co-existence of different ownership arrangements in the same area or sectors.

REFERENCES

- Baye, Michael, Tian, Guoqiang, and Zhou, Jianxin, "Characterizations of the Existence of Equilibria in Games with Discontinuous and Non-quasiconcave Payoffs." *Rev. Econ. Stud.* **60**, 4:935–948, Oct. 1993.
- Blanchard, Oliver, J., and Fischer, Stanley, *NBER Macroeconomics Annual, 1993*, pp. 1–9. Cambridge, MA: MIT Press, 1993.
- Chang, Chun, and Wang, Yijing, "The Nature of the Township-Village Enterprise." *J. Comp. Econ.* **19**, 3:434–452, Dec. 1994.
- Che, Jiahua, and Qian, Yingyi, "Institutional Environment, Community Government, and Corporate Governance: Understanding China's Township-Village Enterprises." *J. Law, Econ. Organ.* **14**, 1:1–23, Apr. 1998.
- Davis, Lance E., and North, Douglass C., *Institutional Change and American Economic Growth*. Cambridge, UK: University Press, 1971.
- Demsetz, Harold, "Toward a Theory of Property Rights." *Amer. Econ. Rev.* **57**, 2:347–359, May 1967.
- Diewert, Walter Erwin, "Functional Forms for Profit and Transformation Functions." *J. Econ. Theory* **6**, 3:284–316, June 1973.
- Eswaran, Mukesh, and Kotwal, Ashok, "A Theory of Contractual Structure in Agriculture." *Amer. Econ. Rev.* **75**, 3:352–367, June 1985.

- Friedman, James W., *Oligopoly and the Theory of Games*. Amsterdam: North-Holland, 1977.
- Furubotn, Eirik G., and Pejovich, Svetozar, "Introduction: The New Property Rights Literature." In Eirik G. Furubotn and Svetozar Pejovich, Eds., *The Economics of Property Rights*. Cambridge, MA: Ballinger, 1974.
- Grossman, Sanford J., and Hart, Oliver D., "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *J. Polit. Econ.* **94**, 4:691–719, Aug. 1986.
- Hart, Oliver, and Moore, John, "Property Rights and the Nature of the Firm." *J. Polit. Econ.* **98**, 6:1119–1158, Dec. 1990.
- Hsiao, Cheng, Nugent, Jeffrey, Perrigne, Isabelle, and Qiu, Jicheng, "Shares versus Residual Claimant Contracts: The Case of Chinese TVEs." *J. Comp. Econ.* **26**, 2:317–337, June 1998.
- Jefferson, Gary H., and Rawski, Thomas G., "Enterprise Reform in Chinese Industry." *J. Econ. Perspect.* **8**, 2:47–70, Spring 1994.
- Li, David D., "A Theory of Ambiguous Property Rights in Transition Economies: The Case of the Chinese Non-state Sector." *J. Comp. Econ.* **23**, 1:1–19, Aug. 1996.
- Reid, Joseph D., Jr., "The Theory of Share Tenancy Revisited—Again." *J. Polit. Econ.* **85**, 2:403–407, Apr. 1977.
- Svejnar, Jan, "Productive Efficiency and Employment." In William A. Byrd and Qingsong Lin, Eds., *China's Rural Industry: Structure, Development, and Reform*, pp. 243–254. Oxford, UK: Oxford University Press for the World Bank, 1990.
- Tian, Guoqiang, "State-Owned Enterprise Reform and Smooth Institutional Transition in China—A Three-Stage Economic Reform Method." In G. J. Wen and D. Xu, Eds., *The Reformability of China's State Sector*, pp. 220–240. River Edge, NJ: World Scientific, 1997.
- Weitzman, Martin L., and Xu, Chenggang, "Chinese Township-Village Enterprises as Vaguely Defined Cooperatives." *J. Comp. Econ.* **18**, 2:121–145, Apr. 1994.