A Theory of Ambiguous Property Rights in Transition Economies: The Case of the Chinese Non-State Sector

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Section 1: Introduction

Previously, it has been assumed that well-defined property rights are necessary to promote economic growth in a post-socialist economy. Li discusses the case of firms outside of the Chinese state/public sector, where ownership rights are often unclear. Yet it has been observed that the output of these firms has been an important component to China’s economic growth over the past two decades. This paper aims to explain that anomaly by presenting a game-theoretic model of ambiguous property rights.

Through a sequence of papers, Hart, Grossman, and Moore developed a framework to study ownership contracts and the relationship between ownership rights and asset control. Here “assets” will refer to capital (e.g. factories, machines, etc.), employed labor, and any other factors of production. This paper follows that framework in assuming that contracts are necessarily incomplete, making control over productive assets crucial to identifying ownership rights.

To solidify the importance of property rights, we now make distinction between well and ill-defined property rights. First of all, well-defined property rights can be described in 3 basic tenants:

1. Owners have exclusive rights of ownership over a property and its assets
2. Owner has the right to control and determine use of the firm’s physical assets. Note that owners can exclude others from accessing assets.
3. Owner receive the residual profits that accrue from the assets

On the other hand, ambiguous property rights will be defined as a scenario where control over the firm and its assets are not guaranteed. More specifically, this entails that the current owner will have to fight to maintain control in every contingency. Here, we will consider contingencies to be the state of the market environment. The market can be divided into 3 states: white, black, and gray. A “white” state implies that market transactions are smooth. A “black” state refers to a market where transactions are difficult. Moreover, in a black state, factor input markets are less likely to be decentralized, making it harder for firm owners to access important factors of production.

A “gray” state is the medium between those two states and refers to the difficulty in determining whether and when certain transactions are prohibited (black state) or not (white

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state). The gray market is a form of market imperfection and is most likely to be prevalent in a transitioning economy.

Li also argues that property rights arrangements can affect information flows between firms. Because information can be excludable, firm insiders have an inherent advantage to outsiders in negotiations. This problem is magnified in the absence of auditors and accountants, which is a stark reality in transitioning or developing countries. As a response to the gray market, a firm owner may find it advantageous to jointly own his/her business with the government in order to ensure transactions and to strengthen negotiation positions. This then leads to ambiguous property rights as the second-best outcome.

Section 2: Property Rights in China

In China, firms are broadly categorized according to ownership. This categorization is a residual of the former socialist state, in which all work units were owned and operated by the state government. With economic reform in the late 1970s, the government began loosening its hold on firms and provided more liberties to businessmen and entrepreneurs. As such, we now observe “hybrid” firms that are partly owned and run by government officials and Chinese citizens.

When we speak of the titular “non-state sector”, we refer to all firms that are not state-owned enterprises (SOEs), which—as the name suggests—are firms formally owned by the state-government. For work units outside of the state-sector, ownership rights become more nebulous. As an illustration, this paper discusses Township and Village Enterprises (abbreviated as TVEs henceforth), which comprise a large portion of China’s rural economy. TVEs are a type of commercial or industrial enterprise regulated by village or town level governments (Tian: 2000). The majority of TVEs are collectively owned between the community and the local government. There are a few TVEs that function as privately owned firms, partnerships, or joint-venture enterprises. As of the writing of Li’s paper, TVEs comprise 74% of the rural economy.

For communally owned TVEs, ownership can then be assumed to lie primarily with the government and the founding entrepreneurs since townspersons do not retain stocks or earn residual profits from being “owners” (251). Then to explain ambiguous property rights, the focus of this paper will be on the direct partnership between private businesspersons and the local government. In the general case, individual entrepreneur(s) will establish their businesses first before registering as a privately owned firm or as a collective.

The Role of Local Government in the Gray Market

Chinese bureaucrats can earn bonus payments that are proportional to collected tax revenues. One obvious way to increase revenues is to promote the local economy by helping out firms, which offers another explanation for why we see partnerships between firms and the government.

From the firm’s point of view, the help of local bureaucrats can be essential in the presence of gray market imperfections. If a firm is having trouble getting a hold of factor inputs, then the managers can team up with local bureaucrats who can then intervene on their behalf. Secondly, as mentioned in the previous section, having the government as an ally can be advantageous when negotiating with other firms. Lastly, due to a centralized and largely state-
controlled capital market in China, firms can enjoy a distinct advantage in capital investments with the help of partners with state-government ties.

However, as with all partnerships, forming a union with the government gives bureaucrats control rights over the firm and accrued profits. Firms in transitioning economies must make a choice between risking the gray market and sharing profits with bureaucrats. This decision is the basis for this paper’s model.

Definitions

- **Property Right**: A property right is the exclusive authority to determine how a resource is used, whether that resource is owned by government or by individuals. (In a family with, say, 3 children and the mother buys lots of toys, every child argues he/she owns all of the toys before the property rights of the toys are clear.)

- **Township and Village Enterprises (TVEs)**: Chinese definition concerns geography, while western academic definition is an ownership understanding. (However, this is not the same as a “red hat” firm, which only concerns large private sector firms)

- **Coase Theorem**: Broadly speaking, this theorem posits that in the absence of transaction costs, ownership rights of an externality will be efficiently (e.g. Pareto optimally) allocated between two parties.

- **Complete contract**: contract that covers the legal consequences of every possible state of the world. As Hart and Moore (1986) argue, contracts in real life are necessarily incomplete because it is impossibly complicated to write up a complete one.

- **First best outcome**: the outcome of a utility maximization problem where there are no constraints on the optimality conditions.

- **Second best outcome**: the outcome of a utility maximization problem where there is a constraint on one of the optimality conditions.

**Section 3: A Theory of Ambiguous Property Rights**

Let E and G be economic agents involved in a project or firm.

At Time 1:

- E and G are not sure who will be productive in the project at time 2. Therefore, in time 1, the state in time 2 is viewed as a gray state.

- E and G are unwilling to agree to explicit contracts that define who get control in time 2 based on what happens in time 1 due to cost or risk.

- E and G can negotiate the ownership arrangement (which is most efficient when both parties’ welfare is taken into account)

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3 Armen A. Alchian. The Concise Encyclopedia of Economics
Only E chooses property rights, and then must make an initial investment $k_E$, which is not known to G.

Assumptions to support basic model:
1. The cost function satisfies normal assumptions of convex cost functions. That is, $C(0) = 0, C'(k_E) > 0, C''(k_E) > 0$.
2. At time 1, all parties know that the profitability $\theta$ follows a uniform distribution, or $\theta \sim Uniform[0,1]$
3. $\pi_w = \theta q_e a_e^\alpha k_e^\beta$ where $0<\alpha, \beta<1$
   - At time 2, the firm enters either a white state (with probability $p$) or black state (with probability $1-p$).
     - Note that probability is independent of the firm’s profitability.
     - In the white state, E is productive, and only G is productive in the black state.
   - Assuming the firm is in a white state, the profit is dependent on the level of effort put forward by the firm, the profitability of the firm, the initial investment, and the measure of productivity.
4. The utility function satisfies normal assumptions of convex utility functions. That is, $U(0) = 0, U'(a_E) > 0, and U''(a_E) > 0$
5. $\pi_B = \theta k_E$
   - In the black state, if the firm does nothing, the profit is zero. Otherwise, E can request help from G, and can negotiate the terms for G’s intervention, i.e. the effort, or fixed amount of additional capital or services that G will put forward.
   - The opportunity cost to G of their investment is $r_g k_G$.
   - The profit in the Black state, assuming assistance from G, is dependent on the profitability and the investment of E.
6. When there is ambiguous ownership, E and G bargain under perfect foresight of $\theta$ and E gets $\delta_E$ of the total surplus, where $\delta_E > 0$
• We assume that E and G bargain under symmetric information, then E’s bargaining power is $\delta_E$.

7. When E and G bargain in the market, the uninformed G acts like a monopolist with private property rights.

Section 3.1 Unambiguous Property Rights
Assumptions:
1. At time 1, E sets up firm as a private entity.
2. Recall from assumption 6 that $\theta \sim \text{uniform}[0,1]$ and both E and G know its distribution.
3. Only E is productive in the white state, and only G is productive in the black state.
4. G acts as a monopolist in the black state.

At time 1, E sets up a firm as a private one.

In the **white state**, E’s profit is

$$\pi_w = \theta q_e a_e^a k_e^b$$

where $0 < \alpha, \beta < 1$

In addition, E will maximize payoff by optimizing $a_E$ in the problem

$$y_w = \max_{a_E} \theta q_e a_e^a k_e^b - U(a_E)$$

With FOC

$$\theta \alpha q_e a_e^{a-1} k_e^b - U'(a_E)$$

The relationship between level of investment by E and payoff is

$$\frac{dy_w}{dk_E} = \theta \beta q_e a_e^a k_e^{b-1}$$

In the **black state**, E has two choices. Either she can do nothing and ask for nothing, which will result in a profit and payoff of nothing, or she can ask for help from G.

If she asks for help from G, they must determine the optimal amount of assistance given. How much E should pay for G’s investment? Since G will not invest in something that has a low risk of generating a profit, the level of investment of G should be determined by the firm’s profitability, which is common knowledge from assumption 2. Therefore, it is necessary that G would invest only if
And the expected payoff given such an investment is

\[ E[r k_G - r_o k_G | \theta \geq r \frac{k_G}{k_E}] = (r k_G - r_o k_G)(1 - r \frac{k_G}{k_E}) \]

The optimal \( r \) that G should charge in order to maximize his expected payoff is

\[ r = \frac{k_E + k_G r_0}{2 k_G} \]

Based on the profitability threshold and the optimal interest rate charged, the expected payoff to the firm in the black state is

\[ E[\theta k_E - r k_G | \theta \geq r \frac{k_G}{k_E}, r = \frac{k_E + k_G r_0}{2 k_G}] = \]

\[ \frac{1}{2} (1 + \frac{k_E + k_G r_0}{2 k_E})(1 - r \frac{k_G}{k_E}) k_E - (1 - r \frac{k_G}{k_E})(\frac{k_E + k_G r_0}{2 k_G}) k_G \]

\[ = (1 - \frac{k_E + k_G r_0}{2 k_E}) \frac{k_E - k_G r_0}{4} \]

Which is the difference between the total profit of the firm and the amount E pays to G for their services.

After investing \( k_E \), the overall expected payoff of E is

\[ y_E = p E[\theta q e a_e^g k_e^\theta - U(a_E)] + (1 - p) \left(1 - \frac{k_E + k_G r_0}{2 k_E}\right) \frac{k_E - k_G r_0}{4} \]

So the investment is the optimal \( k_E \) from

\[ \text{MAX}_{k_E} p E[\theta q e a_e^g k_e^\theta - U(a_E)] + (1 - p) \left(1 - \frac{k_E + k_G r_0}{2 k_E}\right) \frac{k_E - k_G r_0}{4} - C(k_E) \]

**Section 3.2 Ambiguous Property Rights**

**Assumptions:**

1. E and G co-own the firm
2. Only E is productive in the white state, and only G is productive in the black state.
   However, both E and G have ownership rights in both states and can prohibit the other
   from acting.
3. G will again act as a monopolist
In the case of ambiguous property rights, E and G must play a coordination game and bargain in each state. Suppose we are in time 1 and in a white state. If G forfeits all rights, then E will have incentive to produce the same amount as in equation (1). But there’s a catch! By assumption 7, G can extract rent from E for giving up control rights. E’s bargaining power will garner some non-zero fraction of the profits $\delta_E$ and the rest will accrue to G. E solves the same maximization in (1) w.r.t. $a_E$ but will receive a lower payoff than with unambiguous property rights. Thus, E’s expected payoff in the white state will be

\begin{equation}
\delta_E[\theta q_E a_E^g k_E^\beta - U(a_E)]
\end{equation}

where $a_E$ is the optimal level of effort derived from doing the maximization problem in (1).

Now suppose we are in a black state. E makes the initial investment into production but is blocked from being productive due to prohibitory market conditions. Only G can bail out E by making an investment. However, G acts like a profit-maximizing firm and makes the decision to produce only if profits $\theta k_E$ exceed the opportunity cost of helping out E so

\begin{equation}
\theta: \theta > r_0 \frac{k_G}{k_E}
\end{equation}

E will have an expected return of $\delta_E(\theta k_E - r_0 k_G)$ from G’s investment and will get 0 otherwise. In fact, the outcome will always be 0 if E doesn’t cooperate or if the condition in (9) isn’t met and G doesn’t cooperate.

Now, to get the expected return conditional on the restriction in (9) we want to integrate $\delta_E(\theta k_E - r_0 k_G)$ over the range $[r_0 \frac{k_G}{k_E}, 1]$ and we’ll come up with:

\begin{equation}
y_E = \delta_E \frac{1}{2} (1 - r_0 \frac{k_G}{k_E})(k_E - r_0 k_G)
\end{equation}

See the appendix for the derivation of (10).

So E’s ex-ante investment of $k_E$ can derived by maximizing the expected payoff from both states w.r.t. $k_E$:

\begin{equation}
\text{Max}_{k_E} y_E = p(\delta_E E[\theta q_E a_E^g k_E^\beta - U(a_E)|\theta])
\end{equation}

In summary, we can see that the only way that either party can receive a payoff is if both parties cooperate. This is true in both states. Also note that we can never achieve the first-best outcome in the case of ambiguous property rights.
### 1. White State

<table>
<thead>
<tr>
<th>Agent E</th>
<th>Cooperate</th>
<th>Don’t Cooperate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>$\delta_E \theta [q \alpha_E^\alpha \beta^\beta - U(a_E)]$, $1 - \delta_E \theta [q \alpha_E^\alpha k_E^\beta - U(a_E)]$</td>
<td>(0,0)</td>
</tr>
<tr>
<td>Don’t cooperate</td>
<td>(0,0)</td>
<td>(0,0)</td>
</tr>
</tbody>
</table>

### 2. Black State

<table>
<thead>
<tr>
<th>Agent E</th>
<th>Cooperate</th>
<th>Don’t Cooperate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>$\delta_E \frac{1}{2} (1 - r_0 \frac{k_G}{k_E}) (k_E - r_0 k_G)$, $(1 - \delta_E) \left[ \frac{1}{2} \left( 1 - r_0 \frac{k_G}{k_E} \right) (k_E - r_0 k_G) \right]$</td>
<td>(0,0)</td>
</tr>
<tr>
<td>Don’t cooperate</td>
<td>(0,0)</td>
<td>(0,0)</td>
</tr>
</tbody>
</table>

### Section 3.3 Property Rights and the Market Environment

- Based on the discussion before, and by applying the Coase Theorem, it can be seen that E will choose the organization form that maximizes the expected social efficiency. However, it may be difficult to determine the optimal choice for E, and an alternative method is to compare both choices to a benchmark organization.

- Lemma 1:
  *The first-best outcome can be achieved when E obtains unambiguous control rights all the time and when E can have access to $k_G$ at the price of $r_0$.*

  NOTE: this lemma is intuitive that under the case described above, obstacles can be solved at the lowest expense.

- Lemma 2:
  *So long as $p<1$, both private and ambiguous property rights arrangements give rise to too little investment $k_E$, relative to the first-best property right arrangement.*

  Proof: the paper’s appendix has given a complete proof of this lemma, and the only thing that worthwhile to mention is that according to

  $\theta \alpha q_E \alpha^{-1} k_E^\beta - U'(a_E) = 0$

  and

  $0 < \alpha, \beta < 1, U' is increasing$

  we can have $\alpha_E$ is increasing in $k_E$
• Given that none of the property rights forms is a first-best arrangement. By lemma 2, the property rights arrangement that induces the higher investment $k_E$ is relatively more efficient.

• Proposition 1:
  Given $q_E$, $r_0$, $k_G$ and that $\delta_E > 1/4$, there exists a $\bar{p} > 0$, such that, when $p < \bar{p}$, a firm with ambiguous property rights is more efficient than a firm solely owned by $E$.

• Proposition 2:
  Ceteris paribus, the lower the $r_0k_G$, the more likely that a firm with ambiguous property rights is more efficient than a privately owned firm.

• Proposition 3:
  Ceteris paribus, the higher the productivity of $E, q_E$, the more likely that a private firm solely owned by $E$ is more efficient than an ambiguously owned firm between $E$ and $G$.

• Corollary:
  Ceteris paribus, under ambiguous property rights, firms are more likely to have positive ex post profits, i.e., profits not taking initial investments into account, than under private property rights.

• NOTE:
  In proposition 2, “more likely” can mean that there is wider range $p$ that ambiguous property rights is more efficient, or if $p$ is given fixed, for more realization of $\theta$ can ambiguous property rights be more efficient.
  Proposition 3 can be stated that ambiguous property rights is less likely to be more efficient.
  In corollary, “more likely” means that for some realization of $\theta$, entrepreneur with private property rights may not have willing to ask for help due to the high price.

• Proof of propositions:
  The only thing that worth mention is that the appendix has a typo that (a4) should be
  \[
  (1 - \delta_E) p E_\theta (\theta q_E \beta a_E^{\frac{q}{\delta_E}} k_E^{\beta - 1}) + (1 - p) \left( \frac{1}{8} - \frac{1}{2} \delta_E \right) \left( 1 - \frac{r_0^2 k_G^2}{k_E^2} \right) > 0
  \]

Section 4 Conclusion
  This paper has given an explanation of the reason for ambiguous property rights being more efficiency in transition economy such as the case of 90’s China’s economy. More generally, the paper’s conclusion may apply in the case with one agent fearing of future’s exposure to the risk of too high price for protection.
Section 5 Appendix

Deriving equation (10)

\[ Y_E = E[(S_E(\theta k_E - r_0 k_U))|\theta], \text{ where } \theta \sim \text{uniform}(0,1) \]

and production will only occur when \( \theta > r_0 \frac{k_U}{k_E} \)

\[ Y_E = \int_{r_0 \frac{k_U}{k_E}}^{1} S_E(\theta k_E - r_0 k_U) \, d\theta \]

\[ = S_E \int_{r_0 \frac{k_U}{k_E}}^{1} (\theta k_E - r_0 k_U) \, d\theta \]

\[ = S_E \left[ \frac{\theta^2}{2} (k_E - r_0 k_U) \right]_{r_0 \frac{k_U}{k_E}}^{1} \]

\[ = S_E \left[ \frac{1}{2} \left(1 - r_0 \frac{k_U}{k_E} \right)^2 k_E - \left(1 - r_0 \frac{k_U}{k_E} \right) r_0 k_U \right] \]

\[ = S_E \left[ \frac{1}{2} \left(1 - r_0 \frac{k_U}{k_E} \right) \left(1 + r_0 \frac{k_U}{k_E} \right) k_E - \left(1 - r_0 \frac{k_U}{k_E} \right) r_0 k_U \right] \]

\[ = S_E \frac{1}{2} \left(1 - r_0 \frac{k_U}{k_E} \right) (k_E - r_0 \frac{k_U}{k_E}) \]