Introduction

The paper “Production Information Costs and Economic Organization” hopes to explore the foundations of the firm. There are two important questions the paper seeks to answer: 1) is production increased more when specialization occurs within the firm or across firms 2) what is the structure of the firm? The firm is necessitated because resource owners increase productivity through cooperation and specialization. The firm helps to coordinate different resource inputs to increase productivity. For example, a lumber mill that employs a cabinetmaker will be able to offer better services and lower prices to customers seeking new cabinets.

The firm is tasked with centralizing the team productive process. The firm does not real authority in a dictatorial sense—it doesn’t just tell employees what to do. Instead, it revises contracts with employees so that a task is mutually beneficial. Individual directives do not really require the services of the firm—telling an employee to do something is similar to choosing a brand of cereal at the grocery store. To better illustrate, think of the president’s relation to the military versus an individual. Even though sometimes he might try, the president rarely prescribes the actions of each individual. He does, however, command the military and needs an organization such as the military structure in order to facilitate action. The military requires a firm-like organization because it is solely involved in team productive process—the mission fails if the military can’t coordinate team action.

I. The Metering problem

- The authors describe a key issue facing a firm—metering rewards and assigning inputs to their most effective position.
- A competitive market is generally a great mechanism for correctly allocating rewards and assigning people to their most effective positions.
  - People allocate themselves to their comparative advantages in an open market setting.
  - If a person produces more at the market price, they are rewarded by the amount that they increased production—marginal product is easily discernible in a market.
- Key insight: the mechanism or system that meters rewards and inputs stimulates a particular productivity response.
  - People in a market economy respond to the structure of the market.
This response causes people to allocate themselves to their comparative advantages and to produce when marginal productivity equals marginal cost.

- As the market is effective and has a high level of productivity, a firm that meters effectively will be the most productive.
  - For example, a soccer team putting players in the right place—a forward playing forward with an incentive to score goals in his contract.

- The process of metering is not costless to the firm.
  - At a minimum, it takes time to decide for firm management where to best allocate.
  - Also, there is a cost associated with overseeing assembly lines, input process etc so as to best allocate rewards.

II. The Team Production Process

- Metering rewards is made most difficult by the firm’s other function: coordinating team activities.
- If we have two men lifting a heavy object, how do we determine each man’s contribution? Surely it is not exactly equal.
  - Formally, if Z is an output with inputs \( X_i \) and \( X_j \), \( \frac{\partial^2 Z}{\partial X_i \partial X_j} \neq 0 \).
  - The production function is not separable in its outputs so we cannot exactly determine each man’s contribution.

- Essentially, team production yields an output greater than the sum of its parts when metering costs are taken into account.
  - A team productive process will only occur if the output minus the costs of coordinating the team activity is greater than the cost of the inputs.

- Team production is defined by three characteristics:
  - 1) several types of resources are needed as inputs
  - 2) product does not equal the sum of the separable outputs
  - 3) not all the resources belong to one individual

- The team’s output is not the marginal product of each individual, so how does the firm determine how to meter rewards?
  - There are observable characteristics of the team productive process.
  - Observing, however, involves costs.

- Because observation of the team involves a cost, monitoring is not perfect—thus there is an incentive to shirk some responsibility in the group.
  - The incentive comes from the fact that one’s personal marginal productivity is not equal to the reward due to the cost of monitoring.
  - Example: group presentations in class—a person has an incentive not to do all his required work because the professors do not know the amount of effort. The grade is only metered based on the group presentation.

- Assume we have leisure and income as our two utility generating categories.
I would work to equate my marginal reward of leisure and output to their costs
With monitoring costs, my realized cost of more leisure falls more than the cost of working. Thus, I will take more leisure
  - Essentially, it is easier to take more leisure and it feels less costly so I will relax more

• The person who relaxes will cost his teammates because he reduces his output for the team
  - Assuming it is costly to make a relaxing teammate readjust to his actual marginal product, teammates will not be able to make relaxing teammates readjust fully
  - Effort of detection will be set at marginal cost = marginal gain. Thus, shirking will always occur without costless monitoring

• Thus, people always prefer detection because it allows for the realized rate of reward to equal the true productivity possibility
  - A person is able to earn more because their marginal productivity is rewarded correctly

• How do we get people to not shirk their responsibility?
  - Market competition
    - Has two flaws: still cost involved with seeing which team members is shirking and new members still have an incentive to shirk

III. The Classical Firm

Though team production provides extra output, the success of this depends on being able to manage the team so that metering problems and attendant shirking could be overcome. Thus, a monitor who estimates marginal productivity by observing or specifying input behavior is a must and s/he has residual income to claim.

How does the monitor system work?

Monitor => residual claimant

Monitor should be specialized in monitoring while rely on a residual claimant status since the other way in which another monitor is needed to monitor the monitor is not perfectly effective. Added incentive will make the monitor less likely to shirk.

Monitor’s Activities:
1. give instructions; measuring output, reward \(\rightarrow\) think of a football coach
2. Observe input(marginal productivity) \(\rightarrow\) think of a football team captain
cost(contract negotiation in market) < cost(detection of individual efforts)

Residual claimant => monitor

The specialist who receives the residual rewards will be the monitor.

Prices of inputs +observation of the action \(\rightarrow\) reduction in shirking \(\rightarrow\) residual for monitor
Monitor’s Activities 3. the power to revise the contract and incentives of members without changing others
Residual claimant-monitor = owner of the firm
(The entire bundle of six rights)
The relationship between team member and team owner is the “Quid pro quo” contract.

Summary:
firm emerge ← team production + cheaper monitoring system
⇔ Classical capitalist firms of a-f conditions

Other Theories of the Firm
Coase:
Comparative advantage: cost(organizing resource within the firm) higher > cost(market transaction) lower.
Knight:
Risk in decisions cannot be fixed by policing system; bear the risk when make decisions in uncertainties; entrepreneur= owner

IV. Types of Firms
Application to other types of firms
Profit-sharing firms
- The cost of team production increases the less residual the monitor claims; given our assumptions, the loss related to the shirking of the monitor outweighs the gain in incentives for individuals to not shirk.
- This effect would be increasing in team size, so we expect profit-sharing to be more prevalent in small teams as these also permit more reciprocal monitoring.
- Incentive stronger where cost of management is large relative to the gain from team effort; professional or artistic activities.
- If management is costly, but there is still sufficient gains from team effort, then profit-sharing firms can be prevalent.

Partnerships
- Extending from the profit-sharing firms above, partnerships will be small enough for reciprocal monitoring to work reasonably.
- In addition, longstanding knowledge of each other among the partners is preferred to better prevent person-specific shirking.
Socialist firms
- Limits posed by political constraints render usual firm-structures suboptimal.
- Profit-sharing may be a more viable solution, but will render the firm less productive.
- Since the central monitor is no longer incentivized not to shirk, additional mechanisms are needed.
- Example: Case from Jugoslavia where employees had power over the continuation of the manager.

Corporations
- In order to acquire initial resources, a firm needs capital.
- Capital is often raised more cheaply by many smaller contributors – shareholders.
- This alteration of the claimant structure requires some modification of our framework of firm-structure:
  - All stockholder cannot manage due to the bureaucratic costs associated. Therefore a board of directors is appointed by all the shareholders.
  - There are now two sources of monitoring by the shareholders: 1) large enough groups of existing shareholders can change the management, or 2) large enough groups of potential shareholders can buy the shares and change the management if they see it as profitable (that is, current management must be shirking).
  - If stockholders disagree with management they can also sell their stock which would lower the stock price and induce outsiders to take over.

Mutual and non-profit firms
- Changes in management, as they happen in the corporations, may not be desirable as you want anticipated future wealth to accrue to future managers.
- A larger extent of shirking can thus be tolerated if certain behaviors due to market value are not desired.

Labor unions
- Unions act as a monitor of employers for employees.
- Some aspects of employer performance may be hard to measure, and so it is cost-efficient to outsource this activity to a specialized monitor – the labor union.
V. Team Spirit and Loyalty

Every team member would prefer a team in which no one shirked. One possible solution provided in this part is to enhance a common interest in non-shirking. For example, team spirit in sports and team spirit in Japanese companies. The difficulty is to economically create team spirit and loyalty. This team spirit might be explained by the economics of identity by labeling each team social categories to achieve non-shirking. Further research develops in mechanism design to induce team member not to shirk.

VI. Kinds of Inputs Owned by the Firm

In classical firm part, we have explained why firms exist. Another question is the kind of the jointly used resources likely to be owned by the central-owner-monitor and the kind likely to be hired from people who are not team-workers. To answer the previous question, we focus on the owner’s way to demonstrate ability to pay the other hired inputs the promised amount. The owner could pay in advance (rarely in reality) or commit wealth sufficient to cover negative residuals. Compared with commitments of labor-wealth (i.e. human wealth), resalable capital equipment in the firm is more feasible. When a durable resource is used it will have a marginal product and depreciation. Unless the user cost is specifically detectable, payment to cover at least user-induced depreciation will be demanded in accord with expected depreciation. An absentee owner would therefore ask for a higher rental price because of the higher expected user cost than if the item were used by the owner (i.e. tools of trade). Another factor should be considered is one related to the costs of monitoring not only the gross product performance of an input but also the abuse or depreciation inflicted on the input. Resources whose user cost is harder to detect when used by someone else, tend on this count to be owner-used.

VII. Firms as a Specialized Market Institution for Collecting, Collating, and Selling Input Information

The firm serves as a highly specialized surrogate market. The employer, by virtue of monitoring many inputs, acquires special superior information about their productive talents. He sells his information to employee-inputs as he aids them in ascertaining good input combinations for team activity. Opportunities for profitable team production by inputs already within the firm may be ascertained more economically and accurately than for resources outside the firm. Efficient production with heterogeneous resources is a result not of having better resources but in knowing more accurately the relative productive performances of those resources.
Concluding Remarks

Does joint usage of input yield a larger output than the sum of the products of the separate inputs? The examples of the different types of firms are numerous in this model. During the presentation on the article Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design by Holstrom and Milgrom, it was asked in class how models dealing with incentive contracts can be applied to a socialist society. The Kakutani-Nash group would like to conclude this presentation by addressing this question and in doing so, would like to present a real-world example of how team productive activity does not yield a larger output than the sum of the products of the separated inputs.

Alchian and Demsetz (AD) presented the example of a firm in Yugoslavia in which the employees share in the residual. The Yugoslavia model could be applied to cases of cooperatives and common ownerships. However, the metering problem illustrated in AD's model becomes difficult to apply when we consider the cases of public or state ownership. In these cases, we can assume that no residual is allowed to be distributed amongst the workers. What will prevent workers and monitors from shirking in such a socialist society? This problem can be expanded upon with the use of the theory presented by Akerlof and Kranton in their theory, Economics and Identity.

In a typical socialist society, all output of a factory is produced directly for use by the people and little or no residual is distributed among the employees. How can factory managers avoid the issue of employees shirking off responsibility? The examples from Stalinist Soviet Union, Maoist China, and present-day North Korea come to mind. These are countries in which the government influence education and upbringing of the citizens of their respective countries. This control allows the government to indoctrinate each citizen with a strong sense of identity that makes it so that that citizens main purpose in life is to serve the state and its leader. A citizen who does not comply with the government's economic development policies and programs (i.e. Mao Zedong's Great Leap Forward) will be threatened with loss of identity, or reputation, by being accused of being a labor thief (工贼 GōngZéi ) for stealing time and still receiving undeserved salary. The family of the accused individual suffers a similar loss in their reputation in their community.

Those who had the chance to work in Mao's China were delighted to work and serve the new country. However, mechanisms to properly monitor and reward productivity were inefficient. Chinese factors of production had the unfortunate effect of mass shirking by the laborers. It was not required to work hard, but it was a sign of your support for your countrymen by just showing up to your assigned shift. A check next to your name for that day was a testament to your identity as a good communist and not showing up for work would incite criticism from your neighbors and colleagues. But after the Four Modernizations campaign started in 1978,
communes were dismantled in favor of putting farming back into the hands in individual households. These households were given quotas to fill and were allowed to collect the residual output. People started paying attention to the problem of metering rewards and productivity and monitoring against shirking. These structural changes resulted in the benefits seen in Table 1. These farmers were given the right to hire labor and to lease their land no longer identified themselves as good communists who seek utility derived from serving the country, but rather, over time, as profit seeking landowners who derive their utility through the chance to acquire wealth through metering rewards and productivity and effectively monitoring against shirking.

Table 1. Increases in Output of Major Agricultural Products (10,000 tons)

<table>
<thead>
<tr>
<th>Variety</th>
<th>1949</th>
<th>1978</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>11,318</td>
<td>30,477</td>
<td>50,839</td>
</tr>
<tr>
<td>Cotton</td>
<td>44.4</td>
<td>216.7</td>
<td>383.1</td>
</tr>
<tr>
<td>Oil-bearing crops</td>
<td>256.4</td>
<td>521.8</td>
<td>2,601.2</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>264.2</td>
<td>2,111.6</td>
<td>7,470</td>
</tr>
<tr>
<td>Sugarbeet</td>
<td>19.1</td>
<td>270.2</td>
<td>864</td>
</tr>
</tbody>
</table>

Source: The Official Website of the Beijing Government:
http://ebeijing.gov.cn/BeijingInfo/BJInfoTips/BeijingFigures/t934770.htm

The theory of Alchian and Demsetz can be expanded further by applying the ideas of Mehmet Baç in his theory paper: Corruption and Supervision Costs in Hierarchies. A combination of the two models will show that when designing incentive systems, it is possible for collusion to lead to full-on corruption within the firm. Baç makes use of hierarchies to represent collections of monitoring relationships and represents monitoring as a binary, random success variable. The key difference between the two models, however, is that in Baç's model, monitor is for the purpose of appropriating the subordinates' gains from corruption.

Certain assumptions from Baç's model can be use to build upon Alchian and Demsetz's metering problem. The most important assumption is that it is assumed that it is completely safe for members of the firm to take bribes if there is no monitoring. So now, instead of just dealing with the issue of shirking, firms must watch out for corrupt employees at various levels of its monitoring hierarchy. Baç gives the expected utility function for an agent who is willing to take bribes as: $\text{EU}_i = b_i(w_i + z) + (1 - b_i)w_i$ where $b_i = 1$ for acceptance of bribe and $b_i = 0$ otherwise. Variable $w_i$ represents the base wage and $z$ represents amount bribed. Since Alchian
and Demsetz defines a worker's utility as a combination of earned wages and leisure time, and adjusted model for expected utility in the case of no monitoring would be

\[ EU_i = b_i(w_i + z) + (1 - b_i)w_i + u(T), \]

where \( u(T) \) is the utility you get from shirking on the job by a certain amount of time \( T \). The principal, the person in charge of designing an optimal hierarchical structure, would be therefore faced with the extended problem:

\[
\min \sum R_i(h, p_i, t) + \sum w_j + \sum u(T)
\]

Variable \( p_i \) denotes rewards, \( h \) denotes hierarchy, and \( t \) denotes corruption level. Function \( R \) denotes the total rewards from corruption that comes in addition to base wages and the utility of shirking off responsibility.