Market Failure and Forms of Enterprise

Kazuhiko Mikami

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Hans H. Haller, Chair
Robert P. Gilles
Amoz Kats
Nancy A. Lutz
Mark Stegeman

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Kazuhiko Mikami

Committee Chair: Hans H. Haller

(Abstract)

This dissertation attempts to construct a theory which states that forms of enterprise are determined to a large extent by potential market failure. In the four independent, but closely interrelated chapters, I derive this hypothesis through theoretical reasoning, and suppose it by referring to empirical observations.

Chapter 1, *Forms of enterprise as a response to market failure*, proposes the main idea that forms of enterprise are determined by market failure. I take three representative types of firms - capitalist firms, worker owned firms, and consumer cooperatives - and consider their relationship with three major causes for failure of markets: asymmetric information, externalities, and market power.

Chapter 2, *Firms owned by raw material suppliers: A case of food manufacturing firms run by agriculture cooperatives in Japan*, is a case study which complements chapter 1. It deals with food processing farmers' cooperatives. These firms are owned by the suppliers of raw materials, and therefore classified as the fourth type of firms. I consider comparative efficiency of this type of firms from the viewpoint of market power and asymmetric information.

Chapter 3, *Asymmetric information on production-related risks and the form of enterprise: Capitalist firms versus consumer cooperatives*, considers an efficient enterprise form when there is asymmetric information on accident risks in the market.

Chapter 4, *Market power and the form of enterprise: Capitalist firms, worker owned firms, or consumer cooperatives*, considers an efficient enterprise form when there is market power in various markets.

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Chapter 1

Forms of enterprise as a response to market failure

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Abstract: This chapter attempts to relate the question of choosing an enterprise form to market failure. The chapter mainly deals with three types of enterprises, which are capitalist firms, worker owned firms, and consumer cooperatives. I then examine the efficiency of these enterprises in relation to three common causes of market failure, which are asymmetric information, externalities (in a broad sense), and market power. An implication of assigning ownership rights to one particular class of individuals (which determines the form of enterprise) is that transactions between the firm and the firm owners are made not through the market, but instead in a self-supporting manner. We then obtain an inference that when there is a serious market failure, one can do without that market by assigning ownership rights of the firm to the class of individuals that otherwise makes use of that market for transactions with the firm. (JEL classification numbers: L22, P12, P13. Key words: ownership of the firm, form of enterprise, market failure.)

1.1 Introduction

Ownership of the firm consists of the right to control the firm and the right to receive the firm's residual earnings. An enterprise form is determined by the assignment of ownership rights to a certain class of individuals. Capitalist

firms, for example, are an enterprise form which assigns the two ownership rights to the capital suppliers of the firm. This chapter attempts to address the question of choosing an enterprise form in relation to market failure.

The idea of relating enterprise forms with some kinds of market failure can be found in various places in the literature. Weisbrod (1975) saw nonprofit organizations as the second supplier of public goods which complement the function of the government. Hansmann (1987, 1996) considered the effects of asymmetric information on the formation of nonprofit organizations, whereas Hansmann (1988, 1996) discussed market power as well as asymmetric information as a determining factor of an enterprise form. Ben-Ner (1986, 1987) and Ben-Ner and Hoomissen (1993) examined the compound effect of asymmetric information and public nature of goods on the formation of nonprofit organizations and worker owned firms. Quite notably, in contrast, Dow (1986) attempted to construct a formal model which shows that capitalist and worker owned firms can be treated in a totally symmetric manner under a competitive market environment. He then anticipated that a comparative advantage of a particular enterprise form over others, if any, should arise when there is some incompleteness in the market.

Based on and inspired by these prior works, the current chapter attempts to comprehend the relationship between enterprise form and market failure. The chapter mainly deals with three types of enterprises, which are capitalist firms, worker owned firms, and consumer cooperatives, though other types of enterprises can possibly be dealt with in the same framework. I then examine the efficiency of these enterprises in relation to three common causes of market failure, which are asymmetric information, externalities (in a broad sense, which include public goods and externalities in a narrow sense), and market power. These causes of market failure are standard ones, commonly

discussed in microeconomics and public finance, and seem to cover almost all economic causes that give rise to inefficiencies in the market.

There are two characteristics, which are related to each other, that distinguish the present chapter from the existing body of literature in this field. First, in this chapter, a firm of any type is regarded not as an autonomous entity itself with a predetermined corporate objective function, but as an organization consisting of sovereign individuals with their own personal utility functions. In particular, the government is seen as an organization that consists of sovereign citizens, especially as consumers of publicly provided goods (whom I will call voter-consumers). This interpretation of the government leads to the notion that governmental undertakings can be seen as a type of consumer owned enterprise. This is in sharp contrast to the conventional economic models of the public sector, in which the government is assumed to be an autonomous, benevolent entity (*i.e.*, having the intention of maximizing social welfare). In a sense, I share a similar view to the government with Tiebout (1956). It further lends little theoretical sense to classifying various kinds of firms into three sectors, where cooperative and nonprofit firms are supposed to constitute the third sector of the economy and complement the roles played by capitalist firms (constituting the first sector) and the government (constituting the second sector). The second characteristic of this chapter, which is largely associated with the first feature mentioned above, is that the *raison d'être* of any type of firm is sought to be accounted for from the single viewpoint of market failure. This monistic explanation to the determination of enterprise forms given here, which is thoroughly based upon market failure, is in stark contrast to the dualistic explanation adopted in prior works, which is based upon both market failure and government failure.

The remaining parts of this chapter are constructed as follows. The next

section reviews the concept of the ownership rights of the firm, and classifies various types of enterprises according to that concept. It then presents a brief discussion on the three representative enterprise forms, which are capitalist firms, worker owned firms, and consumer cooperatives. Section 1.3 examines how a certain enterprise form would be selected according to possible market failure. Section 1.4 concludes the chapter.

1.2 Ownership of the firm

Production is the transformation of factors of production into products. The firm is an economic entity in charge of the production activity with a certain production technology. It is conventionally recognized that ownership of the firm is made up of two formal rights to the firm: the right to control the firm, and the right to claim dividends from the firm's residual profits. The firm can thus be characterized by the production technology it is endowed with, and the ownership structure over it.

In practice, ownership rights are usually assigned to one particular class of individuals. For instance, the capitalist firm is the form of enterprise which assigns the ownership rights to its capital suppliers; the worker owned firm is one which assigns the rights to its labor suppliers; and the consumer cooperative is one which assigns the rights to its customers. An implication of assigning ownership rights to one particular class of individuals is that transactions between the firm and the firm owners are made *not through the market*, but instead in a self-supporting manner. For instance, under a capitalist firm (in its pure form), capital owners do not rent the physical capital (or sell the capital services) to the firm in the market for physical capital, but rather engage in production by using their own physical capital, buying labor from workers in the labor market, and selling the products to the consumers

in the product market; under a worker owned firm, workers do not sell labor to the firm in the labor market, but rather engage in production by renting the physical capital from capital owners in the market for physical capital, using their own labor endowment, and selling the products to the consumers in the product market; and under a consumer cooperative, consumers do not buy products from the firm in the product market, but rather engage in production by renting the physical capital from capital owners in the market for physical capital, buying labor from workers in the labor market, and supplying the products to themselves for consumption.

To make this point clearer, consider a simple model of transactions in physical capital, labor and a product among a capital owner (indexed 1) endowed with k^0 units of physical capital, a worker (indexed 2) endowed with l^0 units of labor, and a consumer of the product (indexed 3). Let k, l, and x represent the amount of the physical capital supplied by the capital owner, the amount of the labor supplied by the worker, and the amount of the product consumed by the consumer, respectively, where x is assumed to be manufactured from k and l. Furthermore, let r, w, and p represent the market rental rate for the physical capital, the market wage, and the market price for the product. Under a capitalist firm, payoffs to the capital owner, worker, and consumer are given by $u_1 = px - wl + v_1(k^0 - k)$, $u_2 = wl + v_2(l^0 - l)$, and $u_3 = -px + v_3(x)$, respectively, where $v_1(k^0 - k)$ represents the capital owner's utility from reserved physical capital, $v_2(l^0 - l)$ represents the worker's utility from leisure, and $v_3(x)$ represents the consumer's utility from consumption of the product. It is clear from these formulae that under a capitalist firm, physical capital is *not* furnished by the capital owner to the firm through the rental market for physical capital (or, in other words, physical capital services are not furnished from the capital owner to the firm

through the market for the physical capital services), but is directly supplied to the firm by the capital owner. Thus, the rental market for physical capital (or the market for physical capital services) is *not* used under a capitalist firm; indeed, the rental rate for the physical capital (or the price for the physical capital services) r appears nowhere in the expressions for payoffs. Labor and the product, on the other hand, are traded in the market at the prices w and p, respectively, under a capitalist firm. Under a worker owned firm, payoffs to the capital owner, worker and consumer are given by $u_1 = rk + v_1(k^0 - k)$, $u_2 = px - rk + v_2(l^0 - l)$, and $u_3 = -px + v_3(x)$, respectively. Here, the labor is not furnished by the worker to the firm through the labor market, but is directly supplied to the firm by the worker. Thus, the labor market is not used under a worker owned firm; indeed, the wage w does not appear in these expressions for payoffs. Capital services and the product, on the other hand, are traded in the market at the prices r and p, respectively. Similarly, under a consumer cooperative, payoffs to the capital owner, worker and consumer are given by $u_1 = rk + v_1(k^0 - k)$, $u_2 = wl + v_2(l^0 - l)$, and $u_3 = -(rk + wl) + v_3(x)$, respectively. Here, the product is not furnished by the firm to the consumer through the product market, but is directly supplied by the firm to the consumers. Thus, the product market is not used under a consumer cooperative; indeed, the price for the product p does not appear in these expressions for payoffs. Capital services and labor, on the other hand, are traded in the market at the prices r and w, respectively.

We then obtain an inference that, *when there is a serious market failure, one can do without that market by assigning ownership rights of the firm to the class of individuals which otherwise makes use of that market for transactions with the firm.* For instance, when there is a failure in the market for

physical capital, the possible inefficiency that would arise in that market can be avoided by assigning ownership rights of the firm to the capital suppliers and establishing a capitalist firm; when there is a failure in the labor market, the possible inefficiency that would arise in that market can be avoided by assigning the rights to the workers and establishing a worker owned firm; and when there is a failure in the product market, the possible inefficiency that would arise in that market can be avoided by assigning the rights to the consumers and establishing a consumer cooperative.

Before delving into an examination on the effects of market failure on efficient enterprise forms, I will devote the rest of this section to the discussion on the characteristics of the three representative forms of enterprise which I will deal with in the following section.

Capitalist firms

A capitalist firm is an enterprise which is owned by the suppliers of physical capital. Stock company is the representative form of capitalist firm. The suppliers of physical capital to a stock company are usually called shareholders. Stock company is the most common form of enterprise in market economies, and firms in that form are predominant in many industries.

Presumably, the most important reason for the prevalence of stock companies in market economies would be their superiority over others in diversifying financial risks. All business undertakings are more or less associated with risks, and no one group of individuals seems to be in a more advantageous position in diversifying the risks than the shareholders. Shareholders can minutely divide their financial wealth and invest its small pieces in various firms at the same time. [1] This is in sharp contrast to workers, for

[1]The problem of risk bearing is involved with the right to receive the firm's residual earnings. Another sort of problem that may accrue from ownership of the firm is one

instance, who usually supply labor to one firm only. Mainly for this reason, if there are no serious defects in markets for factors for production and products that surround a firm, it seems most efficient that the ownership rights of the firm be assigned to its capital suppliers.

Worker owned firms

Worker owned firm (or labor managed firm) is an alternative enterprise form to the capitalist firm which has been studied quite intensively in economics. [2] In the large body of literature, worker owned firms are often defined to be firms which have two characteristics: the ultimate authority is held by the workers, and the decision making by the workers is democratic. In this chapter, however, I do not necessarily require democracy in decision making as a qualification for a worker owned firm. Rather, I simply refer to the firm which assigns the two formal ownership rights to the workers as a worker owned firm.

Consumer cooperatives

A consumer cooperative (or customer owned firm) is an enterprise that is owned by the customers of the firm. A food retailing consumer cooperative is a common example of the customer owned firm, but a manufacturing firm owned by wholesale firms, or a wholesale firm owned by retail firms, can also be classified in this category. In addition, there are two other enterprise forms that are legally not customer owned firm but may substantially be regarded

that is involved with the right to control the firm, such as the conflict of interests among firm owners, or the ability of firm owners to monitor and discipline the managers under separation of ownership and control. These problems associated with ownership rights of the firm are discussed in details in Hansmann (1988, 1996).

[2]The seminal paper on the worker owned firm is Ward (1958), in which the maximization of net income per worker is first addressed as the firm's objective. The important contributions to the theoretical and empirical study of worker owned firms are collected in Prychitoko and Vanek (1996).

as being owned by the customers of the firm. One is nonprofit organization, and the other is public enterprise.

A nonprofit organization is an enterprise of which no one is formally assigned ownership rights. In Ben-Ner (1986), a consumer cooperative is modeled as a firm that attempts to maximize the sum of the consumers' surplus and the firm's surplus, whereas a nonprofit organization is formulated as a variant form of consumer cooperative that attempts to maximize the consumers' surplus subject to a zero profit constraint. [3] As far as the firm's behavior is concerned, there does not seem to be a significant difference between maximizing the sum of the consumers' surplus and the firm's surplus (where the latter is ultimately distributed among the consumers), and maximizing the consumers' surplus with profit being kept naught. From the point of view of ownership allocation, as a matter of fact, nonprofit organizations may substantially be identified as being customer owned. [4]

In public enterprises, on the other hand, voter-consumers are seen as the ultimate decision makers through the institution of voting, and through the tax system are also the ultimate bearers of risks from undertakings. In this sense, public enterprises may be identified as being owned by the voter-consumers of a state or a local constituency. For example, the military force can be seen as a public enterprise that supplies national defense services, of which potentially all citizens of the nation are the consumers. In so far as the nation is equipped with a democratic institution of voting and with a

[3] In Ben-Ner (1986) and Ben-Ner and Hoomissen (1993), the zero profit constraint is imposed on the firm in an attempt to dampen incentives to cheat or behave dishonestly under asymmetric information. In Hansmann (1987, 1996), on the other hand, the constraint that prohibits dividends plays an essential role in determining the behavioral characteristics of nonprofit organizations.

[4] Ben-Ner and Hoomissen (1993) explain that the absence of shares in nonprofit organizations is a device to prevent the transfer of shares and ensure permanent corporate control by the customers.

proper tax system, the final right of control over the military, and its ultimate financial responsibilities, are considered to lie in the voter-consumers. [5]

The view of nonprofit organizations and public enterprises as a variation of customer owned firms leads us to a more lucid and coherent perspective of the theory developed by Weisbrod (1975). He presented a hypothesis that, whereas the government is the primary supplier of public goods, nonprofit organizations play a secondary role in supplying those goods which fill the gap in the consumers' satisfaction under government failure. The present chapter, on the other hand, proposes the view that public enterprises and nonprofit organizations are originally firms of similar nature, and therefore it is of no surprise to assume that these firms play a complementary role in supplying collective-type goods and services. In practice, the choice among plain consumer cooperatives, nonprofit organizations and public enterprises, would depend on the characteristics of goods and services which the firms deal with.

1.3 Market failure and enterprise forms

If there exists a market in which all individuals behave as price takers, trades in that market lead to an efficient resource allocation. (The First Welfare Theorem.) Any market failure therefore results from incompleteness in the market, where individuals may behave as price setters rather than price takers, or the market itself may fail to exist. When the market fails to attain

[5]The difference in the number of owners between plain consumer cooperatives and public enterprises is not essential in distinguishing these two types of enterprises. For instance, Co-op Kobe, a leading consumer cooperative in Japan with 1.4 million member-consumers, almost matches in size the city of Kobe, the sixth largest city in Japan with 1.5 million residents, and obviously surpasses most cities of small and medium size. The number of owners of plain consumer cooperatives is thus not necessarily extraordinarily smaller than the size of the constituency of local governments.

an efficient resource allocation under some circumstances, individuals may choose to give up market transactions and alternatively arrange an ownership structure of the firm so as to restore the efficiency of trade. In this section, I take three representative market failures, and consider how the ownership structure of the firm can be arranged so as to improve efficiency in transactions.

Informational asymmetry

When there is an asymmetry of information between individuals who exchange goods and services with each other in a market, there will arise informational problems such as adverse selection and moral hazard, and as a result market equilibrium will not in general be Pareto optimal. In theory, inefficiencies caused by an asymmetry of information may be solved by creating a contingent market, in which transactions are actually made only contingent on the true state of the world. [6] In reality, however, bounded rationality of individuals and various transaction costs, such as the costs to write and enforce contingent contracts or the costs to verify the real state of the world, often prevent contingent markets from being created and effectively made use of. Also the informational problems might be neutralized to some extent through rational expectations of individuals, such as signaling and screening, but even with these mechanisms embedded in the market, inefficiencies in the market caused by asymmetric information cannot be totally removed.

If an informational problem can by no means be overcome within a market, it may be resolved by dispensing with the market and instead arranging a new ownership structure of the firm so that the individuals who used to use that market for transactions with the firm own the firm. Hansmann (1988, 1996) presented an example of farmer cooperatives which furnish farm sup-

[6] Radner (1968).

plies, such as livestock feed and fertilizers, to the member farmers. In the early decades of the twentieth century, the ingredients of livestock feed were largely unknown and generally of poor quality, and so the market for feed was inefficient. Farmer ownership of the firm made it possible to dispense with the market and reduce the loss in efficiency due to an informational bias, and consequently it used to have an organizational advantage over other enterprise forms during that period. [7]

There are some related studies on the relationship between asymmetry of information and an efficient enterprise form. Hansmann (1987, 1996) attempted to explain the reason why firms such as child day care centers and hospitals are often established and operated as nonprofit organizations rather than stock companies from the point of view of informational asymmetry between the firm and its customers. (He used the term 'contract failure' instead of informational asymmetry.) The essence of his argument is that when there is an asymmetry of information on the quality of products (*e.g.* medical treatment) between a firm (*e.g.* hospital) and its customers (*e.g.* patients), a stock company will have an incentive to appropriate the private information and successfully supply low quality products. Nonprofit organizations, on the other hand, will have a weaker incentive to behave in a dishonest manner than stock companies, since a constraint is imposed on the former that the firm's surplus not be distributed. (He referred to the last restriction as the 'nondistribution constraint'.) Although Hansmann (1987, 1996) and the present chapter share a common understanding that the capitalist form of firm causes an inefficiency in the presence of asymmetric information, they are different in the logic to reach that conclusion. In Hansmann (1987, 1996), an advantage of nonprofit organizations arises from a partial

[7] Hansmann (1988), p.288.

negation of ownership rights, which is brought about by the nondistribution constraint, that dampens the firm's incentive to deceive customers. In the present chapter (in which nonprofit organizations are regarded as a variant form of customer owned firm), on the other hand, the advantage grows out of a *transfer* of ownership rights from capital suppliers to customers, which is made in order to dispense with the market for products of which the quality is uncertain to the customers. Ben-Ner (1986) and Ben-Ner and Hoomissen (1993) recognize as Hansmann (1987, 1996) that profit motives of capitalist firms would induce an incentive to deceive consumers under asymmetry of information. When the quality of products is known only to the firm and not to the consumers, they argue, integration of the firm by the consumers will eliminate the severity of informational problems. (They assumed that consumers have access to quality information under a nonprofit organization.) Although their discussion is based upon a non-formal analysis, and their analytical framework is partial in the sense that only the product market is taken into account and other markets (such as markets for capital, labor, or raw materials) are ignored, their hypothesis gives us an important insight to consider a comparative advantage of customer ownership of the firm when there is an asymmetry of information on the quality of products.

Externalities [8]

Public goods are defined to be the goods that are nonrival and nonexcludable in consumption. The fundamental reason why the market for public

[8]Here the term 'externality' is interpreted in a broad sense, which includes the situation where consumption benefits are shared and cannot be limited to a particular consumer (*i.e.* the case of public goods), and one where economic activity results in social costs which are not paid for by the consumer who causes them (*i.e.* the case of externality in a narrow sense). (Musgrave and Musgrave (1989), chapter 4, section A.) In other words, there is a consumption externality when individual A's utility depends on what individual B consumes. (Feldman (1980), chapters 5 and 6.)

goods fails to exist is nonexcludability. If the goods are nonrival but excludable, the market does not necessarily fail. The firm can sell the public goods to the price-taking consumers at discriminating Lindahl prices. The preferences of consumers are revealed in the market, and in equilibrium the marginal cost of production for the firm is equated to the sum of the marginal benefit of consumption for the consumers. A Pareto efficient level of public goods can thus be traded in the market.

Many public goods are not excludable, however. National defense, embankment, and street lights are the examples of nonexcludable public goods. The market for those public goods necessarily fails. In that case, it seems natural to think of getting rid of the market for those public goods, which can by no means function well, and replacing it by consumer ownership of the firm. That is, individuals can dispense with the market for public goods by forming a consumer cooperative which furnishes the public goods to themselves. Many public goods are in fact supplied by consumer cooperatives in a small, closed community. In a condominium, for example, tasks such as maintaining the building, setting up a television antenna, or fixing ditch planks, are often conducted by a cooperative of apartment owner-residents. For public goods in a large, open community, on the other hand, plain consumer cooperatives are rarely seen. Nonrivalry of goods, together with their nonexcludability, gives rise to free riding, which makes cooperative schemes very difficult to implement. In that case, a plain consumer cooperative is modified so that an authoritarian power is introduced to the organization. This type of consumer cooperatives can take the form of public enterprise. In a sense, indeed, public enterprises as a supplier of public goods might be well portrayed as a voter-consumer owned enterprise which is equipped with compulsory taxation. For example, all citizens of a nation are the potential

consumers of the national defense service. People all benefit more or less from the security of their lives and property, but they cannot 'buy' it in the marketplace, because the market for the national defense service fails to exist due to its nonexcludable property. People may then overcome the problem by dispensing with the possible market for the national defense service, and instead owning the military force themselves and introducing a coercive and compulsive tax system to finance the enterprise to cope with the free rider problem. [9]

There is some related literature which deals with the supply of public goods by private enterprises. Weisbrod (1975) constructed his argument on the conventional understanding that, since the market fails to provide an efficient amount of public goods, the government should take the place of the market and supply the public goods. Under a democratic political process, however, the government will choose the quantities and sorts of public goods that are desired by the voters who are in a median position in preference in the society, and therefore a significant number of voters are left unsatisfied with the levels and kinds of public goods supplied by the government. (He referred to this phenomenon as the 'government failure' in correspondence

[9] A similar argument can be made for externalities in a narrow sense, such as pollution. The reason why the market for goods which generate external effects fails is that the market for externalities itself is missing. Consider the example where a firm pollutes a river and damages the people living downstream. In this case, the efficiency problem occurs because the market for the polluted water is absent. Pareto efficiency is then restored if the market for polluted water is created and the polluted water is traded between the firm and the residents downstream. (In reality, first the initial rights to pollute the water or to enjoy the clean water is assigned to the firm or to the residents. Then, the rights are traded between the firm and the residents in the market. Through this process of trading pollution, Pareto efficiency is supposed to be attained.)

It is not always possible in practice to create the market for externalities, however. In case the market for externality cannot be created, efficiency may be restored in theory by replacing the missing market with the victims' ownership of the polluter firm. In the previous example of river pollution, the problem may be resolved by reassigning ownership rights of the firm to the victim-residents downstream.

with market failure.) The residual demand for the public goods will thus be satisfied by another mechanism, which is a nonprofit organization. Private hospitals and schools that are operated by nonprofit organizations are the representative examples he referred to. In a sense, Weisbrod's hypothesis can be seen as an extension of the traditional theory of public finance that, just as the government intervenes in the market to correct market failure, nonprofit organizations come into existence in the market to correct government failure. Observing that nonprofit organizations tend to supply goods and services which are of public nature, it was clever of Weisbrod to regard nonprofit organizations as a complementary entity to the government for the supply of public goods. This idea is consistent with the view presented in this chapter that public enterprises and nonprofit organizations are distinct organizations in the same category of customer owned firm. From this viewpoint, it is of no surprise to observe that public enterprises and nonprofit organizations play a similar role in the economy in meeting consumers' needs for public goods and services. Weisbrod's question on the role of nonprofit organizations was thereafter reexamined by Ben-Ner (1986) from a different perspective. Ben-Ner inquired into a comparative efficiency of nonprofit organizations over capitalist firms in providing excludable local public goods. He noticed the possible ability of nonprofit organizations to discriminate between its customers according to their preferences, which he argued comes from the fact that the firm is controlled by the customers. In this setting, Ben-Ner reached the conclusion that nonprofit organization is a superior organizational form to capitalist firm in providing excludable local public goods. Although Ben-Ner (1986) and the present discussion share a common idea that consumer ownership can be a solution to the market failure caused by nonexcludability and nonrivalry in goods and services, there is

a fundamental difference between the two in the logic in arriving at that conclusion. In Ben-Ner's argument, the ability to enforce price discrimination among customers, which he assumed nonprofit organizations are intrinsically equipped with, is the critical advantage for nonprofit organizations to attain efficient resource allocation in the market for public goods. But that ability is originally irrelevant to the assignment of ownership rights to the firm. In this sense, consumer ownership is used for the *remedy* of the market for public goods, which is in contrast with the present logic that consumer ownership is used for the *relinquishment* of the market for public goods. Finally, Ben-Ner and Hoomissen (1993) made an extension of Ben-Ner (1986) and addressed a slightly different perspective of the role of nonprofit organizations. Revelation of preferences, and discriminating prices according to them, are the prerequisite for implementing an efficient resource allocation in the market for public goods. According to those authors, if consumers reveal their true preferences for public goods, a capitalist firm will have an incentive to appropriate that information by charging inflated prices, and extract most of the consumer surplus. In contrast, consumers can reveal their demand information without anxiety to the enterprise which they own, because the firm under their control is by nature not motivated to make a profit to the detriment of its owner-consumers. The conclusion reached by Ben-Ner and Hoomissen is also based on the idea of repairing the market for public goods by resorting to the nonprofit form of the firm, which is fundamentally different from the present idea of restoring efficiency of transactions by replacing a defective market with customer ownership of the firm.

Imperfect competition

There are several institutional, social, and economic factors that prevent new firms from entering into the market and make the market structure non-

competitive. Presumably the most important economic cause of imperfect competition would be natural monopoly. A natural monopoly occurs when the technology exhibits a decreasing average cost up to a substantial quantity of output. A major cause for such technologies is a large scale initial investment in production facilities. Electricity, gas, water, railroad transportation, and telecommunications are the representative examples of industries with increasing returns to scale. Natural monopoly is a type of market failure that is different in nature from market failure due to asymmetric information or externality, in the sense that under a natural monopoly the market for the products does exist but its structure is necessarily monopolistic. In general, there are no effective market solutions for overcoming inefficiency that results from technologies with increasing returns to scale.

Efficiency loss in the product market which is caused by a natural monopoly may be prevented by getting rid of the market, which is necessarily monopolistic, and instead introducing customer ownership of the firm. There are several empirical observations that seem to be consistent with this solution. First, water supplying firms are frequently operated in plain consumer cooperative form in small, isolated communities. A similar example is that a substantial amount of electric power consumed in rural areas is distributed by consumer cooperatives in the United States. [10] Secondly, water supplying enterprises in most urban areas, and gas supplying firms in some suburban areas, are run by municipal governments. [11] Those public enterprises can be viewed as a variant form of customer owned firms, as discussed in section 1.2 and in the previous subsection on externalities. (That is, all residents

[10] Hansmann (1988), section 6.

[11] Other examples for public ownership of firms with convex production technology include Nippon Telegraph and Telephone (NTT) and Japan National Railways (JNR) until mid 1980s, though thereafter they were privatized.

of a local community are the customers of the water supplying firm run by the municipal government, so the set of customers coincides with the set of voters in the constituency. The water supplying firm is therefore considered to be owned by the voter-consumers of the community.) Thirdly, governmental regulations on major electricity and gas supplying companies may be regarded as a partial transfer of ownership of the firm to the voter-consumers. [12] Under governmental regulations, the ultimate control rights of the firm, such as the right to set the price for the product, are considered to be partially transferred to the voter-consumers. This partial shift of control rights from shareholders to customers may be interpreted as an ownership arrangement to cope with the problems caused by a natural monopoly, such as a distorted high price for the product. On the other hand, the rights to claim residual earnings of the firm are usually left in the hands of shareholders, mainly in order to maintain efficiency in risk sharing. Public utilities under governmental regulations may therefore be identified as a hybrid entity of a stock company and a voter-consumer owned enterprise, in which some important control rights of the firm are assigned to the voter-consumers so as to cope with the monopolistic power in the market, whereas the rights to claim residual earnings of the firm are kept in the hands of shareholders so as to deal with the business risks. Thus, many public utilities in reality have more or less a flavor of customer ownership, and this may be understood as an arrangement for dispensing with the noncompetitive product market and replacing it with consumer ownership of the firm.

There are some related works that examine the implications of market power on an efficient enterprise form. Taking the example of social clubs,

[12] For other examples, private railroad companies, including the Japan Railway companies since 1987, and private telecommunication companies, including the Nippon Telegraph and Telephone corp. since 1985, are under strict governmental regulations.

Hansmann (1987, 1996) discussed a comparative efficiency of nonprofit organizations over stock companies when the product market is necessarily monopolistic. The principal aim for people to belong to a social club is to get acquainted and keep in touch with other club members in their business world. Because most people in the business belong to at most one club, the number of major clubs in each business is very small, usually only one. Hence, if a social club were organized as a capitalist firm, it would exploit the members by charging a high membership fee or by reducing the quality of services. In order to avoid such monopolistic exploitation, club members, as the consumers of the services, may well be motivated to own the club themselves. Similar reasoning can be applied to the formation of worker owned firms. Ben-Ner (1987) inquired into incentives for the formation of worker owned firms from the viewpoint of market power in the labor market. Under some circumstances, such as geographical isolation, capitalist firms (which may or may not face a competitive product market) would behave as a monopsonist in the labor market, restricting employment and keeping wages low. If this is the case, he argued, there is good reason for workers to think of owning and operating the firm themselves. [13] Lastly, based on Williamson's (1979) concept of idiosyncrasy, Hansmann (1988, 1996) examined the implication of the market power that is to be exercised *ex post* in a multi-stage circumstance on enterprise forms. If a firm encounters many input suppliers or output customers *ex ante* but must make a transaction-specific investment upon entering into a transactional relationship with either one of them, there can arise *ex post* market power. He considered the possible

[13] Ben-Ner (1987) distinguished between a buy-out of capitalist firms by workers and the creation of new worker owned firms. From the point of view of the efficiency principle and the Coase theorem, however, there seem to be little difference between the two options for the formation of worker owned firms. (As for the efficiency principle and the Coase theorem, see Milgrom and Roberts (1992), chapter 2.)

effect of *ex post* market power on the formation of worker owned firms. The skills of a worker who has been employed by a firm for a prolonged period of time come to be specialized more or less to the tasks he has performed in that firm. In addition, the worker himself and his family usually get used to the community where his workplace is located. If this is the case, a capitalist firm will be in an easy position to appropriate workers by offering low wages or requiring long hours of work. This will motivate workers to own the firm themselves and establish a worker owned firm. [14]

More recently, Hart and Moore (1998) developed a model that compares capitalist firm (which they call outsiders' ownership) with a kind of consumer cooperative (insiders' ownership) when there are specific types of imperfect competition. In their model, both enterprise forms can induce market inefficiency: A capitalist firm sets inefficiently high monopoly prices over consumers, whereas a consumer cooperative sets inefficiently low prices for its member consumers (insiders) at the sacrifice of nonmember consumers (outsiders). Their model and results are not directly comparable with the present discussion. First, their basic idea is, as advocated in Hart and Moore (1990), to see the firm as a collection of physical assets for production, and the owner of the physical assets has the ultimate rights to decide how those assets are used in production, which constitutes the control rights to the firm. Consumer cooperative in Hart and Moore (1998) inherits this view such that the member consumers own the physical assets of the cooperative and, owing to the status of being the owner of the physical assets, consumers have the control rights to the cooperative. In the present discussion, on the other hand, consumers need not own the physical assets in order to have the rights to control the cooperative. It is very possible here that consumers do not

[14] Hansmann (1988), section 5.1.

own the cooperative's physical capital at all but rent all of it for production, still keeping all control rights to the cooperative. Second, in Hart and Moore (1998), mainly nonprofit cooperatives are considered, where price is set so as to balance the revenue and the cost. On the other hand, the objective of consumer cooperatives here is to maximize consumers' utility, where the nonprofit property is irrelevant for the cooperative form of the firm. Despite such differences in modeling consumer cooperatives, Hart and Moore (1998) seem to have pointed out an interesting aspect of imperfect competition embedded in consumer cooperatives.

1.4 Conclusion

The basic idea addressed in this chapter is that the choice of enterprise form is made in response to market failure. Our premise is that a firm, which may take the form of capitalist, public, cooperative or nonprofit firm, is not an autonomous entity with an exogenously given corporate objective, but an organization that consists of sovereign individuals, each with his own utility function. Firms are then classified according to how the ownership rights to the firm are allocated over classes of individuals. An essential implication of allocating ownership rights to a certain group of individuals is that transactions between the firm and the firm owners are made not through the market but in a self-supporting manner. This straightforwardly leads to the reasoning that, if there is a market that does not function well due to some market failures, that market can and should be dispensed with by properly reassigning ownership rights among individuals. Then our conclusion is, in short, that an enterprise form will be chosen so as to dispense with the market with a serious market failure, or more precisely, with the most serious market failure.

We based our analysis on several simplifying assumptions. We focused our mind on the organizational form of one firm. In reality, however, many firms in various forms coexist in a market. Also, we supposed that individuals are homogeneous in the same group. Types of consumers, for example, are in fact not uniform, which creates consumers who do not participate in a consumer cooperative. In spite of such simplification, the present analytical framework seems quite a useful one, both in the way of classifying enterprise types and in the coverage of the kinds of market failure. It may therefore be used for a variety of purposes, from an examination of the actual industry distribution of a certain type of enterprise, to a theoretical investigation of the comparative advantages and disadvantages of different types of enterprises in a specific industry.

Bibliography

[1] Ben-Ner, Avner, 1986, "Nonprofit organizations: Why do they exist in market economies?" In: Susan Rose-Ackerman (ed.) *The economics of nonprofit institutions: Studies in structure and policy.* Oxford and New York, NY: Oxford University Press: 94-113.

[2] Ben-Ner, Avner, 1987, "Producer cooperatives: Why do they exist in capitalist economies?" In: Walter Powell (ed.) *The nonprofit sector: A research handbook.* New Haven, CT and London: Yale University Press: 434-449.

[3] Ben-Ner, Avner, 1988, "Comparative empirical observations on worker-owned and capitalist firms." *International Journal of Industrial Organization* 6-1: 7-31.

[4] Ben-Ner, Avner, and Van Hoomissen, Theresa, 1993, "Nonprofit organizations in the mixed economy: A demand and supply analysis." In: Avner Ben-Ner and Benedetto Gui (eds.), *The nonprofit sector in the mixed economy.* Ann Arbor, MI: The University of Michigan Press: 27-58.

[5] Coase, Ronald, 1937, "The nature of the firm." *Economica* 4:386-405.

[6] Coase, Ronald, 1960, "The problem of social cost." *Journal of Law and Economics* 3:1-44.

[7] Dow, Gregory K., 1986, "Control rights, competitive markets, and the labor management debate." *Journal of Comparative Economics* 10-1: 48-61.

[8] Dow, Gregory K., 1993, "Why capital hires labor: A bargaining perspective." *American Economic Review* 83-1: 118-134.

[9] Feldman, Allan M., 1980, *Welfare economics and social choice theory.* Martinus Nijihoff Publishing.

[10] Hansmann, Henry, 1987, "Economic theories of nonprofit organization." In: Walter Powell (ed.) *The nonprofit sector: A research handbook.* New Haven, CT and London: Yale University Press: 27-42.

[11] Hansmann, Henry, 1988, "Ownership of the firm." *Journal of Law, Economics, and Organization* 4-2: 267-304.

[12] Hansmann, Henry, 1990, "When does worker ownership work? ESOPs, law firms, codetermination, and economic democracy." *Yale Law Journal* 99-8: 1749-1816.

[13] Hansmann, Henry, *The ownership of enterprise.* Cambridge, MA: Harvard University Press, 1996.

[14] Hart, Oliver, and Moore, John, 1990, "Property rights and the nature of the firm." *Journal of Political Economy* 98-6: 1119-1158.

[15] Hart, Oliver, and Moore, John, 1998, "Cooperatives vs. outside ownership." Working Paper ♯6421, National Bureau of Economic Research.

[16] Kishimoto, Tetsuya, *Public economics* (Kokyo keizaigaku). Tokyo: Yuhikaku, 1986.

[17] Ledyard, John O., 1987, "Market failure." In: John Eatwell, Murray Milgate and Peter Newman (eds.) *The new Palgrave: A dictionary of economics*, volume 3. London and Basingstoke: The Macmillan Press Limited: 326-329.

[18] Mikami, Kazuhiko, 1999, "Proxy contests and corporate democracy." *Journal of Economic Behavior and Organization* 40-4: 353-371.

[19] Mikami, Kazuhiko, 2000, "Increasing efficiency by giving up some profit." *Journal of Institutional and Theoretical Economics*, 156-2: 348-359.

[20] Milgrom, Paul, and Roberts, John, 1992, *Economics, organization and management.* Englewood Cliffs, NJ: Prentice-Hall, Inc..

[21] Musgrave, Richard A., and Musgrave, Peggy B., 1989, *Public finance in theory and practice,* 5th edition. McGraw-Hill, Inc..

[22] Prychitoko, David, and Vanek, Jaroslav, 1996, *Producer cooperatives and labor-managed systems*, volumes 1 and 2. Cheltenham, UK and Brookfield, VT: Edward Elgar.

[23] Putterman, Louis, 1984, "On some recent explanations of why capital hires labor." *Economic Inquiry* 22-2: 171-187.

[24] Radner, R., 1968, "Competitive equilibrium under uncertainty." *Econometrica* 36-1: 31-58.

[25] Tiebout, Charles M., 1956, "A pure theory of local expenditures." *Journal of Political Economy* 64-5: 416-424.

[26] Ward, Benjamin, 1958, "The firm in Illyria: Market syndicalism." *American Economic Review* 48-4: 566-589.

[27] Weisbrod, Burton A., 1975, "Toward a theory of the voluntary nonprofit sector in a three-sector economy." In: Edmund S. Phelps (ed.) *Altruism, morality and economic theory.* New York, NY: Russell Sage Foundation: 171-195.

[28] Williamson, Oliver E., 1979, "Transaction-cost economics: The governance of contractual relations." *Journal of Law and Economics* 22-2: 233-261.

Chapter 2

Firms owned by raw material suppliers: A case of food manufacturing firms run by agriculture cooperatives in Japan

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Abstract: Food manufacturing firms run by agriculture cooperatives are portrayed as an enterprise that is owned by the suppliers of raw materials. Typically, in this type of the firm, decision making is made by member farmers through one member-one vote rule, and the surplus is divided among them according to the amount of raw agricultural products they supplied to the firm. This is in contrast to capitalist firms, in which decision making is ultimately made by the shareholders through one share-one vote rule, and the profit is divided among them according to the equity shares they hold. In this chapter, we examine comparative advantages of the former type of the firm over the latter. (JEL classification numbers: L22, P13. Key words: market failure, agriculture cooperatives, food manufacturing.)

2.1 Introduction

There are various types of firms in market economies. Capitalist firms (such as stock companies), which are the firms owned by the suppliers of capital, are by all means dominant in most industries. [1] Worker owned firms, which are the firms owned by the suppliers of labor, are much less common than capitalist firms, but still seen in such industrial areas as professional services (*e.g.*, law, accounting, management consulting, architecture, and medicine), road transport (*e.g.*, taxicabs and truck transportation), and plywood manufacturing. [2] Consumer cooperatives, which are the firms owned by the customers of the product, are familiar in the retail of food. This enterprise form is also seen in finance, insurance, medical care, and housing. Most corporations in the private sector can be classified in either of these three classes of firms, or can be seen as a mixture of these. Other types of firms are not very common in the real world.

Food manufacturing firms run by agriculture cooperatives (henceforth referred to as food processing cooperatives) are classified in the fourth type of firms, which are formally owned by the suppliers of raw materials. [3] That

[1] Ownership of the firm consists of the rights to control the firm and to claim the residual earnings of the firm. This concept is different and must be clearly distinguished from ownership of physical assets for production of the firm, as discussed in Hart and Moore (1990).

[2] See Hansmann (1996), chapter 5.

[3] The agriculture cooperatives are the largest cooperative organization in Japan. As of 1998, there were over 2000 agriculture cooperatives with more than 5 million members nationwide. Each agriculture cooperative is hierarchically organized under a prefectural union, and each prefectural union is further hierarchically organized under the national union. (So the whole agriculture cooperative is a three-tier organization.) Business activities of agriculture cooperatives include credit, insurance, collective purchasing of production materials and livelihood necessities, collective marketing of agricultural products, agricultural warehousing, processing and manufacturing of agricultural products, and supplying of housing lots. Total business profit from these activities amounted to 2.3 trillion yen (or about 22 billion dollars) in 1997. (Data based on Ministry of Agriculture, Forestry and Fisheries (1997).)

is, food processing cooperatives are owned by farmers as the suppliers of raw agricultural products. (Figure 2.1.) Typically, in this type of the firm, decision making is made by member farmers through one member-one vote rule, and the surplus is divided among them according to the amount of raw agricultural products they supplied to the firm. This is in contrast to capitalist firms, in which decision making is ultimately made by the shareholders through one share-one vote rule, and the profit is divided among them according to the equity shares they hold. Therefore, food processing cooperatives may well have features that are different from capitalist firms. [4]

Based on statistical data and case studies, this chapter explores comparative efficiency of food processing cooperatives, mainly in contrast to food manufacturing stock companies. Through the examination, we reached a conclusion that market failure in the market for raw agricultural products is by all means influential in the formation of food processing cooperatives. In contrast, factors that are involved with firm ownership, such as monitoring costs and risk bearing, appeared less influential, as far as the food categories we chose are concerned.

The next section explains the analytical framework. Section 2.3 takes five industry groups that are important for Japanese agriculture cooperatives, and examines comparative efficiency of food processing cooperatives in

[4]Overall, manufacturing industries are under relatively weak governmental regulations compared to other industries. According to Economic Planning Agency (1994), the share of regulated industries in manufacturing industries was 14.1%. The shares of regulated industries in other industries were 87.1% for agriculture, forestry and fisheries, 100% for mining, 100% for construction, 100% for electricity, gas, heat supply and water, 97.3% for transport and communications, 100% for finance and insurance, 7.5% for real estate, 55.6% for service, and 0% for government. (The share for wholesale and retail trade, eating and drinking places was not available in the report.) The relatively low level of regulation in manufacturing industries may imply that the observed distribution of firm types is a result of free choice among various enterprise forms.

reference to market power and asymmetric information. Section 2.4 explores other factors that can influence the formation of food processing cooperatives. Section 2.5 concludes the study.

2.2 Analytical framework

Under farmers' ownership of a food manufacturing firm, raw agricultural products (as input) are provided to the firm in a self sufficient manner, whereas physical capital services, labor, and the processed food (as output) are traded in the market. (Figure 2.1.) This is in contrast to the transactions in input and output under capital suppliers' ownership of the firm. In the latter type of the firm, physical capital services are provided to the firm in a self sufficient manner, whereas raw agricultural products, labor, and the processed food are traded in the market. Therefore, comparative advantages of food processing cooperatives can arise when by some reasons the market for raw agricultural products is inefficient.

Three major causes for market failure are asymmetric information, externality, and market power. In the next section, we examine comparative efficiency of food processing cooperatives from the viewpoint of the market power and the asymmetric information in the market for raw agricultural products. [5]

Market power

Farmers are numerous and individually small-sized. In contrast, food manufacturers are often much fewer in number and greater in size. Therefore, monopsony is a natural consequence in the market for farm products. Prices

[5]Since farm products are all private goods, externality cannot be a major cause of inefficiency in the market.

for farm products are hence distorted downward, and the market transaction results in an inefficient resource allocation. In theory, such inefficiency can be prevented by letting farmers own the food manufacturing firm themselves.

Asymmetric information

In many cases, quality of raw agricultural products is known only to the farmers who have grown them. For example, safety of vegetables depends upon how they were grown; by organic farming, or by standard farming with chemical fertilizer, pesticides, and herbicides. Such information is known to the farmers for an obvious reason, but not to the third parties, since the ways of farming cannot be correctly judged just by looking at the surface of the products. With asymmetry of information on the quality, the market for agricultural products may suffer from such problems as moral hazard or adverse selection. These problems will disappear by forming a food processing cooperative.

2.3 Empirical observations

In this chapter, the scope of food manufacturing industries is confined to twelve small (three-digit) industry groups coded from 121 to 129, and from 131 to 133, in the Standard Industrial Classification for Japan (SIC) revised in 1993 (Table 2.3). Within the food manufacturing industries, we take five detailed (four-digit) industry groups of the SIC in which agriculture cooperatives earn large proceeds (Table 2.1). We then examine the implication of market power and asymmetric information on the formation of food processing cooperatives in these industries.

Meat products [1211], *Dairy products* [1212]

The categories of meat processing and milk processing in Ministry of Agriculture, Forestry and Fisheries (1997) correspond to the divisions of meat products [1211] and dairy products [1212], respectively, of the SIC (Tables 2.1 and 2.3). The agriculture cooperatives' sales of meat processing and milk processing amount to 24.0 and 24.5 billion yen, respectively, which constitute 12.2% and 12.4%, respectively, of the total sales of their processed goods (Table 2.1). As of 1991, 43 (3.6%) agriculture cooperatives and 63 (16.1%) stock companies run by agriculture cooperatives were engaged in the manufacturing of meat products, whereas 35 (2.9%) agriculture cooperatives and 65 (16.9%) stock companies run by agriculture cooperatives were engaged in the production of milk (Table 2.2). [6] The employee ratio of cooperative (and other types of noncapitalistic) firms is 4.3% in the manufacturing of meat products, whereas it is 9.0% in the manufacturing of dairy products (Table 2.3, Ratio 2).

There seems to be substantial monopsonistic power in the market for raw meat. There are six meat product manufacturers which list their equity at the first section of the Tokyo Stock Exchange Market. [7] The CR3 (sum of the market shares of the top three companies) is 44.1% for ham, 57.7% for sausages, and 84.9% for corned beef. The CR4 for meat products as a whole

[6] There are two types of farmer owned enterprises: enterprises that are directly managed by agriculture cooperatives, and firms in stock company form that are run by agriculture cooperatives (called 'cooperative companies'). Although firms of the latter type are legally stock companies, many of them are practically regarded as cooperative firms. In many cooperative companies, (1) a substantial share of the equity is owned by the parent agriculture cooperative, and the equity is not traded in an open market; (2) there are no dividends on the equity; and (3) often managers come from the parent agriculture cooperative. By these reasons, we do not explicitly distinguish these two types of farmer owned enterprises in this chapter.

[7] The six meat product manufactures are Itoham Foods, Nippon Meat Packers, Prima Meat Packers, Marudai Food Co., Hayashikane Sangyo Co., and Yonekyu Corp..

exceeds 60%. [8] It is referred to in case studies that meat processing by agriculture cooperatives is to rival the domination of market by downstream firms (such as manufacturers, wholesalers or retailers). [9]

Potential monopsonistic power also appears quite intensive in the market for raw milk. Three giant dairy product manufacturers list their equity at the first section of the Tokyo Stock Exchange Market. [10] The CR3 is 90% for cheese, 60% for powdered milk, 52% for butter, and 48% for milk. [11] Since price elasticity of supply is quite small for raw milk (raw milk is perishable and must be processed very quickly after extraction), monopsony power is easily exercised by milk product manufacturers over the ranchers even in a small local economy. Indeed, it is argued in various case studies that ranchers have long struggled with low and unstable milk prices that are offered by large manufacturers. For instance, it is reported that ranchers' dissatisfaction with low milk prices that were offered by major manufacturers was the principal motivation for the establishment of the current Yotsuba Milk Products Co., a major milk processing firm in joint stock company form run by several agriculture cooperatives in Hokkaido prefecture. [12]

Knowledge of the quality of raw meat and milk enables ranchers to produce differentiated products, which may give them an incentive to start the processing business by themselves. Generally speaking, ranchers have accurate and detailed information about the quality of the livestock products they produce, but it is difficult or costly to be observed for outsiders. This informational advantage enables ranchers to adopt production lines that are

[8] Nikkan Keizai Tsushinsha (1997), chapters 9 and 15.

[9] Shiraishi (1985b)

[10] The three dairy product manufacturers are Snow Brand Milk Products Co., Morinaga Milk Industry Co., and Meiji Milk Products Co..

[11] Nikkan Keizai Tsushinsha (1997), chapter 8.

[12] Higurashi (1985b).

suitable to the raw livestock products. On the contrary, ranchers may produce raw meat and milk that match their processing technologies. [13]

In fact, it is commonly observed that agriculture cooperatives take a corporate strategy to vertically differentiate their products from the standardized products made by large manufacturers. For instance, the Tohaku-cho Agriculture Cooperative in Tottori prefecture has a policy that in principle it uses only the raw meat they produce, and adds salt and food additives as little as possible. This is in order to have their products gain prestige value to be of high quality and healthy. [14] This is in sharp contrast to the production doctrine adopted by large manufacturers. Typically, large manufacturers produce standardized products out of imported meat with a variety of food additives in a huge, highly automated plant. This enables them to save production and distribution costs to a substantial degree.

Such difference in production style between agriculture cooperatives and large manufacturers can also be seen in the manufacturing of dairy products. Usually, large dairy product manufacturers collect raw milk from various places and mix them to produce standardized milk. On the contrary, dairy products processed by agriculture cooperatives are basically made of the raw milk they extract themselves. For instance, the Hiruzen Ranchers' Cooperative in Okayama prefecture has a corporate strategy to produce pure jersey milk by using only the raw milk extracted from their own jersey milch cows.

[13] When consumers can observe the quality of the final products *ex ante* (search goods) or *ex post* (experience goods), the firm with private information has some incentives to produce high quality products, regardless of the enterprise form. When consumers cannot observe the quality of the final products even after purchasing and consuming the goods (credence goods), the firm is induced to produce low quality products. However, if consumers infer the quality of the products, the firm may want to send them a signal of the real quality, *e.g.* through price or advertisement. Therefore, the firm may still produce high quality products. Enterprise form can affect the firm's ability to send an effective signal for revealing its true type to the consumers.

[14] Shiraishi (1985a).

[15] Generally speaking, Japanese consumers have a strong desire for safe milk, and this sustains competitiveness of the milk made by agriculture cooperatives. For a reason, Japanese consumers have experienced several polluted milk cases, and are especially alert to the safety of milk and dairy products. [16] Knowing the nature of the raw milk, and equipped with labor intensive production facilities, agriculture cooperatives have an advantage of producing safe milk, compared to large manufactures.

Canned and preserved fruit and vegetable products except pickled vegetables [1231]

The category of bottling and canning of fruits and vegetables in Ministry of Agriculture, Forestry and Fisheries (1997) roughly corresponds to the division of canned and preserved fruit and vegetable products except pickled vegetables [1231] of the SIC (Tables 2.1 and 2.3). The agriculture cooperatives' sales of vegetable and fruit products (excluding pickles) amount to 29.3 billion yen, which constitutes 14.9% of the total sales of their processed goods (Table 2.1). The employee ratio of cooperative (and other types of noncapitalistic) firms in this industry group is 9.4% (Table 2.3, Ratio 2).

Overall, potential monopsonistic power does not appear very strong in the market for raw fruits and vegetables. The CR 3 is 27.2% for canned fruits, and 40.4% for canned vegetables. [17] With a variety of substitutes, leading companies in this area do not seem to have strong influence upon the

[15] Takenaka (1985a).

[16] The most serious case of polluted milk is the Morinaga Arsenic-contaminated Milk Case that took place in 1955. Sodium secondary phosphate for industry use was used by mistake as a food additive in powdered milk for babies in a factory of Morinaga Milk Industry Co.. The powdered milk got contaminated with arsenic acid, which was contained in the sodium secondary phosphate. As the result, 130 babies were killed and more than 12,000 babies were seriously injured. See Kawana (1989), chapter 5, for the details of this case.

[17] Nikkan Keizai Tsushinsha (1997), chapter 9.

market. We also do not find many case studies which describe that fruits and vegetable farmers suffered from low market price offered by large manufacturers. Monopsony power hence is not considered a principal incentive for farmers to establish food processing cooperatives in this food category.

Rather, informational advantage seems to give farmers more important incentive to form food processing cooperatives in this area. With the private information on the quality of their own products, farmers have an advantage in producing differentiated products. For the obvious reasons, farmers are well informed about the characteristics and quality of their crops. In addition, agriculture cooperatives are usually endowed with small scale factories, and their methods of processing fruits and vegetables are necessarily highly labor intensive. These properties (a sufficient knowledge on the quality of raw fruits and vegetables, and labor intensive production methods) give agriculture cooperatives an advantage in producing a small amount and wide variety of high quality products.

For instance, it is the policy of the Oita Oyama-machi Agriculture Cooperative in Oita prefecture to use only their own fruits and vegetables as input, not to make a large scale investment in production facilities, and to rely mostly on human hands to produce homemade-like products. Despite its small organizational size with just 690 member farmers, the cooperative produces over 40 kinds of processed fruit and vegetable products, such as strawberry jam, plum jam, plum jelly, marmalade, etc.. In order to maintain their brand name recognition for high quality products, the cooperative has a sales strategy not to supply their products to the supermarkets and other discount stores but to wholesale only to the department stores and prestigious consumer cooperatives. [18] Such strategy is possible and effective only

[18] Masui (1985).

if the quality information is known to the individuals who control the firm.

Starch [1292]

The category of starch and potato processing in Ministry of Agriculture, Forestry and Fisheries (1997) roughly corresponds to the division of starch [1292] of the SIC (Tables 2.1 and 2.3). [19] In this category, agriculture cooperatives have a substantial market share in potato starch. Over 90% of all starch and other potato products manufactured by agriculture cooperatives is produced by agriculture cooperatives in Hokkaido prefecture. The agriculture cooperatives' sales of starch and potato products amount to 37.5 billion yen, which constitutes 19.0% of the total sales of their processed goods (Table 2.1). As of 1991, 67 (5.6%) agriculture cooperatives and 22 (5.6%) stock companies run by agriculture cooperatives were engaged in the production of starch (Table 2.2). The employee ratio of cooperative (and other types of noncapitalistic) firms in this industry group is 8.0% (Table 2.3, Ratio 2).

Historically, market power was a major reason for agriculture cooperatives to undertake starch manufacturing. A prominent instance is observed in the potato processing by the Shihoro Agriculture Cooperative in Hokkaido prefecture. Until the Second World War, potato farmers in the village of Sihoro had long struggled with low price and unfair terms of trade in the transaction with starch manufacturers in the community. [20] After the Second World War, the agriculture cooperative in the village bought out a factory from a starch manufacturer and began processing their potatoes. The principal objective of the factory was to establish a stable and fair transactional

[19] Potato products such as French fries and potato chips are included in the category of starch and potato processing in Ministry of Agriculture, Forestry and Fisheries (1997), but they are not included in starch [1292] of the SIC.

[20] Conventionally, the Fair Trade Commission of Japan has a relatively mild stance in applying the anti-trust law. This might allow market power to exist in local economy.

relationship with the potato farmers. Potato processing by the agriculture cooperative has attracted wide popularity among the potato farmers, and today the scope of potato products has expanded to cover such items as French fries and potato chips. [21] Monopsonistic power thus seems to have played an important role for the establishment of potato processing cooperatives in this region.

Potatoes are relatively homogeneous agricultural products. Starch is also quite a homogeneous product produced in a simple production line. In addition, most part of the starch produced is used not for final consumption but for input for producing other food. For these reasons, asymmetric information on the quality of potatoes does not seem to cause serious problems in the market for potatoes. It therefore is not considered a principal reason for the establishment of potato processing cooperatives.

Tea [1331]

The manufacturing of tea leaves consists of two stages: processing the raw tea leaves into crude tea leaves, and refining the crude tea leaves into final tea leaves. The category of tea refining (both crude and final) in Ministry of Agriculture, Forestry and Fisheries (1997) corresponds to the division of tea [1331] of the SIC (Tables 2.1 and 2.3). The agriculture cooperatives' sales of tea refining amount to 23.8 billion yen, which constitutes 12.1% of the total sales of their processed goods (Table 2.1). Overall, agriculture cooperatives have a substantial share in the production of crude tea leaves, but have only a limited share in the production of final tea leaves. As of 1991, 159 (13.2%) agriculture cooperatives and 39 (9.9%) stock companies funded by agriculture cooperatives were engaged in the production of crude tea leaves, whereas 134 (11.1%) agriculture cooperatives and 26 (6.6%) stock companies funded by

[21] Higurashi (1985a).

agriculture cooperatives were engaged in the production of final tea leaves (Table 2.2). The product in this category which agriculture cooperatives primarily deal with is green tea leaves.

There are a great many number of tea leaf manufacturers, and the concentration rate of the industry is low. [22] However, this does not mean that there is no serious market power in the market for raw tea leaves. Manufacturing and distribution of tea leaves have a long history in Japanese society, and its distribution system is said to be extremely conservative and closed. That is, major local tea leaf refiners and wholesalers have dominated the market for raw tea leaves, and have exercised strong monopsony power over the tea leaf farmers. [23] There are several reasons why such industry structure prevails over the long period of time.

First, final tea leaf is a product that is highly differentiated. There is wide regional diversity in preferences for tea. For instance, green tea with a strong taste is preferred in Shizuoka prefecture; one with a somewhat raw taste is preferred in Kyoto prefecture; and one with a steamed taste is preferred in Osaka prefecture. One kind of green tea that is favored in an area is even minutely classified into smaller sorts. [24] Green tea is not only locally (or horizontally) differentiated but also vertically differentiated to a large extent. Grades for green tea are determined mainly by the time of picking the raw tea leaves. For instance, in Shizuoka prefecture, Japan's largest raw tea leaf planting and final tea leaf producing area, the raw tea leaves that are picked in the earliest time (the highest grade), the second earliest time (the second highest grade), the third earliest time (the third highest

[22] There are 3,200 green tea manufacturers nationwide. The CR3 is 13.3% for green tea (unpacked), and 35.5% for green tea (packed). Data from Nikkan Keizai Tsushinsha (1997), chapter 12, section 4.

[23] Takenaka (1984).

[24] Ohishi (1983), chapter 1, section 1.

grade), and the fourth earliest time (the fourth highest grade), were priced at 484, 111, 79, and 38 yen, respectively, per kilogram. [25] Each grade is further minutely divided into several subgrades. [26] Because of such a fine horizontal and vertical differentiation, the market for tea leaves is partitioned into small and closed local markets, and in each differentiated market refiners and wholesalers exercise market power over the tea leaf farmers (monopolistic competition).

Second, since raw tea leaves quickly decay, they must be processed immediately after they are picked. Consequently, price elasticity of supply is low for raw tea leaves, and this creates a market environment in which monopsony power is easily exercised. [27] [28]

[25] Data in 1995. See Fuchinoue and Fuchinoue (1999), chapter 5, section 2, subsection 2.

[26] According to different data on Shizuoka prefecture, during the three years from 1970 to 1972, green tea leaves that were picked at the beginning period, the middle period, and the final period, of the earliest time (the highest grade) were priced, on average, at 350, 192, and 166 yen, respectively, per kilogram. Similarly, green tea leaves that were picked at the beginning period, the middle period, and the final period, of the second earliest time (the second highest grade) were priced at 117, 90, and 76 yen, respectively, per kilogram. See Fuchinoue and Fuchinoue (1999), chapter 5, section 2, subsection 2.

[27] Presumably because of such unstable quality of raw tea leaves, a commercial custom has been created that raw tea leaves which are picked by the farmers are immediately handed over to manufacturers without a definite agreement on price. The price is later determined when the manufacturers recognize the quality of the tea leaves. In such *ex post* determination of the price, the manufacturers come to have a dominant bargaining power, and there is no help for the farmers but to accept the price offered by the manufacturers. In the year of a good harvest, the manufacturers assign a quota of raw tea leaves they buy from the farmers, and refuse to buy an additional quantity. In this way, tea leaf farmers are in a weak position in the market that is dominated by manufacturers. See Fuchinoue and Fuchinoue (1999), chapter 5, section 2, subsection 4.

[28] In contrast to raw tea leaves, crude tea leaves can be preserved for an extended period of time. The crude tea leaf producers can therefore keep their products in cold storage and supply them to the market when the price is favorable to them. In addition, since raw tea leaves become about one-fifth in size when they are processed into crude tea leaves, transportation cost is lower for crude tea leaves than raw tea leaves. This makes it easy for crude tea leaf producers to sell their products even to distant refiners outside the community. (See Fuchinoue and Fuchinoue (1999), chapter 5, section 2, subsection 4.)

For these reasons, monopsonistic power is less easily exercised in the market for crude tea

For these reasons (minute differentiation of kinds and quality, and low price elasticity of supply), the market for raw tea leaves is not as competitive as it might appear in the statistical data. Rather, it is considered quite monopsonistic. Tea leaf processing cooperatives are thus thought to be a solution to avoid strong monopsonistic power imposed by downstream firms which dominate the segmented markets.

Knowledge of the features of raw tea leaves may also give tea leaf farmers an incentive to engage in tea leaf processing. Quality control of tea leaves is relatively easy if they were processed in a vertically integrated line, from growing raw tea leaves to manufacturing final tea leaves. It has been a custom of the industry not to label such information as place of production or processing site on the packages for final consumption. It is reported that tea leaves made by the Kanagawa Prefectural Economic Federation of Agriculture Cooperatives have attracted wide popularity among consumers by revealing such information on the packages. [29] A reason behind this is that consumers desire to know the safety information of the products, such as the type, amount, and frequency of agricultural chemicals that are used in growing the raw tea leaves. Such information can easily be obtained if the tea leaves are produced in a vertically integrated line run by agriculture cooperatives. Private information on quality can thus promote tea leaf processing by the farmers.

leaves than in the market for raw tea leaves. This may explain why agriculture cooperatives actively engage in the processing of raw tea leaves, but not so earnestly in the processing of crude tea leaves.

[29] Ohshima (1985).

2.4 Other factors

In the previous section, we examined how market power and asymmetric information could affect the establishment of food processing cooperatives. However, the reality is so complex that these two factors do not explain the whole. In this section, we discuss other factors that may affect comparative efficiency of food processing cooperatives.

Hold-up problems

A hold-up problem occurs in a multi-stage strategic interaction. In the present context, if a food processing plant is specific to a certain farming area, then the investors will refrain from making an ample investment in the plant in order to be ready for a sudden termination of trade in the raw agricultural product. [30] In a sense, the underinvestment is a result of uncertain return on investment for investors. In that case, rental contracts are a better solution than investor-owned firm for the physical capital to be properly provided to the firm. If farmers rent the factories, or own the factories themselves by raising a mortgage on their assets from a bank, then a hold-up can be prevented. [31] [32]

Factories for processing fruits and vegetables are usually built in inland areas near the place of their production. For instance, canned tangerines are produced in Nagasaki prefecture, the major area for tangerine production; canned peaches in Yamagata prefecture, the major area for peach production; and canned pineapples in Okinawa prefecture, the major area for pineapple

[30] Williamson (1979).

[31] Putterman (1984) and Hansmann (1988) discussed the possibility that, in a noncapitalistic firm, the firm owners get to own the physical capital entirely by borrowing.

[32] Another possibility to avoid a hold-up is to let capital owners farm themselves. This way seems unrealistic, however. In particular, ownership of a farm by stock companies is prohibited by law in Japan.

production. [33] The advantages of operating factories at the place of production are to keep freshness of the raw products, and presumably to save on transportation costs. But factories for such on-the-spot production come to have site specificity. In particular, factories built far from urban areas will be of little use once the farmers stop supplying the local agricultural products. [34] The value of physical assets per establishment is 177 million yen in this industry, which is not very small (Table 2.3, Capital). In this circumstance, investment in production facilities may well be hindered. This inefficiency can be prevented if farmers own the factories and process their fruits and vegetables by themselves.

Site-specificity can also be influential in the formation of potato processing cooperatives. Production of both potatoes and potato starch is concentrated in Hokkaido prefecture. About 77% (2,597 thousand tons) of the total domestic production of potatoes (3,365 thousand tons) were produced in Hokkaido prefecture in 1995. In addition, as it is seen above, more than 90 percent of the potato starch made by agriculture cooperatives is processed in the same region. The amount of physical assets that is required for starch production is relatively large (which is 335 million yen, or 3.04 million dollars, per establishment; see Table 2.3, Capital). Taking these facts into account, we can imagine that potato farming villages in Hokkaido had difficulty in introducing a new investment in potato processing factories into the village. The underinvestment problem could thus be a reason for the establishment

[33] Japan Food Journal (1997), volume 2, pp. 342-344.

[34] Usually, the hold-up problem is discussed in such a context that farmers threaten manufacturers with a sudden termination of supply in their agricultural products. In practice, however, holding back investment in a rural community can arise even in the absence of farmers' intentional termination of trade. For instance, production of a farm product may stop due to the lack of successors of the farm. Or, the boom for certain processed food may be over soon. In these cases, factories built in countryside become devaluated, which backwardly prevents investment in the local community.

of potato processing cooperatives in this region.

Monitoring costs

Under separation of ownership and control, there arise costs of investigation whether the management is appropriately executed for the sake of the firm owners. In the present context, the costs for monitoring may be small for farmers when the factory is located within their farm area, and the farmers have good access to the factory.

An example may be found in the case of fruits and vegetable products. As discussed in the previous subsection, factories for processing fruits and vegetables are usually built near the place of their production. The geographical proximity makes it possible for the farmers to visit and watch the factories frequently. This may contribute to the establishment of fruits and vegetable processing cooperatives in farm areas.

Risk bearing

An agriculture cooperative consists of family-managed farmers. Their livelihood depends heavily upon the activities of the agriculture cooperative they belong to. Farmers are therefore not in a good position to diversify the risks from undertakings compared to the investors of a stock company. [35] The cost associated with risk bearing will thus be great when the business is accompanied with substantial risks, and presumably when a large amount of investment is required to start the business.

In this respect, agriculture cooperatives may have some advantages in tea leaf processing. There is only a little variation in profits from tea leaf processing over the past decade (Table 2.3, Variance). In addition, facto-

[35] In particular, managers of agriculture cooperatives assume unlimited liability for the results of the cooperative's undertakings.

ries for tea leaf processing are quite small in size compared with other food manufacturing businesses (Table 2.3, Capital). These conditions may make it easier for farmers to engage in tea leaf production.

Institutions

By all means, the institutional framework influences the comparative advantage of food processing cooperatives. Under present laws, agriculture cooperatives are not allowed to issue bonds, so their external financing is restricted to borrowing from financial institutions. In addition, agriculture cooperatives are legally prohibited from borrowing a large sum for investment. These restrictions make it difficult for farmers to start a business that requires a large-scale factory. Also, the scope of undertakings and the area of activity are restricted for agriculture cooperatives. These restrictions keep their businesses from growing in variety and geographically. On the other hand, the corporate income tax rate is lower for agriculture cooperatives than for stock companies. Furthermore, under some conditions, agriculture cooperatives are exempted from an application of the anti-trust law. These favorable treatments for agriculture cooperatives may encourage establishment of food processing cooperatives.

2.5 Conclusion

In this chapter, we examined implications of market power and asymmetric information on the formation of food manufacturing firms run by agriculture cooperatives. Although market conditions vary across food categories, we observed that these two factors have important influence upon establishment of food processing cooperatives.

Market power is by all means thought to play the primary role for the

formation of food processing cooperatives. We found numerous case studies in which food processing cooperatives were formed in the market that is dominated by large food manufacturers. As far as the food categories we dealt with are concerned, statistical data seem to support this tendency.

The role of asymmetric information is also important. In many cases, private information on the quality of raw agricultural products gives farmers a good advantage in forming food processing cooperatives. For it is very important for food manufacturers to keep high quality and safety levels of food in Japan. Concerning this point, there are two features in the food supply system in Japan. Firstly, Japan heavily depends upon the imports of raw materials for food from overseas. Secondly, Japanese consumers have a strong preference for safe foods. Generally speaking, imported raw agricultural products are less costly than domestic products. This reflects a large scale, capital intensive agriculture overseas, in contrast to a small scale, labor intensive domestic agriculture. Typically, major food manufacturers use imported raw agricultural products, and produce standardized products in large, capital intensive plants. In contrast, agriculture cooperatives use domestic (*i.e.*, their own) raw agricultural products, and produce differentiated products in small, labor intensive factories. Consequently, the final products of agriculture cooperatives are priced higher than those of large manufacturers, but still maintain competitiveness in the market. [36] Informational

[36]This may explain the two characteristics of Japanese food manufacturing industries. First, they often exhibit a bi-polar concentration structure, in which standardized national brands and differentiated local brands coexist in a single market. (Tokoyama and Egaitsu (1995).) Our observation suggests that standardized national brands are produced by large manufacturing companies, while differentiated local brands are produced by smaller manufacturers such as food manufacturing cooperatives. Second, there are numerous small-sized food manufactures in Japan. This is in contrast to those in western countries. As of 1982, the number of all food manufacturing firms was 80,802 in Japan, whereas it was 26,887 in the United States, 6,747 in Britain, 4,653 in West Germany, and 3,485 in Australia. The average number of employees per firm was 15 in Japan, whereas it was 58

advantage makes it possible for food processing cooperatives to vertically differentiate their products, and this in turn makes it profitable for the farmers to process their own farm products.

In contrast to market power and asymmetric information, monitoring costs and risk bearing appear less influential for the formation of food processing cooperatives. We could only find a few instances in which such factors as location of factories or stability of earnings might have encouraged formation of food processing cooperatives.

in the United States, 97 in Britain, 102 in West Germany, and 51 in Australia. (Onodera (1987).) This is partly due to the prevalence of food processing cooperatives.

Bibliography

[1] Central Union of Agricultural Cooperatives, 1991, *National survey on activities of agriculture cooperatives*. (Nokyo no katusdo ni kansuru zenkoku issei chosa hokoku.) Tokyo: Central Union of Agricultural Cooperatives.

[2] Central Union of Agricultural Cooperatives, 1998, *Data list of local specialty processed foods by agriculture cooperatives*. (JA Chiiki tokusan kakohin data list.) Tokyo: Central Union of Agricultural Cooperatives.

[3] Economic Planning Agency, 1994, *Economic white paper*. Tokyo: Ministry of Finance.

[4] Fuchinoue, Yasumoto, and Fuchinoue, Hiroko, 1999, *Encyclopedia of Japanese tea*. (Nihoncha zensho.) Tokyo: Nosangyoson Bunka Kyokai.

[5] Hansmann, Henry, 1988, "Ownership of the firm." *Journal of Law, Economics, and Organization* 4-2: 267-304.

[6] Hansmann, Henry, 1996, *The ownership of enterprise*. Cambridge, MA: Harvard University Press.

[7] Hart, Oliver, and Moore, John, 1990, "Property rights and the nature of the firm." *Journal of Political Economy* 98-6: 1119-1158.

[8] Higurashi, Kenji, 1985a, "Potato processing by agriculture cooperatives and the local agriculture." (Nokyo baresho kako to chiiki nogyo.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *Development of local economy and food processing by agriculture cooperatives*. (Chiiki keizai no hatten to nokyo kako.) Tokyo: Jichosha: 129-149.

[9] Higurashi, Kenji, 1985b, "Milk processing by agriculture cooperatives and the local agriculture." (Nokyo gyunyu kako jigyo to chiiki nogyo.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 229-248.

[10] Hyogo Prefectural Union of Agricultural Cooperatives, 1991, *A method for energizing regional farming: A way for the Hyogo agricultural cooperative to make farming more prosperous in the 1990s*. Kobe: Hyogo Prefectural Union of Agricultural Cooperatives.

[11] Japan Food Journal, 1997, *Encyclopedia of food industries*. (Shokuhin sangyo jiten.) Sixth edition, volume 1 and volume 2. Tokyo: Japan Food Journal.

[12] Japan Food Journal, 1998, *List of firms in food industries*. (Shokuhinkai sogo meibo.) Tokyo: Japan Food Journal.

[13] Kawana, Hideyuki, 1989, *Drug and food pollution*. (Yakuhin shokuhin kogai.) Tokyo: Ryokufu Shupan.

[14] Kawano, Shigetou (ed.), 1986, *Encyclopedia of cooperatives*. (Kyodo kumiai jiten.) Second edition. Tokyo: Ienohikari Association.

[15] Management and Coordination Agency, 1993, *The standard industrial classification for Japan*. Tokyo: National Federation of Statistical Associations.

[16] Management and Coordination Agency, 1998, *1996 Establishment and enterprise census of Japan*. Vol. 1-1. Tokyo: Management and Coordination Agency.

[17] Masui, Yoshio, 1985, "One village-one good movement and food processing by agriculture cooperatives." (Isson-ippin undo to nokyo kako.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 91-109.

[18] Ministry of Agriculture, Forestry and Fisheries, 1997, *Statistics on agricultural cooperatives*. Tokyo: Ministry of Agriculture, Forestry and Fisheries.

[19] Ministry of International Trade and Industry, 1998, *1996 census of manufacturers: Report by enterprise*. Tokyo: Ministry of International Trade and Industry.

[20] Nikkan Keizai Tsushinsha, 1997, *Production and sales shares of alcoholic beverages and foods*. (Shurui shokuhin sangyo no seisan hanbai share). Tokyo: Nikkan Keizai Tsushinsha.

[21] Ohishi, Sadao, 1983, "History of tea industry development in Japan." (Nihon chagyo hattatsusi.) Tokyo: Nosangyoson Bunka Kyokai.

[22] Ohshima, Kazutsugu, 1985, "Development and function of tea leaf processing by agriculture cooperatives." (Nokyo cha kako jigyo no tenkai to kino.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 195-209.

[23] Onodera, Yoshiyuki, 1987, "The management and economy structure of food manufacturing industries." (Shokuhin kogyo no keiei keizai kozo.) In: Namiki, Masayoshi (ed.), *Japanese food manufacturing industries*

towards the 21st century: Management/economy. (21 Seiki wo mukaeru Nihon no Shokuhin Sangyo: Keiei/Keizai.) Tokyo: Nosangyoson Bunka Kyokai: 75-113.

[24] Putterman, Louis, 1984, "On some recent explanations of why capital hires labor." *Economic inquiry* 22-2: 171-187.

[25] Shiraishi, Masahiko, 1985a, "Meat product manufacturing by agriculture cooperatives and the area formation of hog raising." (Nokyo no shokuniku kakohin seisan to yoton no sanchi keisei.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 111-127.

[26] Shiraishi, Masahiko, 1985b, "Meat treatment by agriculture cooperatives and the wide collective agricultural area." (Nokyo no shokuniku shori kako to koiki eino danchi.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 151-165.

[27] Shiraishi, Masahiko, 1995, "Today's characteristics of agricultural product processing and the development directions of agriculture cooperatives." (Nosanbutu kako no gendankaiteki tokusei to nokyo no tenkai hoko.) In: Agricultural Marketing Society of Japan, *Reformation of food distribution and the problems of cooperatives.* (Shokuryo ryutu saihen to towareru kyodo kmiai.) Tokyo: Tsukuba-Shobo Publishing Company: 133-152.

[28] Takenaka, Kunio, 1984, *Culture and economy of green tea.* (Ryokucha no Bunka to Keizai.) Tokyo: Ienohikari Association.

[29] Takenaka, Kunio, 1985a, "Hiruzen jersey ranch and milk processing." (Hiruzen jersey rakuno to gyunyu kako.) In: Takenaka, Kunio, and Shiraishi, Masahiko (eds.), *op. cit.*: 47-72.

[30] Teramoto, Yasuhide, 1999, *A Research on the history of prewar Japanese tea business*. (Senzenki nihon chagyousi kenkyu.) Tokyo: Yuhikaku.

[31] Tokoyama Hiromi, and Egaitsu Norio, 1995, "Industrial organization of food manufacturing industries." (Shokuhin kogyo no sangyo soshiki.) In: Norio Egaitsu and Teizo Higuchi (eds.), *Industrial organization of agri-business*. (Agri-business no sangyo soshiki.) Tokyo: The University of Tokyo Press: 173-194.

[32] Williamson, Oliver E., 1979, "Transaction-Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics* 22: 233-261.

Table 2.1: Sales (thousand yen) and ratio (%) of processed goods and by-products of 872 agriculture cooperatives. Ministry of Agriculture, Forestry and Fisheries (1997). Note: Sales by firms in joint stock company form are not included.

Items	Sales	Ratio
Rice & barley polishing	11,730,599	6.0
Milling	4,013,780	2.0
Starch & potato processing	37,452,481	19.0
Pickles manufacturing	14,956,589	7.6
Soy bean paste & sauce	1,917,377	1.0
Bottling & canning of fruits & vegetables	29,304,532	14.9
Meat processing	24,031,738	12.2
Milk processing	24,484,349	12.4
Tea refining	23,781,148	12.1
Fertilizer	1,955,739	1.0
Feed	1,382,837	0.7
Others	21,972,116	11.2
Total	196,997,752	100.0

Table 2.2: Food processing by agriculture cooperatives. Central Union of Agriculture Cooperatives (1991).

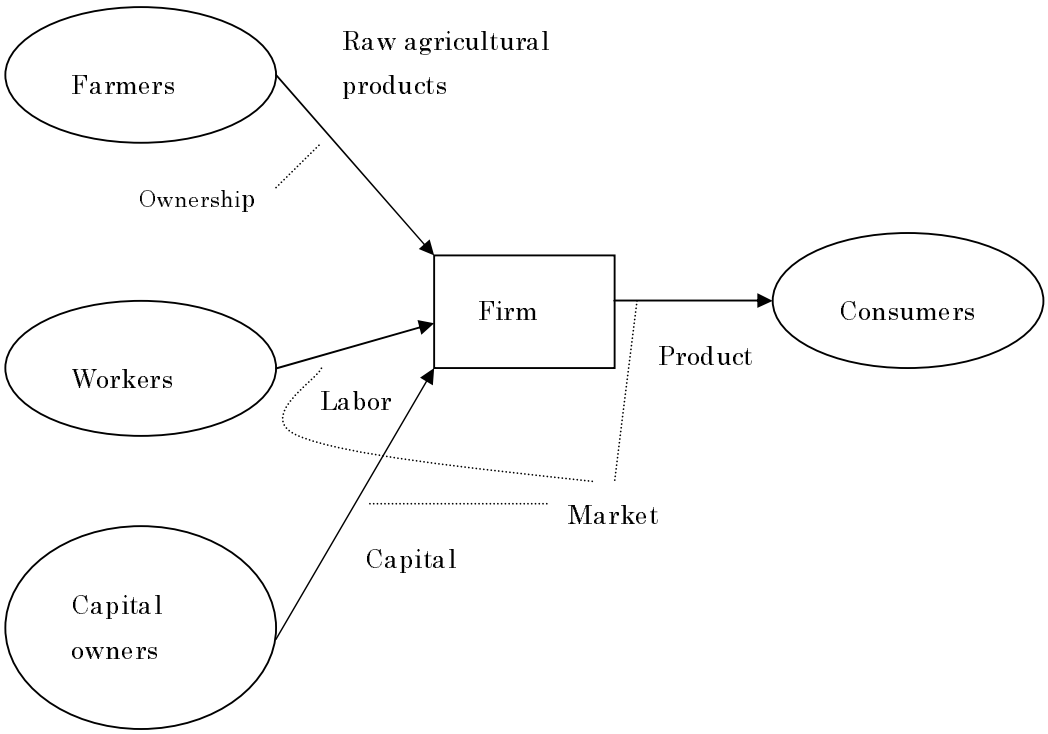
Items	Agriculture cooperatives		Joint stock company		Women's section		Voluntary group	
	#	%	#	%	#	%	#	%
Starch	67	5.6	22	5.6	5	0.7	19	1.4
Pickled vegetables	395	32.8	128	32.7	341	49.1	550	39.9
Soft drinks	151	12.6	49	12.5	57	8.2	108	7.8
Jam	69	5.7	28	7.1	118	17.0	188	13.6
Noodles	52	4.3	72	18.4	22	3.2	177	12.8
Rice products	125	10.4	35	8.9	63	9.1	135	9.8
Confectioneries	26	2.2	74	18.9	50	7.2	204	14.8
Canned & preserved food	140	11.6	72	18.4	74	10.6	172	12.5
Alcoholic beverages	31	2.6	99	25.3	2	0.3	103	7.5
Soy bean paste	484	40.2	86	21.9	435	62.6	508	36.9
Soy bean sauce	76	6.3	74	18.9	25	3.6	117	8.5
Seasonings except soy bean paste & sauce	35	2.9	14	3.6	21	3.0	43	3.1
Bean curd	89	7.4	126	32.1	84	12.1	490	35.6
Meat products	43	3.6	63	16.1	8	1.2	90	6.5
Milk	35	2.9	65	16.6	5	0.7	70	5.1
Dairy products except milk	11	0.9	32	8.2	9	1.3	21	1.5
Green tea (crude)	159	13.2	39	9.9	1	0.1	186	13.5
Green tea (refined)	134	11.1	26	6.6	1	0.1	174	12.6
Tea excpet green tea	67	5.6	18	4.6	5	0.7	107	7.8
Food boiled down in soy sauce	39	3.2	37	9.4	48	6.9	98	7.1
Others	279	23.2	49	12.5	57	8.2	166	12.0
Total	1,203	100.0	392	100.0	695	100.0	1,378	100.0

Table 2.3: Statistics of food manufacturing cooperatives. Ratio 1: Employee ratio of cooperatives (%). Management and Coordination Agency (1998). Ratio 2: Employee ratio of cooperatives (%). Ministry of International Trade and Industry (1998). Capital: Fixed capital assets per establishment (million yen). Ministry of International Trade and Industry (1998). Variance: Variance of rates of change in gross added values, 1988-1997. Ministry of International Trade and Industry (1998). Note: Employees of firms in joint stock company form are not included in Ratios 1 and 2.

Code	Industry	Raio 1	Ratio 2	Capital	Variance
121	Livestock products	6.1	7.1		
1211	Meat products		4.3	15.02	15.02
1212	Dairy products		9.0	19.52	19.52
1219	Others		9.3	87.49	87.49
122	Seafood products	2.5	2.9		
1221	Canned fish and seafoods		2.3	188.18	188.18
1222	Seaweed products		2.2	72.05	72.05
1223	Agar-agar		n.a.	121.29	121.29
1224	Fish sausages		n.a.	572.57	572.57
1225	Prepared seafood products		7.6	141.44	141.44
1226	Frozen fish and seafoods		9.5	217.85	217.85
1227	Frozen seafood products		4.1	124.16	124.16
1229	Others		n.a.	65.69	65.69
123	Canned & preserved fruit & vegetable products	6.9	6.1		
1231	Except pickled vegetables		9.4	12.93	12.93
1232	Pickled vegetables		3.9	19.73	19.73
124	Seasonings	2.5	2.6		
1241	Soy bean paste		4.2	20.93	20.93
1242	Soy bean sauce		6.7	15.10	15.10
1243	Chemical seasonings		0.0	218.75	218.75
1244	Sauce mix		0.0	94.81	94.81
1245	Vinegar		1.6	127.53	127.53
1249	Others		0.0	16.42	16.42
125	Sugar processing	4.2	n.a.		
1251	Cane sugar, except refining		n.a.	671.68	671.68
1252	Cane sugar refining		0.0	36.01	36.01

1253	Glucose		0.0	206.66	206.66
126	Flour & grain mill products	6.9	8.9		
1261	Rice polishing		22.0	172.42	172.42
1262	Wheat polishing		0.0	486.85	486.85
1263	Flour		0.0	124.53	124.53
1269	Others		0.0	260.66	260.66
127	Bakery & confectionary products	0.6	0.0		
1271	Bread		1.2	13.16	13.16
1272	Cakes		0.0	20.31	20.31
1273	Biscuits and crackers		1.5	32.35	32.35
1274	Rice crackers		n.a.	14.13	14.13
1279	Others		n.a.	21.88	21.88
128	Animal & vegetable oil & fats	1.1	1.8		
1281	Vegetable oils		8.7	46.86	46.86
1282	Animal oils		0.0	152.57	152.57
1289	Table oils			413.07	413.07
129	Miscellaneous foods & related products	1.8	1.7		
1291	Yeast		9.8	452.90	452.90
1292	Starch		23.1	103.61	103.61
1293	Noodles		0.0	26.82	26.82
1294	Malt		n.a.	30.40	30.40
1295	Bean curd, fried bean curd		3.1	22.34	22.34
1296	Sweet bean paste		2.9	29.80	29.80
1297	Frozen prepared foods		3.0	65.81	65.81
1298	Prepared foods		0.0	55.11	55.11
1299	Others		n.a.	28.22	28.22
131	Soft drinks & carbonate water	7.9	11.8		
1311	Soft drinks & carbonated water		11.8	102.76	102.76
132	Alcoholic beverages	1.0	0.0		
1321	Wines		8.7	34.99	34.99
1322	Beer		0.0	24.02	24.02
1323	Sake (Rice wines)		0.0	11.16	11.16
1324	Distilled & blended liquors		3.0	22.37	22.37
133	Tea & coffee	19.9	n.a.		
1331	Tea		n.a.	13.04	13.04
1332	Coffee		n.a.	169.81	169.81

Figure 2.1: Transactional structure of a food processing cooperative. The raw agricultural products are supplied to the firm through ownership (self-procurement). Labor, capital, and the product are traded in the market.



Chapter 3

Asymmetric information on production-related risks and the form of enterprise: Capitalist firms versus consumer cooperatives

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Abstract: This chapter explores the implications of forms of enterprise on the level of production-related risks. As forms of enterprise, we take a capitalist firm and a consumer cooperative. By the term 'production-related risks' here we mean both the risks of production process (a stochastic loss to the input providers) and the risks of products (a stochastic loss to the output customers). Assuming asymmetry of information on the safety level of production between the firm and the outside traders, we compare the equilibrium safety levels under the two types of firms. Our conclusion is that, in order to reduce production-related risks, an enterprise form should be chosen such that the management rights of the firm are given to the class of individuals which would incur the most substantial loss in case of an accident. At a first glance, this result may sound fairly straightforward: It is efficient to give management rights to those who are most affected by an accident, since that will best internalize the risk. This is the story under complete information,

however. Under incomplete information, the underlying logic is more complex. That is, efficiency of market transactions depends upon how effectively the mechanism of signaling works, which in turn depends upon distribution of losses among individuals in case of an accident. (JEL classification numbers: D18, L23, P12, P13. Key words: form of enterprise, capitalist firm, consumer cooperative, risk of production process, risk of product.)

3.1 Introduction

This chapter explores the implications of forms of enterprise on the level of production-related risks. As forms of enterprise, we take a capitalist firm, which is defined to be a firm owned by the owners of physical capital, and a consumer cooperative, which is defined to be a firm owned by consumers. Ownership of the firm is implied by the rights to control (or manage) the firm, and to claim the firm's residual earnings. [1] By the term 'production-related risks' here we mean both the risks of production process and the risks of products. The risks of production process refer to a stochastic loss to the input providers (*i.e.*, owners of physical capital, workers, and suppliers of other input) that accrues from an accident, whereas the risks of products refer to a stochastic loss to the output customers (*i.e.*, consumers) that accrues from an accident. [2] In this chapter, we will incorporate these two risks in one model. To clarify this idea, let us take the production of air transportation services, as an example. One needs an airplane (as physical capital) and flight attendants (as labor) to produce air transportation ser-

[1] There is some descriptive analysis on the relationship between asymmetric information and enterprise form in Ben-Ner (1986), Ben-Ner and Hoomissen (1993), and Hansmann (1996).

[2] The risks of production process, in the present context, have been studied in the literature on workplace injury (*e.g.*, Curington (1986), French (1988), and Lanoie (1992)), whereas the risks of products have been studied in the literature on product safety (*e.g.*, Arrow (1963), Oi (1973), Spence (1977), Simon (1981), Polinski and Rogerson (1983), Viscusi, Magat and Huber (1986), Kolstad, Ulen and Johnson (1990), and Daughety and Reinganum (1995)). In a sense, the present model synthesizes these two lines of works.

vices (as a product). If an airplane crashes, both input providers and output customers incur losses; the shareholders of the airline company (as owners of physical capital) lose the airplane, and the flight attendants (as workers) and the passengers (as consumers) lose their lives. In this framework, we assume that there is asymmetry of information on the safety level of production between a firm (*i.e.*, a capitalist firm, or a consumer cooperative) and outside individuals who transact with the firm (*i.e.*, consumers under a capitalist firm, or owners of physical capital under a consumer cooperative). We then compare the equilibrium safety level under a capitalist firm to that under a consumer cooperative. Our basic viewpoint is that individuals can reduce the risks that are associated with production through a proper choice of an enterprise form. In other words, we regard enterprise forms as a social institution for reducing production-related risks. [3]

An empirical fact that motivates us to pursue this research topic is the prevalence of consumer cooperatives in the retail of daily consumption goods. [4] Safety of daily consumption goods, such as food and household goods, is greatly influential on consumers' healthy life, and it is perceived in public that consumer cooperative stores sell safer goods than capitalist firm stores. There is some evidence that supports this stylized fact. Firstly, there are historical facts that consumer cooperatives have been involved in various ways with protection of consumers' safety and health. In the United States, the problem of food safety, such as agricultural chemicals and food additives, was one of

[3]The latter view to the enterprise form will be discussed in detail in section 3.6.

[4]Consumer cooperatives are pretty common in the retail of food and household goods in Europe and Japan. In Sweden, for instance, the share of total sales by consumer cooperatives is 12 to 13 percent with respect to food, and 21 percent with respect to household goods. (Kawano (1983).) In Japan, based on the number of employees, the share of noncapitalistic corporations (most of which are considered consumer cooperatives) is 9.0% for the retail of food in general. This is in contrast to the share of 2.6% for the retail industry as a whole. (Statistical Bureau (1996).)

the most important issues for the so-called 'new wave' co-ops during the late 1960s and 1970s. This idea of U.S. cooperatives was later imported to Japan, and the slogan of food safety and consumers' health became a strong engine for the development of Japanese consumer cooperatives. [5] Today, supply of safe goods seems to be a common objective of consumer cooperatives all over the world, and this is in sharp contrast to the stance of their stock company counterparts. [6] [7] Secondly, it is reported in various case studies that consumer cooperatives actually sell safer goods than stock companies. Tables 3.1 and 3.2 summarize some of those surveys. Table 3.1 shows the evaluation of major supermarket corporations in Japan with respect to their concern for environment and health. Overall, we see that consumer cooperatives earn significantly higher rates (with average points being 3.1 on a scale of 5 maximum) than stock companies (with average points being 1.8 on the same scale). [8] The second survey is summarized in Table 3.2. Based on the nature of goods sold at the stores, 255 supermarkets in the city of Kyoto are ranked according to their consciousness regarding consumers' health, and the top 30 stores among them are broken down into those of stock companies and those of consumer cooperatives. Although the share of consumer cooperative stores is just less than 10 percent of the 255

[5]It is often argued that the principal motive for Japanese consumers to become a co-op member is the desire to get safe and reliable goods. See Kakuchi (1995).

[6]International Co-operative Consumer Organization (1994, 1998); International Co-operative Alliance and the United Nations Department for Policy Coordination and Sustainable Development (1995); Italian National Association of Consumers' Coops (1995); Takamura (1995); Seikatsu Club Consumers' Cooperative Union (1995); Fabretti and Belfiori (1997); Co-op Kobe (1998); Japanese Consumers' Co-operative Union (1999).

[7]Such an inclination of consumer cooperatives towards safe and healthy goods is conspicuous in developed countries, but not so much in developing countries. Indeed, we do not find many arguments on safe and healthy goods in the documents issued by consumer cooperatives in developing countries. In those countries, consumer cooperatives seem to put more emphasis on consumer protection through low prices.

[8]Green Consumer Network (1994).

stores, 17 consumer cooperative stores appear in the top 30 with respect to safety of food (which is 56.7 percent), and 19 consumer cooperative stores appear in the top 30 with respect to safety of household goods (which is 63.3 percent). [9] From these surveys, it is seen that food and household goods sold at consumer cooperative stores are actually safer than those sold at capitalist firm stores. Thirdly, there is a fact that new consumer cooperatives are being established most intensively in the area of organic food distribution. [10] Taking these facts into account, we may conclude that, in reality, consumer cooperatives tend to supply safer food and household goods than capitalist firms.

The question that arises here is why in some cases consumer cooperatives supply safer goods than capitalist firms, or, more generally, why enterprise forms affect the safety level of production. One possibility is the difference in founding philosophy of the firm. In contrast to capitalist firms, which intrinsically have a strong profit motive, consumer cooperatives are established not for profit but for contributing to the consumers' welfare. It might therefore be taken for granted that consumer cooperatives tend to supply safer goods than capitalist firms. Philosophy cannot be the sole reason, however. For, firstly, it is costly for the firm to maintain a high safety level. If a consumer cooperative keeps a high safety level only for philosophical reasons, it will not survive in a competitive market. Secondly, as mentioned above, there is a fact that organic food retailing firms are often established as a consumer cooperative. If philosophy were the sole reason why consumer cooperatives supply safe food, consumers who desire to consume safe food would not need to establish a consumer cooperative, but could instead establish a stock company with keeping the same philosophy in mind. We thus need to find some

[9] Citizens Environmental Foundation (1999).

[10] Böök (1992), chapter 8; Coleman (1994), chapter 7, section 3.

economic reasons why consumer cooperative is at times a safer enterprise form than capitalist firm.

The major premises for the model are as follows. First, we assume that managing a firm implies access to the safety information of production. The safety level of production is therefore the private information of the owner of physical capital under a capitalist firm, whereas it is the private information of the consumer under a consumer cooperative. [11] It should be noted that the analytical framework adopted here is that of adverse selection, and not that of moral hazard. From the practical point of view, both models seem to have important implications to the reality. [12] Second, individuals outside the firm infer the safety level from the prices offered by the firm (*i.e.* the product price offered to the consumer by the capitalist firm, or the rental rate offered to the owner of physical capital by the consumer cooperative). Third, we consider the case in which production of the safe type should take place, whereas production of hazardous type should not take place, from a

[11] There are four possible cases according to the whereabouts of safety information: the owner of the physical capital is privately informed under both types of firms, the owner of the physical capital is privately informed under a capitalist firm whereas the consumer is privately informed under a consumer cooperative, the consumer are privately informed under a capitalist firm whereas the owner of the physical capital is privately informed under a consumer cooperative, and the consumer is privately informed under both types of firms. Which case is most plausible depends on characteristics of goods and services, the size of the firm, and other social, political, economic, and geographical conditions, though the third case seems least plausible. In this chapter, I adopt the second option on the ground that usually safety information is most likely obtained through daily operations of the firm.

[12] There are some difficulties in modeling moral hazard in the present context, however. First, if the standard model of moral hazard is applied, the consumer (principal) should be risk-neutral and the capital owner (agent) should be risk-averse under a capitalist firm, whereas the capital owner (principal) should be risk-neutral and the consumer (agent) should be risk-averse under a consumer cooperative. The switch of preferences to the risk may be problematic. Second, the contract (which is the product price under a capitalist firm, or the rental rate for physical capital under a consumer cooperative) should be conditional upon the realization of an accident. In the real world, we do not find many such examples.

social welfare point of view.

Upon such setting of the model, we obtain the following result. Safety of production is more likely assured under a capitalist firm than under a consumer cooperative when the loss caused by an accident is large for the owner of physical capital but small for the consumer. Conversely, safety of production is more likely assured under a consumer cooperative than under a capitalist firm when the loss caused by an accident is large for the consumer but small for the owner of physical capital. This gives us a direction that: *to reduce production-related risks, select a form of enterprise such that the management rights of the firm are given to the class of individuals who would incur the most substantial loss in case of an accident.* At a first glance, this result may sound fairly straightforward: It is efficient to give management rights to those who are most affected by an accident, since that will best internalize the risk. This is the story under complete information, however. Under incomplete information, the underlying logic is more complex, which may be summarized as follows.

A correct intuition for the result is as follows. There are potentially two markets that are available for transactions; the product market, and the rental market for physical capital. Under a capitalist firm, the product market is used for trading the product between the capitalist firm and the consumer. Alternatively, the rental market for physical capital is not used there. For the owner of physical capital uses his own physical capital for production, so that the physical capital is not rented at the rental market. Under a consumer cooperative, the rental market for physical capital is used for trading the physical capital services between the consumer cooperative and the owner of physical capital. Alternatively, the product market is not used there. For the consumer produces and consumes the product by him-

self, so that the product is not sold and bought at the product market. (For this discussion, also see footnote 21.) The point is that neither market can be thoroughly free from the inefficiency caused by asymmetric information; adverse selection occurs in the product market under a capitalist firm, and it occurs in the rental market for physical capital under a consumer cooperative. Then, which market should we choose for transactional use? Obviously, we should choose the market that is less vulnerable to the asymmetric information and realizes a better resource allocation.

To consider this problem, suppose that the loss to the owner of physical capital is small and the loss to the consumer is large. Since the loss to the owner of physical capital is small, safe technology is not so valuable for the owner of physical capital. Then, the capitalist firm of the safe type, were it formed, would have only a small economic advantage over the capitalist firm of the hazardous type, and the capitalist firm of the safe type would not be in a very good position to distinguish itself from the capitalist firm of the hazardous type. Hence, the capitalist firm of the safe type would not successfully reveal its true type to the consumer in the product market. Therefore, it is unlikely that the product market, were it used under a capitalist firm, would function well to select the safe technology and attain efficiency. On the other hand, since the loss to the consumer is large, safe technology is highly valuable for the consumer. Then, the consumer cooperative of the safe type, were it formed, would have a large economic advantage over the consumer cooperative of the hazardous type, and the consumer cooperative of the safe type would be in a good position to distinguish itself from the consumer cooperative of the hazardous type. Hence, the consumer cooperative of the safe type would successfully reveal its true type to the owner of physical capital in the rental market for the physical capital. Therefore, it

is likely that the rental market for the physical capital, were it used under a consumer cooperative, would function well to select the safe technology and attain efficiency. Thus, when the loss to the owner of physical capital is small and the loss to the consumer is large, the mechanism of signaling will work better in the rental market for the physical capital than in the product market to remove the inefficiency caused by the asymmetric information. Consumer cooperative therefore turns out to be a safer (and more efficient) enterprise form than capitalist firm in this case. A symmetrically reverse explanation holds for the case when the loss to the owner of physical capital is large and the loss to the consumer is small. In that case, capitalist firm is a safer (and more efficient) enterprise form than consumer cooperative. In sum, we should choose the enterprise form with which the mechanism of signaling works effectively to cure the market disordered by the asymmetric information.

This conclusion may explain in part the empirical observations as argued above that consumer cooperatives tend to deal with safer food and household goods than capitalist firms. That is, since the loss from unsafe food and household goods usually falls on the consumers (such as health problems) but not on the owners of physical capital, consumer cooperatives turn out to be safer than capitalist firms in the supply of those goods.

The analysis in this chapter implicitly assumes that there are no third parties that supervise product safety. Examples for such organizations include Consumers Union and Underwriters Laboratories Inc.. Consumers Union is a nonprofit organization that tests and distributes the information through its publication, Consumer Reports. Underwriters Laboratories is also a nonprofit organization that tests and certifies safety of products. It has its own safety standards and inspection centers, and serves 92 countries worldwide.

Such independent organizations can be an alternative to the establishment of consumer cooperatives to secure safety of products.

The next section constructs a signaling model of the firm with production-related risks. Sections 3.3 and 3.4 derive the equilibrium safety levels of production under a capitalist firm and a consumer cooperative, respectively. Section 3.5 compares the equilibrium safety levels under the two types of firms. Section 3.6 discusses the conceptual relevance of this study to the conventional regulatory measures for product safety, such as minimum safety standards and liability rules. Section 3.7 concludes the chapter with some remarks.

3.2 The model

Consider a subeconomy with two individuals, 1 and 2. Individual 1 is the owner of physical capital. He either provides the physical capital (inelastically) for production, or not. Individual 2 is the consumer of the product which is made from the physical capital. He either consumes one unit of the product, yielding the monetary value v, or not. [13] The physical capital and the product are assumed specific in this subeconomy (*i.e.*, there are no uses for the physical capital and no alternative products outside), so that the reservation utility of individuals (*i.e.*, the payoff when the individuals do no make a transaction with each other in this subeconomy) is 0. [14] For analytical convenience, individuals are assumed to have a risk neutral expected

[13] It is easy to extend the model so that there are homogeneous n_1 owners of physical capital and homogeneous n_2 consumers. It is also easy to introduce an initial wealth m_i^0, $i = 1, 2$, to the model. These modifications in setting do not change the result, however.

[14] The other interpretation is that, outside the subeconomy, the rental rate for the physical capital is r^0, and the utility from an alternative product is v^0. Without loss of generality, we can normalize these values such that $r^0 = 0$ and $v^0 = 0$.

utility function, $u_i(m) = m$, $i = 1, 2$. [15]

There are potentially two types of production technology, one of the safe and one of the hazardous type. Let s^H and s^L, $0 \leq s^L < s^H \leq 1$, stand for the probability that an accident does *not* occur (*i.e.*, the safety level) when the production technology is of the safe and the hazardous type, respectively. The two types of production technology are different only in safety level. [16] Let q, $0 < q < 1$, be the prior probability that the technology is of the safe type, and so $1 - q$ be the probability that the production is of the hazardous type. [17] Let $s^P = qs^H + (1 - q)s^L$. Further, let $l_1 > 0$ and $l_2 > 0$ be the monetary loss incurred by the owner of the physical capital and the consumer, respectively, when an accident occurs. [18] For an example of l_1 and l_2, refer to the case of the air transportation service discussed at the outset of section

[15] By convention, for the expected utility function $u_i : \mathcal{L} \to R$, where $\mathcal{L}$ is a lottery space, $\mathcal{L} = \{[t, m; 1 - t, m'] : 0 \leq t \leq 1, m, m' \in R\}$, the notation is somewhat abused such that $u_i(m) = u_i([1, m; 0, m'])$. By assuming a risk neutral expected utility function, the problem of risk allocation among individuals can be left out of consideration. We can then purify the effects of enterprise form on the safety level of production in the analysis.

[16] For analytical simplicity, we use a single parameter, s^i, $i = H, L$, to represent both the risk of the production process and the risk of the product. Although it is not difficult to distinguish the two sorts of risk by using distinct parameters, that only makes the expressions complicated and does not change the essence of the result. Also, we can introduce cost difference between the two technologies, such as c^H for the unit cost under safe technology and c^L for hazardous technology. This generalization makes the analysis very complicated, but does not change the essence of the result.

[17] In order to obtain a concrete image of q, let us consider a grocery which buys vegetables for sale from nearby farms. The ratio of q farms conduct organic farming, while the rest uses chemical fertilizer, pesticides, and herbicides. The manager of the store knows which type of farm has delivered the vegetables to him, but that is not observable to the outsiders. With regard to the construction of the model, safety level in the present model plays the same role as the quality of used cars in Akerlof (1970), or productivity of workers in Spence (1973).

[18] The model and the analysis degenerate if $l_1 = 0$ and/or $l_2 = 0$. When $l_1 = 0$, for instance, there is no room for signaling to succeed under a capitalist firm, and only pooling equilibrium can exist.

3.1. [19]

When production with safety level s^i $(i = H, L)$ takes place, the social value of the enterprise is v with probability s^i, and $v - l_1 - l_2$ with probability $1 - s^i$, and so the expected social value is $V^i = v - (1 - s^i)l_1 - (1 - s^i)l_2$. When production does not take place, the social value of enterprise is 0. It is easily verified that $V^H > V^L$. In this chapter, I consider the case that $V^H > 0 > V^L$. Then, the efficiency of transaction can be described as follows.

Efficiency: The transaction between the owner of the physical capital and the consumer is efficient if: When the technology is of the safe type, the physical capital is provided for production by the owner of the physical capital, production takes place, and the product is consumed by the consumer; and when the technology is of the hazardous type, the physical capital is not provided for production by the owner of the physical capital, production does not take place, and no product is consumed by the consumer.

A capitalist firm is managed by the owner of the physical capital, where the safety level is the private information of the capitalist firm. The capitalist firm uses its own physical capital as input (self-procurement), and sells the product to the consumer. A consumer cooperative is managed by the consumer, where the safety level is the private information of the consumer cooperative. The consumer cooperative rents the physical capital from its owner, and supplies the product to the consumer (self-consumption).

[19] We exclude the possibility that individuals buy an insurance that compensates them for the possible loss in case of an accident.

3.3 The equilibrium safety level under a capitalist firm

With the information on the safety level, the capitalist firm offers a product price p to the consumer at which it wishes to sell the product. The consumer then chooses between buying and not buying the product. If the capitalist firm is of the safe type (hazardous type, respectively), an accident occurs with probability $1 - s^H$ ($1 - s^L$, respectively), causing losses l_1 and l_2 to the owner of the physical capital and the consumer, respectively.

When the capitalist firm of type i ($i = H, L$) engages in production and sells the product to the consumer, the capital owner's payoff is p with probability s^i, and $p - l_1$ with probability $1 - s^i$, and so his expected utility is $u_1 = p - (1 - s^i)l_1$. When the capitalist firm does not engage in production, the capital owner's payoff is 0. Then, the capitalist firm of type i never sells the product at the price p with $u_1 = p - (1 - s^i)l_1 < 0$, so that the price

$$\underline{p}^i = (1 - s^i)l_1 \tag{3.1}$$

is the lowest product price at which the capitalist firm of type i will sell the product. For analytical simplicity, we assume that the capitalist firm of type i does *not* sell the product when $p = \underline{p}^i$. [20] It is easy to verify that $\underline{p}^H < \underline{p}^L$.

When the consumer believes that the safety level is s and buys the product from the capitalist firm, his payoff is $v - p$ with probability s, and $v - p - l_2$ with probability $1 - s$, and so his (subjective) expected utility is $u_2 = v - p - (1 - s)l_2$. When the consumer does not buy the product, his payoff is 0. Then, given his belief s, the consumer never buys the product at the price p

[20] A more rigorous way to treat the model would be to introduce a sufficiently small cost $\delta > 0$ of selling the product. We will not do so, however, because that makes the presentation complex whereas the result does not change.

with $u_2 = v - p - (1-s)l_2 < 0$, so that the price

$$\overline{p}(s) = v - (1-s)l_2 \tag{3.2}$$

is the highest price at which the consumer will buy the product. For analytical simplicity, we assume that the consumer buys the product when $p = \overline{p}(s)$. [21] It is easy to verify that $\overline{p}(s^L) < \overline{p}(s^P) < \overline{p}(s^H)$.

Note that

$$V^i \begin{pmatrix} > \\ = \\ < \end{pmatrix} 0 \Leftrightarrow \underline{p}^i \begin{pmatrix} < \\ = \\ > \end{pmatrix} \overline{p}(s^i)$$

and let

$$\begin{aligned} Z_1 : &= \{(\underline{p}^H, \underline{p}^L) \in R^2 \mid V^H > 0, V^L < 0, \underline{p}^H < \underline{p}^L\} \\ &= \{(\underline{p}^H, \underline{p}^L) \in R^2 \mid \underline{p}^H < \overline{p}(s^H), \underline{p}^L > \overline{p}(s^L), \underline{p}^H < \underline{p}^L\}. \end{aligned}$$

Z_1 is the set of the pairs $(\underline{p}^H, \underline{p}^L)$ which is considered in this analysis. That is, in this area, production is worth taking place if the technology is of the safe type but it is not if the technology is of the hazardous type. Furthermore, the firm of the safe type can endure offering lower product price to the consumer than the firm of the hazardous type. For analytical convenience, let us divide Z_1 into three areas as

$$\begin{aligned} X_1^P &:= \{(\underline{p}^H, \underline{p}^L) \in Z_1 \mid \underline{p}^L < \overline{p}(s^P)\} \\ X_1^{S1} &:= \{(\underline{p}^H, \underline{p}^L) \in Z_1 \mid \overline{p}(s^P) \leq \underline{p}^L < \overline{p}(s^H)\} \\ X_1^{S2} &:= \{(\underline{p}^H, \underline{p}^L) \in Z_1 \mid \overline{p}(s^H) \leq \underline{p}^L\}. \end{aligned}$$

(Figure 3.1) Then, the equilibrium safety level of production under a capitalist firm is given as in the following lemma. [22]

[21] A more rigorous way to treat the model would be to introduce a sufficiently small cost $\epsilon > 0$ of not buying the product at this time. We will not do so, for the same reason as given in footnote 18.

[22] In this chapter, we only consider the equilibrium in pure strategy.

Lemma 3.1: Suppose that $V^H > 0$, $V^L < 0$, and there is a capitalist firm. In X_1^P, either (a) production of both the safe and the hazardous types can take place (so that the safety level is not revealed), where the product is sold at p with $\underline{p}^H < p \leq \overline{p}(s^P)$, or (b) production of only the safe type can take place (so that the safety level is revealed), where the product is sold at $\underline{p}^L$. In X_1^{S1}, production of only the safe type can take place (so that the safety level is revealed), where the product is sold at $\underline{p}^L$. In X_1^{S2}, production of only the safe type can take place (so that the safety level is revealed), where the product is sold at $\overline{p}(s^H)$.

Proof: See Appendix 3A. ‖

If the technology is of the hazardous type and the type is revealed, production does not take place. For, in order for a contract of transaction to be concluded between individuals 1 and 2, it is necessary that both $u_1 = p - (1 - s^L)l_1 > 0$ and $u_2 = v - p - (1 - s^L)l_2 > 0$ hold at the same time. But this is impossible since $V^L = v - (1 - s^L)l_1 - (1 - s^L)l_2 < 0$ by assumption. Hence, $u_1 > 0$ implies $u_2 < 0$, and $u_2 > 0$ implies $u_1 < 0$. That is, when individual 1 wants to sell the product, individual 2 does not want to buy it, and when individual 2 wants to buy the product, individual 1 does not want to sell it.

Let

$$X_1^S := X_1^{S1} \cup X_1^{S2} = \{(\underline{p}^H, \underline{p}^L) \in Z_1 \mid \underline{p}^L \geq \overline{p}(s^P)\}.$$

Then, Z_1 is divided into two zones, X_1^P and X_1^S, and the results of Lemma 3.1 are reduced as follows.

Lemma 3.2: Suppose that $V^H > 0$, $V^L < 0$, and there is a capitalist firm. In X_1^P, production of both the safe and the hazardous types can take place.

In X_1^S, production of only the safe type can take place.

Proof: Straightforward from Lemma 3.1, and the definition of X_1^P and X_1^S. ‖

It is observed from Lemma 3.2 that the outcome depends upon whether $\underline{p}^L$ is greater than or equal to $\overline{p}(s^P)$, or not. Notice that

$$\underline{p}^L \begin{pmatrix} > \\ = \\ < \end{pmatrix} \overline{p}(s^P) \Leftrightarrow l_1 \begin{pmatrix} > \\ = \\ < \end{pmatrix} \alpha_1 \tag{3.3}$$

where

$$\alpha_1 := -\frac{1-s^P}{1-s^L} l_2 + \frac{v}{1-s^L}.$$

Then we obtain the following proposition.

Proposition 3.1: Suppose that $V^H > 0$, $V^L < 0$, and there is a capitalist firm. Production of both the safe and the hazardous types can take place if $l_1 < \alpha_1$, and production of only the safe type can take place if $l_1 \geq \alpha_1$.

Proof: Straightforward from the definition of X_1^P and X_1^S, Lemma 3.2, and the relation (3.3) ‖

Proposition 3.1 is interpreted as follows. When l_1 is small, the economic value of safety is low for a capitalist firm, implying that it is not so advantageous for a capitalist firm to be of the safe type. The capitalist firm of the safe type therefore cannot endure offering the price to the consumer that is low enough to prevent the capitalist firm of the hazardous type from mimicking it. Conversely, when l_1 is large, the economic value of safety is high for a capitalist firm, implying that it is highly advantageous for a capitalist firm to be of the safe type. The capitalist firm of the safe type therefore

can endure offering the price to the consumer that is low enough to prevent the capitalist firm of the hazardous type from mimicking it. Thus, greater l_1 implies higher likelihood that production of the hazardous type will be prevented under a capitalist firm.

3.4 The equilibrium safety level under a consumer cooperative

The equilibrium under a consumer cooperative is symmetrical to that under a capitalist firm. With the information on the safety level, the consumer cooperative offers a rental rate r at which it wishes to rent the physical capital. The owner of the physical capital then chooses between renting and not renting the physical capital. If the consumer cooperative is of the safe type (hazardous type, respectively), an accident occurs with probability $1 - s^H$ ($1 - s^L$, respectively), causing losses l_1 and l_2 to the owner of the physical capital and the consumer, respectively.

When the consumer cooperative of type i ($i = H, L$) rents the physical capital from its owner and engages in production, the consumer's payoff is $-r + v$ with probability s^i, and $-r + v - l_2$ with probability $1 - s^i$, and so his expected utility is $u_2 = -r + v - (1 - s^i)l_2$. When the consumer cooperative does not engage in production, the consumer's payoff is 0. Then, the consumer cooperative of type i never rents the physical capital at the rental rate r with $u_2 = v - r - (1 - s^i)l_2 < 0$, so that the rental rate

$$\overline{r}^i = v - (1 - s^i)l_2 \tag{3.4}$$

is the highest rental rate at which the consumer cooperative of type i will rent the physical capital. For analytical simplicity, we assume that the consumer cooperative of type i does *not* rent the physical capital when $r = \overline{r}^i$. It is

easy to verify that $\overline{r}^H > \overline{r}^L$.

When the owner of the physical capital believes that the safety level is s and rents the physical capital to the consumer cooperative, his payoff is r with probability s, and $r - l_1$ with probability $1 - s$, and so his (subjective) expected utility is $u_1 = r - (1-s)l_1$. When the owner of the physical capital does not rent the physical capital to the consumer cooperative, his payoff is 0. Then, given his belief s, the owner of the physical capital never rents the physical capital to the consumer cooperative if $u_1 = r - (1-s)l_1 < 0$, so that the rental rate

$$\underline{r}(s) = (1-s)l_1 \tag{3.5}$$

is the lowest rental rate at which the owner of the physical capital will rent the physical capital. For analytical simplicity, we assume that the owner of the physical capital rents the physical capital when $r = \underline{r}(s)$. It is easy to verify that $\underline{r}(s^H) < \underline{r}(s^P) < \underline{r}(s^L)$.

Note that

$$V^i \begin{pmatrix} > \\ = \\ < \end{pmatrix} 0 \Leftrightarrow \overline{r}^i \begin{pmatrix} > \\ = \\ < \end{pmatrix} \underline{r}(s^i)$$

and let

$$\begin{aligned} Z_2 : &= \{(\overline{r}^H, \overline{r}^L) \in R^2 \mid V^H > 0, V^L < 0, \overline{r}^H > \overline{r}^L\} \\ &= \{(\overline{r}^H, \overline{r}^L) \in R^2 \mid \overline{r}^H > \underline{r}(s^H), \overline{r}^L < \underline{r}(s^L), \overline{r}^H > \overline{r}^L\}. \end{aligned}$$

That is, Z_2 is the set of the pairs $(\overline{r}^H, \overline{r}^L)$ which is considered in this analysis. Let

$$\begin{aligned} X_2^P &:= \{(\overline{r}^H, \overline{r}^L) \in Z_2 \mid \overline{r}^L > \underline{r}(s^P)\} \\ X_2^{S1} &:= \{(\overline{r}^H, \overline{r}^L) \in Z_2 \mid \underline{r}(s^P) \geq \overline{r}^L > \underline{r}(s^H)\} \\ X_2^{S2} &:= \{(\overline{r}^H, \overline{r}^L) \in Z_2 \mid \underline{r}(s^H) \geq \overline{r}^L\}. \end{aligned}$$

(Figure 3.2) Then, the equilibrium safety level of production under a consumer cooperative is given as in the following lemma.

Lemma 3.3: Suppose that $V^H > 0$, $V^L < 0$, and there is a consumer cooperative. In X_2^P, either (a) production of both the safe and the hazardous types can take place (so that the safety level is not revealed), where the physical capital is rented at r with $\overline{r}^H > r \geq \underline{r}(s^P)$, or (b) production of only the safe type can take place (so that the safety level is revealed), where the physical capital is rented at $\overline{r}^L$. In X_2^{S1}, production of only the safe type can take place (so that the safety level is revealed), where the physical capital is rented at $\overline{r}^L$. In X_2^{S2}, production of only the safe type can take place (so that the safety level is revealed), where the physical capital is rented at $\underline{r}(s^H)$.

Proof: The proof of this lemma is symmetrical to that of Lemma 3.1, and therefore omitted. ‖

Let

$$X_2^S := X_2^{S1} \cup X_2^{S2} = \{(\overline{r}^H, \overline{r}^L) \in Z_2 \mid \overline{r}^L \leq \underline{r}(s^P)\}.$$

Then, Z_2 is divided into two zones, X_2^P and X_2^S, and the results of Lemma 3.3 are reduced as follows.

Lemma 3.4: Suppose that $V^H > 0$, $V^L < 0$, and there is a consumer cooperative. In X_2^P, production of both the safe and the hazardous types can take place. In X_2^S, production of only the safe type can take place.

Proof: Straightforward from Lemma 3.3, and the definition of X_2^P and X_2^S. ‖

It is observed from Lemma 3.4 that the outcome depends upon whether

$\overline{r}^L$ is smaller than or equal to $\underline{r}(s^P)$, or not. Notice that

$$\overline{r}^L \begin{pmatrix} < \\ = \\ > \end{pmatrix} \underline{r}(s^P) \Leftrightarrow l_2 \begin{pmatrix} > \\ = \\ < \end{pmatrix} \alpha_2 \tag{3.6}$$

where

$$\alpha_2 := -\frac{1-s^P}{1-s^L} l_1 + \frac{v}{1-s^L}.$$

Then we obtain the following proposition.

Proposition 3.2: Suppose that $V^H > 0$, $V^L < 0$, and there is a consumer cooperative. Production of both the safe and the hazardous types can take place if $l_2 < \alpha_2$, and production of only the safe type can take place if $l_2 \geq \alpha_2$.

Proof: Straightforward from the definition of X_2^P and X_2^S, Lemma 3.4, and the relation (3.6) ‖

An interpretation for Proposition 3.2 is similar to that for Proposition 3.1. When l_2 is small, the economic value of safety is low for a consumer cooperative, implying that it is not so advantageous for a consumer cooperative to be of the safe type. The consumer cooperative of the safe type therefore cannot endure offering the rental rate to the owner of the physical capital that is high enough to prevent the consumer cooperative of the hazardous type from mimicking it. Conversely, when l_2 is large, the economic value of safety is high for the consumer cooperative, implying that it is highly advantageous for the consumer cooperative to be of the safe type. The consumer cooperative of the safe type therefore can endure offering the rental rate to the owner of the physical capital that is high enough to prevent the consumer cooperative of the hazardous type from mimicking it. Thus, greater l_2

implies higher likelihood that production of the hazardous type is prevented under a consumer cooperative.

3.5 A comparison

It is observed from Propositions 3.1 and 3.2 that, safety tends to be guaranteed under a capitalist firm but not under a consumer cooperative when the loss to the owner of the physical capital l_1 is large and the loss to the consumer l_2 is small; conversely, safety tends to be guaranteed under a consumer cooperative but not under a capitalist firm when the loss to the consumer l_2 is large and the loss to the owner of the physical capital l_1 is small. We thus obtain a course of enterprise form choice: *to reduce production-related risks, select a form of enterprise such that the management rights of the firm are given to the class of individuals who would incur the most substantial loss in case of an accident.* This property can be illustrated in Figure 3.3. Inside of line AG is the set of (l_1, l_2) with which $V^H > 0$ holds, and outside of line CE is the set of (l_1, l_2) with which $V^L < 0$ holds, so the region which we now take into account is area ACEG. Lines CF and BE represent variables α_1 as a function of l_2, and α_2 as a function of l_1, respectively. Proposition 3.1 states that, under a capitalist firm, only safe production can take place if (l_1, l_2) is in area ACFG, whereas hazardous production can take place if (l_1, l_2) is in area CEF. Similarly, Proposition 3.2 states that, under a consumer cooperative, only safe production can take place if (l_1, l_2) is in area ABEG, whereas hazardous production can take place if (l_1, l_2) is in area BCE. Therefore, when (l_1, l_2) is in area DEF, only safe production can take place under a consumer cooperative, but hazardous production can take place under a capitalist firm. Conversely, when (l_1, l_2) is in are BCD, only safe production can take place under a capitalist firm, but hazardous production can take place under a

consumer cooperative.

This conclusion can be interpreted as follows. There are potentially two markets that can be used for transactions; the product market, which is used under a capitalist firm, and the rental market for the physical capital, which is used under a consumer cooperative. [23] Neither market is free from the inefficiency caused by the asymmetric information; adverse selection occurs in the product market under a capitalist firm, whereas it occurs in the rental market for the physical capital under a consumer cooperative. The question is which market we should use for transactions, and which market we should dispense with. Obviously, we should use the market which can better deal with the asymmetric information, and dispense with the other.

Now, suppose that l_1 is large and l_2 is small. A large l_1 implies that the safe technology is highly valuable for the owner of the physical capital, giving the capitalist firm of the safe type a large economic advantage over that of the hazardous type. The safe type is therefore put in a good position to distinguish itself from the hazardous type in its offer of the product price in the product market. Hence, the product market allows a separating equilibrium to exist, and successfully selects the safe technology. On the other hand, a small l_2 implies that the safe technology is not so valuable for the consumer, giving the consumer cooperative of the safe type only a small economic advantage over that of the hazardous type. Therefore, the safe type is

[23] Under a capitalist firm, the owner of the physical capital uses his own physical capital for production, and *sells* the product to the consumer at the price p. There, the physical capital is not rented at the rental market for the physical capital. Indeed, rental rate for the physical capital r does not appear in the expressions for payoffs, $u_1 = p - (1 - s^i)l_1$ and $u_2 = v - p - (1 - s)l_2$, where only the product price p appears. Under a consumer cooperative, the consumer *rents* the physical capital for production at the rental rate r from its owner, and consumes the product by himself. There, the product is not sold and bought at the product market. Indeed, product price p does not appear in the expressions for payoffs, $u_1 = r - (1 - s)l_1$ and $u_2 = -r + v - (1 - s^i)l_2$, where only the rental rate for the physical capital r appears.

not put in a very good position to distinguish itself from the hazardous type in its offer of the rental rate in the rental market. Hence, the rental market does not allow a separating equilibrium to exist, and fails to select the safe technology. Thus, when l_1 is large and l_2 is small, since the mechanism of signaling works better in the product market than in the rental market, a capitalist firm becomes safer than a consumer cooperative.

Suppose, on the contrary, that l_1 is small and l_2 is large. A small l_1 implies that the safe technology is not so valuable for the owner of the physical capital, giving the capitalist firm of the safe type only a small economic advantage over that of the hazardous type. Therefore, the safe type is not put in a very good position to distinguish itself from the hazardous type in its offer of the product price in the product market. Hence, the product market does not allow a separating equilibrium to exist, and fails to select the safe technology. On the other hand, a large l_2 implies that the safe technology is highly valuable for the consumer, giving the consumer cooperative of the safe type a large economic advantage over that of the hazardous type. The safe type is therefore put in a good position to distinguish itself from the hazardous type in its offer of the rental rate in the rental market. Hence, the rental market allows a separating equilibrium to exist, and successfully selects the safe technology. Thus, when l_1 is small and l_2 is large, since the mechanism of signaling works better in the rental market than in the product market, a consumer cooperative becomes safer than a capitalist firm.

This result has a useful implication to understand reality. Let us go back to the problem of safety of agricultural products, which largely depends upon the cultivation process. For example, if vegetables are planted in a field contaminated with toxic chemicals such as dioxin, or grown with strong pesticides and herbicides, then it is highly possible that the harmful chemical

substances will remain in the vegetables until they are cooked and eaten at home. Similarly, if plenty of antibiotics are mixed up in the forage for cattle, they will remain in the meat and will be finally taken in the human body. Obviously, the retailers who stock these agricultural products themselves are in an advantageous position in acquiring the safety information on these products compared to the outsiders. [24] Since the loss from unsafe agricultural products will mostly fall on the consumers and not on the suppliers of physical capital, the theory suggests that consumer cooperative is a safer form of enterprise than capitalist firm. This may partly explain the reason why consumer cooperatives are common in the retail of food and household goods, and why in fact they are supplying safer goods than their stock company counterparts, as observed in section 3.1. [25]

3.6 Governmental and non-governmental institutions for reducing production-related risks

The basic analytical viewpoint of Arrow (1963) was that, when there is uncertainty over the quality of goods and services and then market fails to achieve optimality, some social institutions are developed to help restore economic efficiency. So far, several sorts of regulatory measures for occupational and product safety have been used in practice, and studied in economics. Safety

[24] This is true particularly when the retailer buys the agricultural products not from the wholesalers but directly from farmers. The latter is becoming a common distribution system of agricultural products today.

[25] Of course, in reality, safety is not the sole factor that determines the organizational form of food retailing firms. Even in Europe and Japan, where food retailing consumer cooperatives are quite prevalent, capitalist firms dominate the retail market for food. Presumably, ability of raising capital is the most influential factor that determines the organizational form of those firms, as it is in most other industries.

standards (Baumol and Oates (1971), Curington (1986)) and tort liability (Brown (1973), Diamond (1974)) are two major regulatory measures. Until recently, various types of extensions and sophistication have been made on these two policy tools (*e.g.*, Daughety and Reinganum (1995) on liability under asymmetric information, and Kolstad, Ulen and Johnson (1990) on the joint use of safety standards and liability). The other regulatory measures to control the safety of goods and services include Pigouvian taxes (Rose-Ackerman (1973)) and programs to inform consumers (Viscusi, Magat and Huber (1986)). These regulatory measures are all categorized as *governmental* social institutions for reducing the risks that are associated with production. In contrast, an appropriate selection of enterprise form, as discussed in the previous sections, is considered to be a *non-governmental* social institution that is embedded in the private sector economy for reducing production-related risks and improving economic efficiency.

In general, there are several informational requirements for pursuing governmental regulatory measures. If some risk is expected in the consumption of a product yet that risk is not verifiable both *ex ante* and *ex post*, the effectiveness of the regulatory measures seems limited. For example, in order for a safety standard to be effective for the prevention of risks, first the standard itself must be set based on scientific evidence. In many cases, this task is costly or technically difficult. Once the standard is finally set, the safety level of the products that are traded in the market must then be observable by the regulatory agency. In addition, when the regulatory agency judges that the products do not satisfy the minimum safety level, that fact must be verifiable in court. (If the safety level is observable by the regulatory agency but not verifiable in court, the firm which violates the safety standard can by no means be punished, and hence the rule itself does not work.) There

are similar informational difficulties when one uses liability rules. In order for a strict liability rule to be effective, the regulatory agency must be able to prove the cause-effect relationship between the failure of goods and the loss that was in fact realized. If the loss is not pecuniary, the monetary value of the loss needs to be estimated. (These are necessary not only for the *ex post* resolution of the injury but also for the *ex ante* prevention of hazardous products.) Furthermore, when the negligence rule is used, the level of care taken by the firm before an accident occurs must be observable by the regulatory agency and verifiable in court. These informational requirements are in many cases too demanding to pursue the regulatory policies satisfactorily. Let us recall the example of the safety of food. Suppose that an experiment with rats has shown that a certain food additive can have a bad influence on living organisms, so that it can be anticipated that in the long run the food additive might have a bad influence on the human body. However, it is extremely difficult to 'prove' that the food additive was in fact harmful to the human body in a specific case; *e.g.*, it seems almost impossible to verify the cause-effect relationship between a certain food additive that has been contained in a person's diet in the past thirty years and his current health problem, say cancer. In such circumstances, the governmental regulatory measures do not seem to function satisfactorily for preventing risks from food. Instead, an appropriate selection of enterprise form may help reduce the risks, where it is not required that the safety information be observable or verifiable to the third parties.

In conclusion, when the necessary information is available with a small cost to the third parties, governmental regulatory measures are a powerful policy tool for preventing risks, while an appropriate selection of enterprise form may help reduce risks under less strict informational requirements.

It might then be hypothesized that people are trying to avoid production-related risks by selecting an appropriate form of enterprise in the sectors of the economy where unavailability of information invalidates the full functioning of the governmental regulatory measures. Consumer cooperatives that deal with organic food might be one instance of this mechanism.

3.7 Conclusion

In this chapter, we constructed a signaling model of the firm with production-related risks, and examined implications of an enterprise form on the safety level of production. The main result obtained in this study is that, in some cases, production-related risks can be prevented by giving the management rights of the firm to the individuals who would incur the most substantial loss in case of an accident. This result may be applied to explain the consumer cooperatives in food retailing industries. That is, a food-related accident usually induces substantial loss to the consumers (health hazard), whereas it brings about no or only minor loss to the capital owners. If this is the case, the theory suggests that a consumer cooperative is a safer (and more efficient) form of enterprise than a capitalist firm in food retailing.

Four remarks should be made. First, selection of an enterprise form as discussed in this chapter is a story in an ideal world of Coase (1960), where negotiations can be made without cost. Choice of an enterprise form may not be totally free in the real world, but it seems plausible to some extent to apply the present study to a society where several enterprise types are available to entrepreneurs. [26] Secondly, the concept of economic efficiency

[26] In a sense, this is a positive interpretation for the result, stating that a particular enterprise form *will* be chosen by individuals. Alternatively, a normative interpretation is also possible, which would state that, a particular enterprise form *should* be chosen from a social welfare point of view. Mathematical structure of the model is invariant between

need not be the sole normative criterion in considering a desirable level of safety. As Oi (1973) argues, such concepts as justice and fairness seem no less an important criterion in considering the problem of safety. Such a criterion is profoundly concerned with ethical issues, and is beyond the scope of the present chapter. Thirdly, the model presented here is surely not the sole one to analyze the relation between product safety and enterprise form. In reality, safety of goods is sometimes used as a corporate strategy. For example, the advertising of a grocery store chain that it deals with only organic food can attract some class of consumers. In fact, there are some capitalist firm food chains that sell vertically differentiated commodities. Fourthly, the model presented here can easily be applied to the analysis of safety in the workplace (*e.g.*, Curington (1986), French (1988), and Lanoie (1992)). In that setting, it will be demonstrated that, when workers have to incur a large amount of loss in case of an accident, a worker owned firm may be a solution for safety at their workplace.

Appendix 3A: Proof of Lemma 3.1

Let μ_2 be the consumer's belief, and p^H and p^L be the message price sent by H and L, respectively, where H and L stand for the capitalist firm of the safe and hazardous type, respectively. Let $\sigma_1 := \max\{\overline{p}(s^H), \underline{p}^H, \underline{p}^L\}+1$, that is, σ_1 is the price at which both the safe and hazardous types of the firm are willing to sell the product, but the consumer never buys it. Let a_2 be the action taken by the consumer, where $a_2 = 1$ and $a_2 = 0$ stand for 'buys the product' and 'doesn't buy the product', respectively. Recall that it always

the two interpretations.

hold that $\underline{p}^H < \underline{p}^L$.

Property 3.1:

(1) For $p \leq \underline{p}^H$, the criterion of domination puts no restrictions on μ_2.

(2) For p with $\underline{p}^H < p \leq \underline{p}^L$, $\mu_2(L \mid p) = 0$ by the criterion of domination.

(3) For $p > \underline{p}^L$, the criterion of domination puts no restrictions on μ_2.

Proof:

(1) Any $p \leq \underline{p}^H$ is (weakly) dominated (*e.g.* by σ_1) for both H and L, and therefore both $\mu_2(H \mid p)$ and $\mu_2(L \mid p)$ are underterminate. Hence, the criterion of domination puts no restrictions on μ_2.

(2) Any p with $\underline{p}^H < p \leq \underline{p}^L$ is (weakly) dominated (*e.g.* by σ_1) for L, but not for H. Hence, the criterion of domination dictates that $\mu_2(L \mid p) = 0$ for such p.

(3) Any $p > \underline{p}^L$ is not dominated by any other action for both H and L; such p is not dominated by $\hat{p}$ with $\underline{p}^L < \hat{p} < p$ since individual 1 is better off with p being accepted than with $\hat{p}$ being either accepted or not accepted, whereas such p is not dominated by $\hat{p} > p$ since individual 1 is better off with p being accepted than with $\hat{p}$ being not accepted. Hence, the criterion of domination puts no restriction on μ_2. $\|$

Property 3.2:

(1) Any $p \leq \underline{p}^H$ cannot be H's message price at an equilibrium.

(2) Any p with $\underline{p}^H < p \leq \underline{p}^L$ cannot be H's message price at a pooling equilibrium.

(3) Any $p > \underline{p}^L$ cannot be H's message price at a separating equilibrium.

Proof:

(1) H is better off, and at least not be worse off, with $p^H = \sigma_1$ than with $p^H \leq \underline{p}^H$. Therefore, $p^H \leq \underline{p}^H$ cannot be the best message price for H, and hence $p^H \leq \underline{p}^H$ cannot be a message price at an equilibrium.

(2) L is better off, and at least not be worse off, with $p^L = \sigma_1$ than with $p^L \leq \underline{p}^L$. Therefore, $p^L \leq \underline{p}^L$ cannot be the best message price for L, and hence p with $\underline{p}^H < p \leq \underline{p}^L$ cannot be a message price at a pooling equilibrium.

(3) Suppose that a $p > \underline{p}^L$ is a message price for H at a separating equilibrium, so that $\mu_2(H \mid p) = 1$. Since the type is revealed in this equilibrium, L cannot earn a positive payoff with a message price $p^L \neq p^H$. (L's payoff is negative or at best zero if he offers $p^L \leq \underline{p}^L$, and his payoff is zero if he offers $p^L > \underline{p}^L (> \overline{p}(s^L))$.) On the other hand, L can earn positive profit with a message price $p^L = p^H$. Therefore, $p^L \neq p^H$ cannot be the best message price for L. The original supposition is thus contradictory and a $p > \underline{p}^L$ cannot be a message price for H at a separating equilibrium. ‖

We are now in a position to prove Lemma 3.1.

Proof of Lemma 3.1:

By Property 3.2, the only possible message prices for H in equilibrium are p^H with $\underline{p}^H < p^H \leq \underline{p}^L$ at a separating equilibrium, and $p^H > \underline{p}^L$ at a pooling equilibrium.

Equilibrium in X_1^P

Following Property 3.2(2), I first look for H's message price at a separating equilibrium over $(\underline{p}^H, \underline{p}^L]$. For p with $\underline{p}^H < p \leq \underline{p}^L$, since $\mu_2(H \mid p) = 1$ (Property 3.1(2)) and $p \leq \underline{p}^L < \overline{p}(s^H)$, the consumer will accept the price.

H's best action over $(\underline{p}^H, \underline{p}^L]$ is therefore $p^H = \underline{p}^L$, and then $p^H = \underline{p}^L$ is the only possible message price for H at a separating equilibrium. Indeed, it is shown that, when $\overline{p}(s^L) \leq \underline{p}^H$,

$$\left(\begin{pmatrix} p^H = \underline{p}^L \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \overline{p}(s^L)) = 1 \\ a_2(\overline{p}(s^L) < p \leq \underline{p}^H) = 0 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = 0 \end{pmatrix} \right)$$

is an equilibrium, and when $\underline{p}^H < \overline{p}(s^L)$,

$$\left(\begin{pmatrix} p^H = \underline{p}^L \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \underline{p}^H) = 1 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = 0 \end{pmatrix} \right)$$

is an equilibrium.

For the first case above, rationality of the strategies $(a_2(p), (p^H, p^L))$ and consistency of the belief $\mu_2(H \mid p)$ are verified as in the next remark.

Remark 3.1: In the first case above, a_2 and (p^H, p^L) are rational, and μ_2 is consistent.

Proof:

Rationality of a_2: For $p \leq \overline{p}(s^L)$, since $\mu_2(H \mid p) = 0$ (note that $p \leq \overline{p}(s^L) \leq \underline{p}^H$) and $p \leq \overline{p}(s^L)$,

$$\begin{aligned} u_2 \mid_{a_2=1} &= -p + v - (1 - s^L)l_2 \\ &\geq -\overline{p}(s^L) + v - (1 - s^L)l_2 = 0 = u_2 \mid_{a_2=0} \end{aligned}$$

so $a_2 = 1$ is optimal. For p with $\overline{p}(s^L) < p \leq \underline{p}^H$, since $\mu_2(H \mid p) = 0$ and $p > \overline{p}(s^L)$,

$$\begin{aligned} u_2 \mid_{a_2=1} &= -p + v - (1 - s^L)l_2 \\ &< -\overline{p}(s^L) + v - (1 - s^L)l_2 = 0 = u_2 \mid_{a_2=0} \end{aligned}$$

so $a_2 = 0$ is optimal. For p with $\underline{p}^H < p \leq \underline{p}^L$, since $\mu_2(H \mid p) = 1$ and $p \leq \underline{p}^L < \overline{p}(s^H)$,

$$\begin{aligned} u_2 \mid_{a_2=1} &= -p + v - (1 - s^H)l_2 \\ &> -\overline{p}(s^H) + v - (1 - s^H)l_2 = 0 = u_2 \mid_{a_2=0} \end{aligned}$$

so $a_2 = 1$ is optimal. For $p > \underline{p}^L$, since $\mu_2(H \mid p) = 0$ and $p > \underline{p}^L > \overline{p}(s^L)$,

$$\begin{aligned} u_2 \mid_{a_2=1} &= -p + v - (1 - s^L)l_2 \\ &< -\overline{p}(s^L) + v - (1 - s^L)l_2 = 0 = u_2 \mid_{a_2=0} \end{aligned}$$

so $a_2 = 0$ is optimal.

Rationality of p^H: Given a_2, the highest price at which H can sell the product to individual 2 is $\underline{p}^L$, in which H's payoff is

$$\begin{aligned} u_1 \mid_{p=\underline{p}^L} &= \underline{p}^L - (1 - s^H)l_1 \\ &> \underline{p}^H - (1 - s^H)l_1 = 0 = u_1 \mid_{p=\sigma_1} \end{aligned}$$

so $p^H = \underline{p}^L$ is optimal for H.

Rationality of p^L: Given a_2, the highest price at which L can sell the product to individual 2 is $\underline{p}^L$, in which L's payoff is

$$u_1 \mid_{p=\underline{p}^L} = \underline{p}^L - (1 - s^L)l_1 = 0 = u_1 \mid_{p=\sigma_1}$$

so $p^L = \sigma_1$ is optimal for L.

Consistency of μ_2: The message prices on the equilibrium path are $\underline{p}^L$ and σ_1. At $\underline{p}^L$, since $Pr(\underline{p}^L \mid H) = 1$ and $Pr(\underline{p}^L \mid L) = 0$,

$$Pr(H \mid \underline{p}^L) = \frac{Pr(\underline{p}^L \mid H)Pr(H)}{Pr(\underline{p}^L \mid H)Pr(H) + Pr(\underline{p}^L \mid L)Pr(L)} = 1 = \mu_2(H \mid \underline{p}^L).$$

At σ_1, since $Pr(\sigma_1 \mid H) = 0$ and $Pr(\sigma_1 \mid L) = 1$,

$$Pr(H \mid \sigma_1) = \frac{Pr(\sigma_1 \mid H)Pr(H)}{Pr(\sigma_1 \mid H)Pr(H) + Pr(\sigma_1 \mid L)Pr(L)} = 0 = \mu_2(H \mid \sigma_1).$$

Hence, μ_2 is consistent on the equilibrium path. μ_2 satisfies the criterion of domination for all message prices off the equilibrium path; the criterion of domination is satisfied for $p < \underline{p}^H$ by Property 3.1(1), for p with $\underline{p}^H < p < \underline{p}^L$ by Property 3.1(2), and for p with $\underline{p}^L < p$ and $p \neq \sigma_1$ by Property 3.1(3). [27] ‖

Rationality of the strategies and consistency of the belief for the second case above can be verified in a similar way.

Next, following Property 3.2(3), I look for H's message price at a pooling equilibrium over $p > \underline{p}^L$. $p > \overline{p}(s^P)$ cannot be H's message price at a pooling equilibrium. (For, H's payoff is zero with some $p^H > \overline{p}(s^P)$, since such p^H is not accepted by the consumer at a pooling equilibrium, and H's payoff is positive with a lower message price, say $\underline{p}^L$, which is accepted by the consumer. $p^H > \overline{p}(s^P)$ cannot therefore be a message price for H at a pooling equilibrium.) p with $\underline{p}^L < p \leq \overline{p}(s^P)$ can be H's message price at a pooling equilibrium. Indeed, for any $\hat{p}$ with $\underline{p}^L < \hat{p} \leq \overline{p}(s^P)$, it is shown that, when

[27] In fact, μ_2 also satisfies the Intuitive Criterion for all message prices off the equilibrium path. Any $p < \underline{p}^L$ is equilibrium-dominated for H (H is worse off with any $p^H < \underline{p}^L$, whether it is accepted or not accepted by the consumer, than with $p^H = \underline{p}^L$, which is accepted by the consumer) as well as for L (L's payoff cannot exceed zero with $p^L < \underline{p}^L$; L's payoff is negative if some $p^L < \underline{p}^L$ is accepted by the consumer, and is zero if such p^L is not accepted.) Hence, the Intuitive Criterion puts no restrictions on μ_2 over $p < \underline{p}^L$. Any p with $p > \underline{p}^L$ and $p \neq \sigma_1$ is not equilibrium-dominated for H (H would be better off with $p^H > \underline{p}^L$ (and $p^H \neq \sigma_1$), if it were accepted by the consumer, than with $p^H = \underline{p}^L$ which is accepted) as well as for L (L would be better off with $p^L > \underline{p}^L$ (and $p^L \neq \sigma_1$), if it were accepted by the consumer, than with $p^L = \sigma_1$ which is not accepted.) Hence, the Intuitive Criterion puts no restrictions on μ_2 over p with $p > \underline{p}^L$ and $p \neq \sigma_1$. Thus, μ_2 trivially satisfies the Intuitive Criterion for all message prices off the equilibrium path.

$\overline{p}(s^L) \leq \underline{p}^H$,

$$\left(\begin{pmatrix} p^H = \hat{p} \\ p^L = \hat{p} \end{pmatrix}, \begin{pmatrix} a_2(p \leq \overline{p}(s^L)) = 1 \\ a_2(\overline{p}(s^L) < p \leq \underline{p}^H) = 0 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p \leq \hat{p}) = 1 \\ a_2(\hat{p} < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p \leq \hat{p}) = q \\ \mu_2(H \mid \hat{p} < p) = 0 \end{pmatrix} \right)$$

is an equilibrium, and when $\underline{p}^H < \overline{p}(s^L)$,

$$\left(\begin{pmatrix} p^H = \hat{p} \\ p^L = \hat{p} \end{pmatrix}, \begin{pmatrix} a_2(p \leq \underline{p}^H) = 1 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p \leq \hat{p}) = 1 \\ a_2(\hat{p} < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p \leq \hat{p}) = q \\ \mu_2(H \mid \hat{p} < p) = 0 \end{pmatrix} \right)$$

is an equilibrium, both by a procedure similar to Remark 3.1.

Equilibrium in X_1^{S1}

For p with $\underline{p}^H < p^H \leq \underline{p}^L$, since $\mu_2(H \mid p) = 1$ by Property 3.1(2) and $\underline{p}^L < \overline{p}(s^H)$, the best message price for H is $p^H = \underline{p}^L$, which is the only possible message price for H at a separating equilibrium. Indeed, it is shown that, when $\overline{p}(s^L) \leq \underline{p}^H$,

$$\left(\begin{pmatrix} p^H = \underline{p}^L \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \overline{p}(s^L)) = 1 \\ a_2(\overline{p}(s^L) < p \leq \underline{p}^H) = 0 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = q \end{pmatrix} \right)$$

is an equilibrium, and when $\underline{p}^H < \overline{p}(s^L)$,

$$\left(\begin{pmatrix} p^H = \underline{p}^L \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \underline{p}^H) = 1 \\ a_2(\underline{p}^H < p \leq \underline{p}^L) = 1 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = q \end{pmatrix} \right)$$

is an equilibrium, both by a procedure similar to Remark 3.1.

$p^H > \underline{p}^L$ cannot be the best message price for H, since such p^H exceeds $\overline{p}(s^P)$ and is not accepted by the consumer at a pooling equilibrium.

Equilibrium in X_1^{S2}.

For p with $\underline{p}^H < p^H \leq \underline{p}^L$, since $\mu_2(H \mid p) = 1$ by Property 3.1(2) and $\overline{p}(s^H) \leq \underline{p}^L$, the best message price for H is $p^H = \overline{p}(s^H)$, which is the only possible message price for H at a separating equilibrium. Indeed, it is shown that, when $\overline{p}(s^L) \leq \underline{p}^H$,

$$\left(\begin{pmatrix} p^H = \overline{p}(s^H) \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \overline{p}(s^L)) = 1 \\ a_2(\overline{p}(s^L) < p \leq \underline{p}^H) = 0 \\ a_2(\underline{p}^H < p \leq \overline{p}(s^H)) = 1 \\ a_2(\overline{p}(s^H) < p \leq \underline{p}^L) = 0 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = q \end{pmatrix} \right)$$

is an equilibrium, and when $\underline{p}^H < \overline{p}(s^L)$,

$$\left(\begin{pmatrix} p^H = \overline{p}(s^H) \\ p^L = \sigma_1 \end{pmatrix}, \begin{pmatrix} a_2(p \leq \underline{p}^H) = 1 \\ a_2(\underline{p}^H < p \leq \overline{p}(s^H)) = 1 \\ a_2(\overline{p}(s^H) < p \leq \underline{p}^L) = 0 \\ a_2(\underline{p}^L < p) = 0 \end{pmatrix}, \begin{pmatrix} \mu_2(H \mid p \leq \underline{p}^H) = 0 \\ \mu_2(H \mid \underline{p}^H < p \leq \underline{p}^L) = 1 \\ \mu_2(H \mid \underline{p}^L < p) = q \end{pmatrix} \right)$$

is an equilibrium, both by a procedure similar to Remark 3.1.

$p^H > \underline{p}^L$ cannot be the best message price for H, since such p^H exceeds $\overline{p}(s^P)$ and is not accepted by the consumer at a pooling equilibrium. ‖

Bibliography

[1] Akerlof, G., 1970, "The market for lemons: Quality uncertainty and the market mechanism." *Quarterly Journal of Economics* 89: 488-500.

[2] Arrow, Kenneth J., 1963, "Uncertainty and the welfare economics of medical care." *American Economic Review* 53-5: 941-973.

[3] Baumol, William J., and Oates, Wallace E., 1971, "The use of standards and prices of protection of the environment." *Swedish Journal of Economics* 73-1: 42-54.

[4] Ben-Ner, Avner, 1986, "Nonprofit organizations: Why do they exist in market economies?" In: Susan Rose-Ackerman (ed.) *The economics of nonprofit institutions: Studies in structure and policy.* Oxford and New York, NY: Oxford University Press: 94-113.

[5] Ben-Ner, Avner, and Van Hoomissen, Theresa, 1993, "Nonprofit organizations in the mixed economy: A demand and supply analysis." In: Avner Ben-Ner and Benedetto Gui (eds.), *The nonprofit sector in the mixed economy.* Ann Arbor, MI: The University of Michigan Press: 27-58.

[6] Böök, Sven Åke, 1992, *Cooperative value in a changing world.* Geneva: International Co-operative Alliance.

[7] Brown, J. P., 1973, "Toward an economic theory of liability." *Journal of Legal Studies* 2-2: 323-349.

[8] Citizens Environmental Foundation, 1999, *Green Consumer Guide: 1999 Kyoto.* Kyoto: Citizens Environmental Foundation.

[9] Coase, Ronald, 1960, "The problem of social cost." *Journal of Law and Economics* 3-1: 1-44.

[10] Coleman, Daniel A., 1994, *Ecopolitics.* New Brunswick, NJ: Rutgers University Press.

[11] Co-op Kobe, 1998, *General Evaluation Report of Co-op Kobe.* (Co-op Kobe Sōgō Hyōka Report).

[12] Curington, William P., 1986, "Safety regulation and workplace injuries." *Southern Economic Journal* 53-1: 51-72.

[13] Daughety, Andrew F., and Reinganum, Jennifer F., 1995, "Product safety: Liability, R & D, and signaling." *American Economic Review* 85-5: 1187-1206.

[14] Diamond, Peter A., 1974, "Single activity accidents." *Journal of Legal Studies* 3-1: 107-163.

[15] Dow, Gregory K., 1986, "Control rights, competitive markets, and the labor management debate." *Journal of Comparative Economics* 10-1: 48-61.

[16] French, Michael T., 1988, "An efficiency test for occupational safety regulation." *Southern Economic Journal* 54-3: 675-693.

[17] Fabretti, Guiseppe, and Belfiori, Antonella, 1996/1997, "Report of the International Consumer Co-operative Organization." *ICA Review* 90-2: 40-42.

[18] Green Consumer Network, 1994, *Green Consumer Guide.* Tokyo: Kōdansha.

[19] Hansmann, Henry, 1988, "Ownership of the firm." *Journal of Law, Economics, and Organization* 4-2: 267-304.

[20] Hansmann, Henry, 1996, *The ownership of enterprise.* Cambridge, MA: Harvard University Press.

[21] International Consumer Co-operative Organization, 1994, "ICCO rules." International Co-operative Information Centre.

[22] International Consumer Co-operative Organization, 1998, "What is ICCO?" International Co-operative Information Centre.

[23] International Co-operative Alliance, and the United Nations Department for Policy Coordination and Sustainable Development, 1995, "Co-operatives and the consumer." International Co-operative Information Centre.

[24] Italian National Association of Consumers' Cooperatives, 1995, "Italian National Association of Consumers' Coops ANCC." International Co-operative Information Centre.

[25] Japanese Consumers' Co-operative Union, 1999, "Co-op for a better tomorrow." Japanese Consumers' Co-operative Union.

[26] Kakuchi, Suvendrini, 1995, "Consumer co-ops make it big." International Co-operative Information Centre.

[27] Kawano, Shigetou (ed.), 1983, *Encyclopedia of cooperatives* (Kyōdō kumiai jiten) 2nd ed., Tokyo: Ienohikari Association.

[28] Kolstad, Charles D., Ulen, Thomas S., and Johnson, Gray V., 1990, "*Ex post* liability for harm vs. *ex ante* safety regulation: substitutes or complements?" *American Economic Review* 80-4: 888-901.

[29] Lanoie, Paul, 1992, "Safety regulation and the risk of workplace accidents in Quebec." *Southern Economic Journal* 58-4: 950-965.

[30] Mikami, Kazuhiko, 1991, "Market structure and quality regulation." *Economic Studies Quarterly* 42-3: 213-223.

[31] Oi, Walter Y., 1973, "The economics of product safety." *Bell Journal of Economics and Management Science* 4-1: 3-28.

[32] Polinski, Mitchell A., and Rogerson, William P., 1983, "Products liability, consumer misperceptions, and market power." *Bell Journal of Economics and Management Science* 14-2: 581-589.

[33] Rose-Ackerman, Susan, 1973, "Effluent charges: A critique." *Canadian Journal of Economics* 6-4: 512-528.

[34] Seikatsu Club Consumers' Cooperative Union, 1995, "Seikatsu Club Consumers' Cooperative Union." International Co-operative Information Centre.

[35] Simon, Marilyn J., 1981, "Imperfect information, costly litigation, and product quality." *Bell Journal of Economics and Management Science* 12-1: 171-184.

[36] Spence, Michael, 1973, "Job market signaling." *Quarterly Journal of Economics* 87: 355-374.

[37] Spence, Michael, 1977, "Consumer misperceptions, product failure and producer liability." *Review of Economic Studies* 44-3: 561-572.

[38] Statistical Bureau, Management and Coordination Agency, Government of Japan, 1998, *1996 Establishment and enterprise census of Japan.* Volume 1-1.

[39] Takamura, Isao, 1995, "Consumer Co-op Movement in Japan." International Co-operative Information Centre.

[40] Viscusi, Kip W., Magat, Wesley A., and Huber, Joel, 1986, "Informational regulation of consumer health risks: An empirical evaluation of hazard warnings." *Rand Journal of Economics* 17-3: 351-365.

Table 3.1: Evaluation of major food and household goods retailers in Japan with respect to the concern for environment and health. For evaluation points, 1 is lowest and 5 is highest. The number in parenthesis is the percentage ratio to the total number of corporations of each type. (Source: Green Consumer Network (1994)).

Enterprise type	# of corpo-rations	Evaluation						Refused to answer
		1	2	3	4	5	av. pt.	
Joint-stock company	53 (100)	17 (32.1)	19 (35.8)	11 (20.8)	2 (3.8)	0 (0.0)	1.8	4 (7.5)
Consumer cooperative	15 (100)	0 (0.0)	2 (13.3)	6 (40.0)	6 (40.0)	0 (0.0)	3.1	1 (6.7)

Table 3.2: Number of stores in the top 30 stores in Kyoto, Japan, with respect to safety of food and household goods. The number in parenthesis is the percentage ratio to the total number of stores. (Source: Citizens Environmental Foundation (1999).)

Enterprise type	# of stores	# of stores in top 30 stores with respect to safety of food	# of stores in top 30 stores with respect to safety of household goods
Joint-stock company	231 (90.6)	13 (43.3)	11 (36.7)
Consumer cooperative	24 (9.4)	17 (56.7)	19 (63.3)
Total	255 (100)	30 (100)	30 (100)

Figure 3.1: Equilibrium under a capitalist firm. In X_1^P, hazardous production can take place. In X_1^{S1} and X_1^{S2}, only safe production can take place.

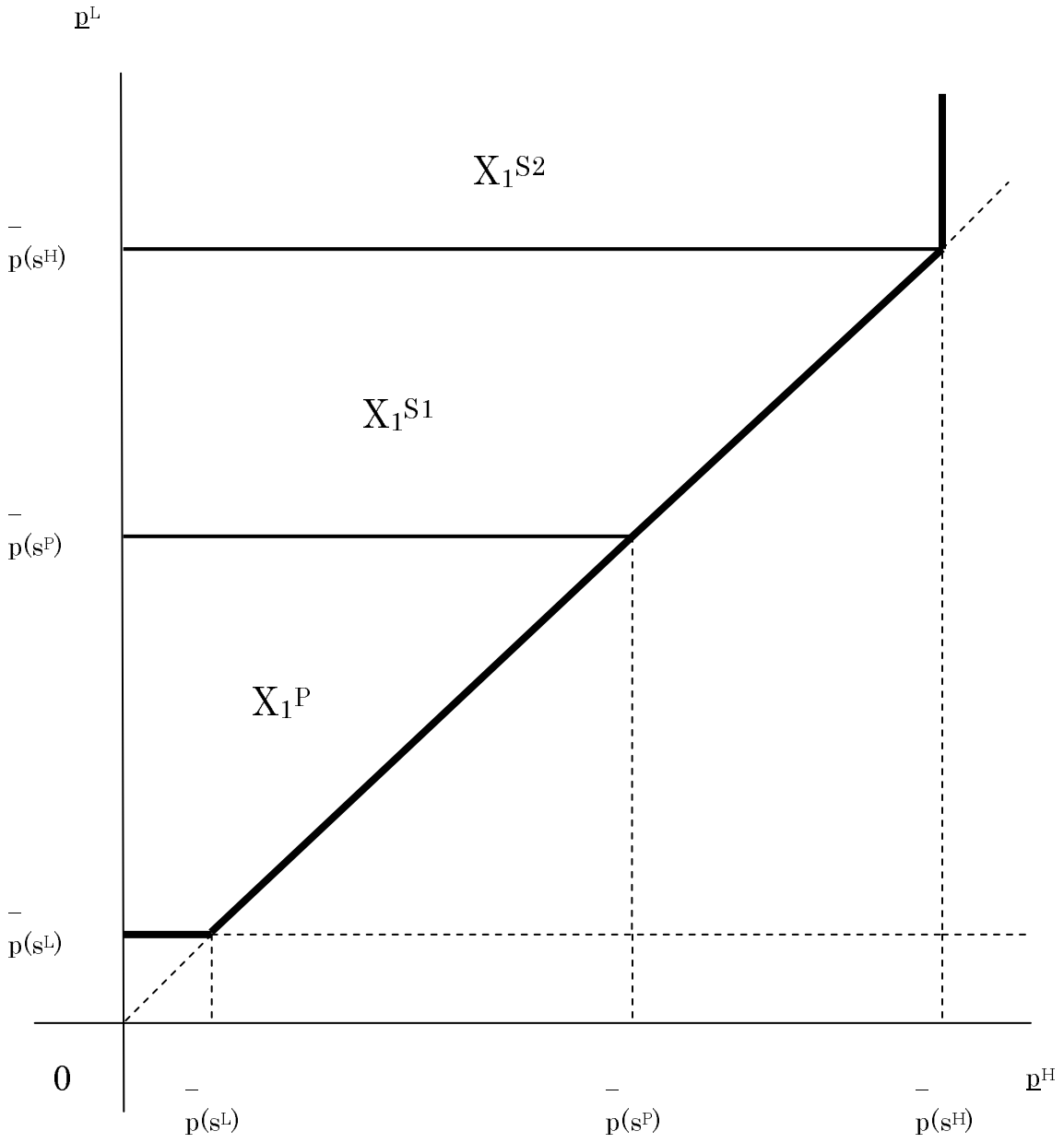


Figure 3.2: Equilibrium under a consumer cooperative. In X_2^P, hazardous production can take place. In X_2^{S1} and X_2^{S2}, only safe production can take place.

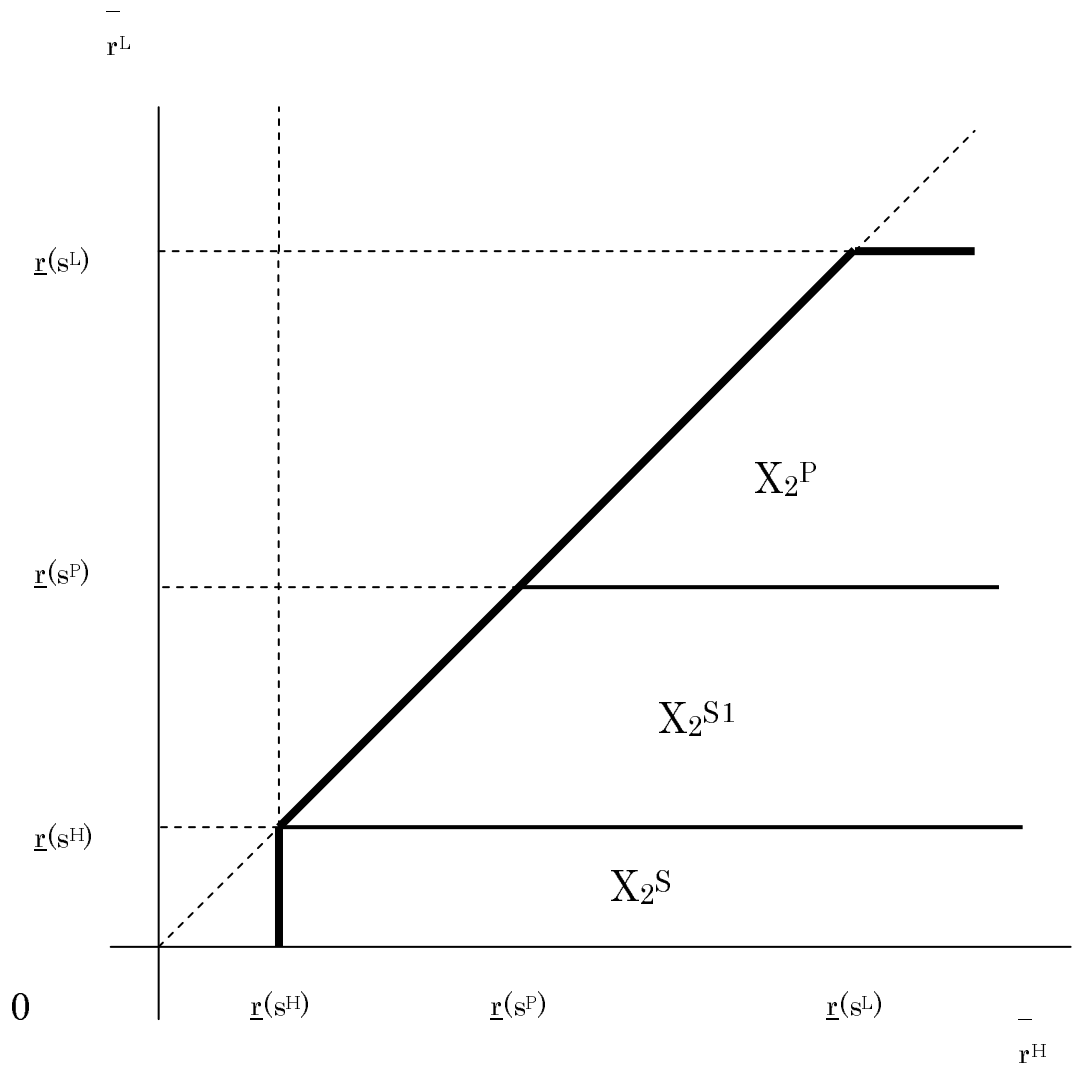
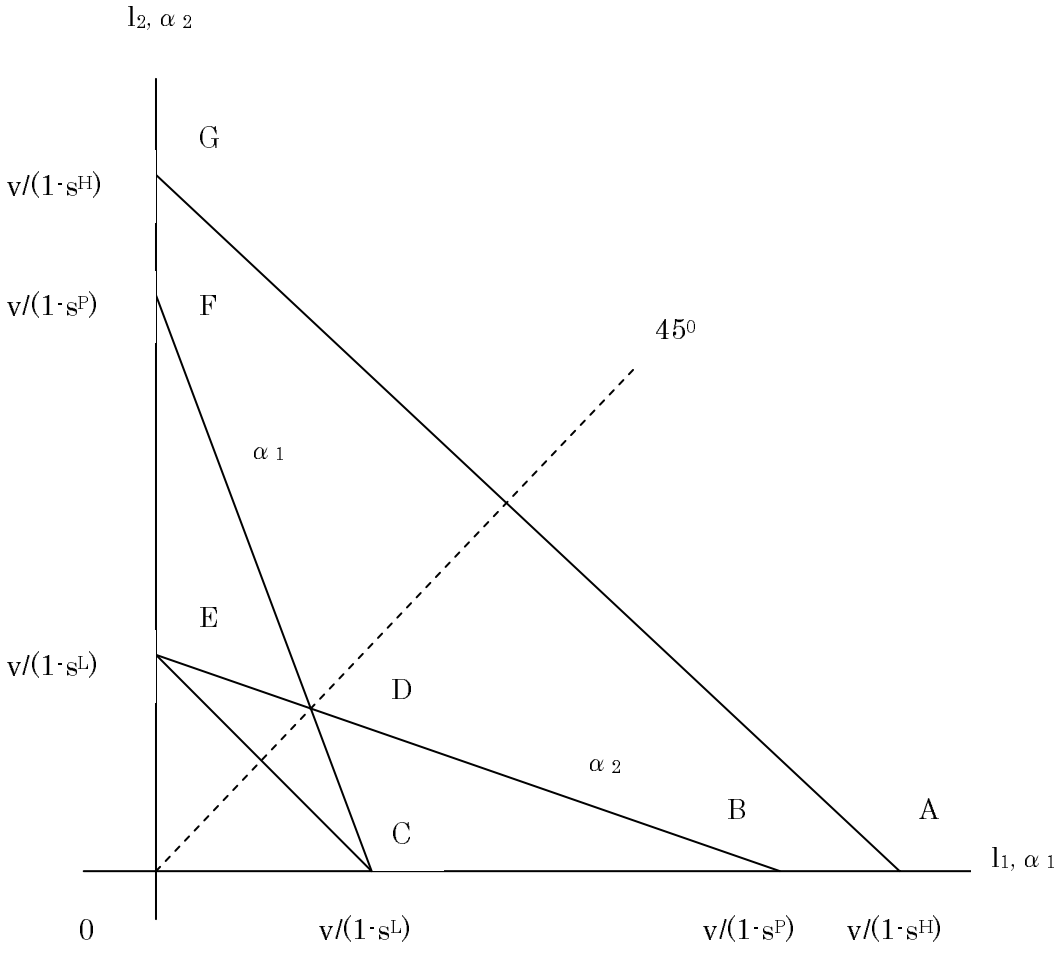


Figure 3.3: A comparison in equilibrium safety level between capitalist firm and consumer cooperative. In DEF (BCD), only safe production can take place under consumer cooperative (capitalist firm), but hazardous production can take place under capitalist firm (consumer cooperative). In ABDFG, only safe production can take place under both enterprise forms. In CED, hazardous production can take place under both enterprise forms.



Chapter 4

Market power and the form of enterprise: Capitalist firms, worker owned firms, or consumer cooperatives

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Abstract: This paper examines the effect of market power on an efficient form of enterprise. An efficiency comparison is made among three types of firms - capitalist firms, worker owned firms, and consumer cooperatives - where each type of firm has monopoly and monopsony power in the market. It will be shown that a capitalist firm (worker owned firm, or consumer cooperative, respectively) will be formed when the supply of physical capital services (supply of labor, or demand for the product, respectively) is least sensitive to variations in rental fee (wage, or product price, respectively). This result can be understood by the standard theory of monopoly and monopsony, and by some insight into implications of ownership of the firm to the structure of transactions among individuals. The latter aspect, a perspective of ownership as a selection of markets, plays an important role in explaining the structure of the model and the result obtained in this paper. (JEL classification numbers: D23, L22, P13. Key words: market power, ownership of the firm, form of enterprise, capitalist firm, worker owned firm, consumer cooperative.)

4.1 Introduction

This chapter examines the effect of market power on an efficient form of enterprise. One way to classify organizational forms of firms is to categorize them according to their ownership structure, which is characterized by the rights of decision making and of claim to the firm's residual earnings. [1] Based on this idea, we will consider three types of firms: firms owned by the suppliers of physical capital (referred to as capitalist firms), those owned by the workers (worker owned firms), and those owned by their customers (consumer cooperatives). We will then make an efficiency comparison among them, given that each type of firm has monopoly and monopsony power in the market.

The motivation for this research derives to a large extent from the numerous empirical observations and explorations made in Hansmann (1996). For example, farm marketing cooperatives, such as the grain elevator cooperatives in the late nineteenth century throughout the United States, or the fruit and vegetable canning cooperatives in the mid twentieth century in California, were formed when the middlemen who purchase farm products had a potential monopsony power in the market. [2] Many farm supply cooperatives, which furnish the member farmers with farm inputs such as fertilizer, petroleum, farm chemicals, feed, and seeds, were established in the period when investor-owned firms had a substantial monopoly power over farmers in the supply of those farm inputs. [3] In these cases, market power seems to be the primary reason for the establishment of firms that are owned by individuals who are not the investors to the firm.

[1] Dow (1986) and Hansmann (1996).
[2] Hansmann (1996), pp. 120-125.
[3] Hansmann (1996), pp. 149-151.

The theoretical literature on the relation between market power and enterprise form has been developed along two different lines. One is a performance comparison between different types of firms. Ireland and Law (1982) compared the efficiency of capitalist and worker owned firms when these firms have monopoly power in the output market. Alternatively, Stewart (1984) compared the efficiency of these two types of firms when such firms have monopsony power in the labor market. The other is an efficiency evaluation of markets, in which different types of firms coexist. Assuming an output market with a capitalist firm monopolist, Sexton and Sexton (1987) considered the possibility that customers of the product form a cooperative and enter the market as the second supplier of the product. Cremer and Crémer (1992, 1994) analyzed a mixed duopoly by a capitalist and a worker owned firms, and examined the outcomes of Bertrand and Cournot competition. Ireland and Stewart (1995) compared the consequences of three kinds of duopoly, which are the duopoly by two capitalist firms, that by a capitalist and a worker owned firms, and that by two worker owned firms.

This chapter falls under the former strand of literature, but is also related to the latter. Two points, however, distinguish this study from the prior contributions as listed above. First, whereas most of the existing literature deals only with capitalist and worker owned firms, we will deal with consumer cooperatives in addition to capitalist and worker owned firms. Second, these three types of firms are distinguished not by their objective functions, but by the allocation of ownership rights to the firm. In this sense, the three types of firms will be treated in a totally symmetric manner. In order to illustrate the characteristics of this chapter, we will briefly discuss its similarities and dissimilarities to Stewart (1984) and Sexton and Sexton (1987).

In the existing theoretical literature, the setting of the present chapter is

probably closest to that of Stewart (1984). He compared a capitalist firm with a worker owned firm of the Ward (1958) type, which is assumed to maximize net income per worker. While a capitalist firm, were it formed, would have monopsony power in the labor market, a worker owned firm would face a kind of participation constraint that the net income per worker must be greater than the wage that would be paid by a counterpart capitalist firm hiring the same amount of labor. This asymmetry between a capitalist and a worker owned firms in their ways of exerting market power is the major source of different consequences. In the present chapter, a worker owned firm of the Dow (1993) type is assumed, in which workers have the rights of decision making and of claim to the firm's residual earnings. This allows us to treat the market power exercised by a capitalist and a worker owned firms in a symmetric manner. That is, just as a capitalist firm exercises monopsony power in hiring labor, a worker owned firm exercises monopsony power in hiring physical capital.

Concerning policy implications, our study seems to be an alternative to what Sexton and Sexton (1987) suggest. They considered that, in a monopolistic market with a single capitalist firm, a consumer cooperative may be established and enter the market to compete with the incumbent monopolist. Entry of a consumer cooperative into a monopoly market is desirable from a social point of view, since such action is expected to reduce the efficiency loss under monopoly. We tackle the problem of monopoly from another point of view. That is, if monopoly by a capitalist firm is causing inefficiency, then why not consider taking the ownership rights to the firm away from the owners of physical capital and giving them to another group of individuals. For example, if consumers' monopsony power in hiring physical capital were weaker than capital owners' monopoly power in selling the product, then the

efficiency loss would be made smaller under a consumer cooperative rather than a capitalist firm.

Before describing the main results obtained in this chapter and their interpretations, we remark upon two premises in analyzing the model.

First, as was pointed out above, the three enterprise types are modeled in a symmetric manner in this model. That is, in a capitalist firm, the owners of physical capital have the ownership rights to the firm, use their own physical capital, hire workers, and sell the product to the consumers. In a worker owned firm, workers have the ownership rights to the firm, rent the physical capital from its owners, use their own labor, and sell the product to the consumers. In a consumer cooperative, consumers have the ownership rights to the firm, rent the physical capital from its owners, hire workers, and consume the product by themselves. It should be noted that it is *physical* capital, not financial capital, that is meant by capital in the present context. Therefore, the market for capital means the rental market for physical capital, or in other words the market for physical capital services, and not the stock market. [4] An implicit idea behind this is that the physical capital that is used for production is specific to the firm in the sense of Williamson (1979), and then is of no use outside the subeconomy in question. We will come back to this point in section 4.2.

Second, there are two possible mechanisms through which the proceeds of a firm are allocated among individuals. One is the market mechanism, in which proceeds are allocated through trades in the market. [5] The other is a

[4]Dow (1986) suggests that it is the services extracted from physical capital, not the physical capital itself, that is used as a factor of production in the firm. In this interpretation, the capital services are traded in the market for physical capital services under a worker owned firm, just as labor is traded in the labor market under a capitalist firm. See Dow (1986), section 3.

[5]For instance, Ireland and Law (1982), Stewart (1984), and Dow (1993), section 2 and the first half of section 4.

bargaining process, in which proceeds are allocated according to the relative bargaining power of individuals. [6] This chapter adopts the market mechanism, rather than a bargaining process, for the following reasons. Firstly, individuals with ownership rights will necessarily coordinate themselves in order to pursue managerial tasks and to settle the division of the firm's residual earnings. Real world examples include a general meeting of shareholders for stock companies, and a poll from all members for cooperatives. In contrast, such coordination for managerial and distributive purposes is not necessary for individuals without ownership rights. Secondly, in the real world, we do not see many organizations of non-owner individuals. We do not observe very often formal organizations of capital suppliers to a specific firm outside the class of capitalist firm. [7] Although labor union is a very common phenomenon in a capitalist economy, participation rate of workers in labor union is actually not very high. In Japan, for example, the participation rate is 23.2%, implying that three out of four workers are unorganized. [8] Organizations of consumers for a specific firm are also seldom seen outside the class of consumer cooperative. [9] Thirdly, as was stated at the outset of the chapter, our aim is to examine implications of *market* power on an efficient form of enterprise. If a bargaining process is presumed, a bilateral monopoly will arise and the market will collapse; the relationship between the market power and the enterprise form thus cannot be analyzed. [10]

[6] For instance, Dow (1993), Section 3 and the second half of section 4, and Schotter (1994), chapter 19, section 7.

[7] An exception is a creditors' gathering in case of bankruptcy of the firm. This is an event on a special occasion, though.

[8] Labor Minister's Secretariat Department of Policy Investigation (1997).

[9] An exception is a patients' organization that is formed to collectively sue a drug company for selling a medicine that caused serious side effects on the patients. Of course, this is also an event on a special occasion.

[10] In fact, costs of establishing and operating the organization will influence the decision of non-owner individuals whether organizing or not organizing themselves. For these costs,

The main result obtained upon these settings of the model is as follows. A capitalist firm (worker owned firm, or consumer cooperative, respectively) will be formed when the supply of the physical capital services (supply of labor, or demand for the product, respectively) is least sensitive to variations in the rental rate (wage, or product price, respectively). This result can be understood by means of the standard theory of monopoly and monopsony, and of some insight into implications of ownership of the firm to the structure of transactions among individuals.

Let us consider a monopoly in a product market. There are two factors that affect the degree of price distortion in equilibrium: demand responsiveness to price, and the monopolist's incentive to raise the price. When the demand is highly responsive to the price, variations in price have a large impact on the quantity purchased by the consumers. The monopolist then has only a little incentive to raise the price above marginal cost, because at every step of raising the price he would lose a substantial quantity that he can sell to the consumers. (The monopolist is able to charge a higher price if he wishes, but that doesn't meet his interest.) Consequently, the monopolist will set the price close to the marginal cost. On the other hand, when the demand is not very responsive to the price, variations in price have a small impact on the quantity purchased by the consumers. The monopolist then has a good deal of incentive to raise the price far above the marginal cost,

refer to Meade (1975), Ben-Ner (1988), and Hansmann (1996). In any case, when these costs of organization are relatively large, the non-owner individuals will choose to stay unorganized, and a market solution will prevail. When these costs are relatively small, they may choose to organize themselves, and the market will collapse. Although it seems quite reasonable to assume market solution in the present context by the reasons stated in the text, or at least for the first step of the analysis, it might be an interesting extension to introduce some asymmetries to the model, such as a capitalist firm with organized workers and unorganized consumers being compared with a consumer cooperative with unorganized capital suppliers and organized workers, and so on.

because he can raise the price without loosing a substantial quantity that he can sell to the consumers. Consequently, the monopolist will set the price high above the marginal cost. [11] Thus, the less sensitive is the demand for the product, the greater will be the monopolist's incentive to raise the price, and as a result the larger will be the efficiency loss in the product market. (In other words, the monopolist's rent-shifting power works strongly when demand is not easily affected by variations in price.)

This inefficiency in the product market might be avoided if we can somehow arrange transactions so that the product market is not used. Theoretically, this can be accomplished by giving ownership rights to the firm to the consumers, thus establishing a consumer cooperative. Under a consumer cooperative, the product is no longer sold and bought, and therefore monopoly power is by no means exercised in the product market. Hence, if the demand for the product is insensitive to the price, thus giving rise to strong monopoly power in the product market, then there is a comparative efficiency for a consumer cooperative.

Similarly, when the supply of labor is insensitive to the wage, the employer of labor will exercise strong monopsony power over the workers, giving rise to a large efficiency loss in the labor market. This inefficiency in the labor market can be avoided by giving ownership rights to the firm to the workers and establishing a worker owned firm. For, under a worker owned firm, labor is no longer sold and bought, and monopsony power is by no means exercised in the labor market. Thus, when the supply of labor is insensitive

[11] This property can be illustrated by using a simple example. Let $x = p^{-\epsilon}$ be the demand function for a good, where x is the consumers' demand for the good, and p is its price. For this demand function, the price elasticity of demand, $-x'(p)p/x$, is constant and equal to ϵ. With the inverse demand function $p = x^{-1/\epsilon}$ and a constant marginal cost c, a monopolist maximizes his profit $(p(x) - c)x$. The first order condition for profit maximization is given by $1/\epsilon = (p - c)/p$. This condition says that, smaller values of ϵ lead to greater divergence in percentage between the price and the marginal cost.

to the wage, there is a comparative efficiency for a worker owned firm. By similar reasoning, when the supply of physical capital services is insensitive to the rental rate, there is a comparative efficiency for a capitalist firm.

An essential feature of the model in getting to this conclusion is that, ownership of the firm implies choice of the market that is *not* used for transactions. That is, a capitalist firm is an arrangement of transactions in which the physical capital is not rented, or in other words the rental market for the physical capital is not used, whereas the labor market and the product market are used. A worker owned firm is an arrangement of transactions in which labor is not hired, or in other words the labor market is not used, whereas the rental market for the physical capital and the product market are used. A consumer cooperative is an arrangement of transactions in which the product is not sold and bought, or in other words the product market is not used, whereas the rental market for the physical capital and the labor market are used. A relative social efficiency can therefore be attained by dispensing with the market in which the largest efficiency loss would be caused by the market power. This perspective of ownership rights as a selection of markets plays an important role in explaining the result obtained in this chapter.

The model implicitly excludes the possibility that new firms enter the market when there is monopoly and monopsony rent. For example, in this chapter, when there is monopsony power in the labor market, the workers are supposed to form a workers' cooperative to cope with the monopsonistic exploitation. Another possibility is the entry of new firms, with keeping the form of the incumbent firm unchanged. Entry and enterprise form are thus considered substitutable mechanisms to restore efficiency that are embedded in the market.

The next section frames an economic model of capitalist firm, worker owned firm, and consumer cooperative. Section 4.3 examines an efficient enterprise form in relation with potential market power in each market. Section 4.4 observes worker owned firms and consumer cooperatives in reality from the viewpoint of market power. Section 4.5 concludes the chapter.

4.2 The model

In this section we develop a model that is the minimum necessary to analyze the relationship between imperfect competition in the market and the efficient enterprise form. Let us consider a subeconomy with a set N_1 of owners of physical capital, a set N_2 of workers, and a set N_3 of consumers. It is assumed that $N_i \cap N_j = \emptyset$ for $i, j \in \{1, 2, 3\}$ with $i \neq j$, and that individuals in the same group are identical in initial endowment and preference. [12] Let numbers $1, 2$ and 3 indicate a representative owner of the physical capital, worker, and consumer, respectively. Let $k^0 \in (0, \infty)$ be 1's initial endowment of physical capital, and $k \in [0, k^0]$ be the amount of physical capital 1 provides for production. Let $l^0 \in (0, \infty)$ be 2's initial endowment of labor, and $l \in [0, l^0]$ be the amount of labor 2 provides for production. Let $x \in [0, \infty)$ be the amount of the product 3 consumes. The circumstance we assume is that, there is a demand for a differentiated product, and correspondingly there are physical capital and labor that are specific for production of the differentiated product. [13]

[12] The assumption that $N_i \cap N_j = \emptyset$, $i, j \in \{1, 2, 3\}$, $i \neq j$, is a functional division of input and output, which is frequently used for analytical convenience in the literature. See, for instance, Dow (1993). Of course, this convention does not exclude the possibility that the owners of physical capital work for or purchase goods from another firm, that the workers own and rent physical capital to or purchase goods from another firm, or that the consumers own and rent physical capital to or work for another firm.

[13] As an example for such a circumstance, consider a travel to a country which has just opened its border to foreign travelers. Some people are interested in making jour-

Let $K = n_1 k$, $L = n_2 l$, and $X = n_3 x$, where $n_i = \sharp N_i$ for $i \in \{1, 2, 3\}$. [14] For a function $v_1 : R_+ \to R$, let $v_1(k^0 - k)$ be 1's utility (measured in monetary term) from the physical capital reserved for himself. [15] For a function $v_2 : R_+ \to R$, let $v_2(l^0 - l)$ be 2's utility from leisure. For a function $v_3 : R_+ \to R$, let $v_3(x)$ be 3's utility from consumption of the product.

Production technology is assumed to be of constant coefficient type, that is, $X = \min\{aK, bL\}$ for some positive numbers a and b. Without loss of generality, quantity of physical capital and labor is measured so that $a = b = 1$. It then follows that the technological constraint and production efficiency require that $K = L = X$, or equivalently that

$$k = (n_3/n_1)x \tag{4.1}$$

and

$$l = (n_3/n_2)x. \tag{4.2}$$

We now impose the following assumptions.

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neys around the unknown country (as the products). For that demand, there is a limited amount of condominiums and apartment houses which can be used for the travelers' accommodation (as the physical capital), and also a limited number of local residents who speak major as well as local languages and can serve as interpreters (as the labor).

[14] The symbol $\sharp$ indicates cardinality of the set.

[15] There are some interpretations for v_1. (1) v_1 is 1's utility from self-consuming the physical capital. For example, if a person owns rooms in a condominium, he can rent it to a firm for an office use, or he can use it as his second residence. (2) v_1 reflects maintenance cost for the physical capital that are provided for and used in the firm. For instance, let $c_1 : [-k^0, 0] \to R$ be a function defined as $c_1(k - k^0) := -v_1(k^0 - k)$ with $c_1(k - k^0)|_{k=0} = c_1(-k^0) = 0$ (no maintenance cost is needed if all the physical capital is reserved) and $c_1(k - k^0)|_{k>0} > 0$ (some maintenance cost is needed if a positive amount of the physical capital is provided for and used in the firm). In this case, the assumptions $v_1' > 0$ and $v_1'' < 0$ are translated in terms of c_1 as $c_1' > 0$ (the marginal maintenance cost of the physical capital used in the firm is positive) and $c_1'' > 0$ (the marginal maintenance cost of the physical capital used in the firm is increasing in its quantity), respectively.

Assumption 4.1: For $i \in \{1, 2, 3\}$, v_i is twice continuously differentiable and the third derivative exists with

(A.1) $v_i' > 0$, $v_i'' < 0$, and $v_1''' \geq 0$, $v_2''' \geq 0$, and $v_3''' \leq 0$,

(A.2) $v_3'(0) > v_1'(k^0) + v_2'(l^0)$,

and

(A.3) $v_3'(\hat{x}) < v_1'(k^0 - (n_3/n_1)\hat{x}) + v_2'(l^0 - (n_3/n_2)\hat{x})$ for some $\hat{x} > 0$.

(A.1) ensures that the firms' objective functions are strictly concave, and that the second order conditions for maximization problems are satisfied. [16] (A.2) and (A.3) together imply that producing some positive amount of the product is desirable from a social point of view. [17]

Ownership of the firm is characterized by the rights to make production decisions and to claim residual earnings of the firm. [18] The type of a firm is then defined according to the distribution of the ownership rights to the firm among individuals. [19] Basically, we follow this characterization for firm types. That is, in a capitalist firm, the owners of the physical capital make production by using their own physical capital, hiring labor in the labor market, and selling the product to the consumers in the product market, and then claim the (residual) profit of the firm. In a worker owned firm, workers make production by renting the physical capital in the rental market for the physical capital, using their own labor, and selling the product to the consumers in the product market, and then claim the surplus of the firm (which corresponds to the profit of the capitalist firm). We extend such formulation to the consumer cooperative. That is, in a consumer cooperative, consumers make production by renting the physical capital in the rental market for the

[16] See footnotes 26, 29, and 31.
[17] See footnote 24.
[18] Milgrom and Roberts (1992), chapter 9.
[19] Dow (1986, 1993); Hansmann (1996).

physical capital, hiring labor in the labor market, and supplying the product to themselves, where they receive the surplus of the firm (which in this model coincides with the consumer surplus; refer to equation (4.11)). Therefore, in the present setting of the model, the group of owners of the physical capital is the monopsony employer of labor and the monopoly seller of the product under a capitalist firm; the group of workers is the monopsony renter of the physical capital and the monopoly seller of the product under a worker owned firm; and the group of the consumers is the monopsony renter of the physical capital as well as the monopsony employer of the labor under a consumer cooperative.

For simplicity, it is assumed that the firm's residual earnings is divided equally among individuals in the group with ownership rights to the firm. Under a capitalist firm, payoffs to an owner of the physical capital, a worker, and a consumer are thus given by

$$u_1 = \frac{pX - wL}{n_1} + v_1(k^0 - k) \tag{4.3}$$

$$u_2 = wl + v_2(l^0 - l) \tag{4.4}$$

$$u_3 = -px + v_3(x) \tag{4.5}$$

respectively, where w and p are the wage and the product price, respectively. Under a worker owned firm, payoffs to an owner of the physical capital, a worker, and a consumer are given by

$$u_1 = rk + v_1(k^0 - k) \tag{4.6}$$

$$u_2 = \frac{pX - rK}{n_2} + v_2(l^0 - l) \tag{4.7}$$

$$u_3 = -px + v_3(x) \tag{4.8}$$

respectively, where r is the rental fee. Under a consumer cooperative, payoffs to an owner of the physical capital, a worker, and a consumer are given by

$$u_1 = rk + v_1(k^0 - k) \tag{4.9}$$

$$u_2 = wl + v_2(l^0 - l) \tag{4.10}$$

$$u_3 = -\frac{rK + wL}{n_3} + v_3(x) \tag{4.11}$$

respectively. [20]

In what follows, we consider an efficient ownership structure of the firm in a two stage model. In the first stage, individuals decide upon allocation of ownership rights to the firm. At this stage, the ownership structure upon which individuals agree is contractible, and some side payments can be made. Alternatively, quantity of the physical capital services, labor, and the product that are traded in the future are all noncontractible. [21] In the second stage,

[20] The product is not sold and bought at the product market under a pure form of consumer cooperative as described in the present model. Then, in our symmetric models of firms, the surplus of the consumer cooperative represented by equation (4.11) is one that corresponds to the profit of the capitalist firm. In fact, it coincides with consumer surplus discussed in welfare economics.

[21] For instance, in case K and L show the intensity of use of physical capital and labor as input, respectively, it is difficult to write a contract upon these variables. (For instance, Dow (1993) adopts this interpretation.) Also, if X shows the quality of product, then it is hard to write a contract upon it. (See, for instance, Tirole (1988), chapter 2, section 3, and Varian (1993), chapter 34.)

Indeed, if these variables are directly contractible, then the first best input-output bundle can always be chosen regardless of the organizational structure of the firm. Essentially, the organizational form selection problem as discussed in this chapter arises from the setting that input-output bundles are not directly contractible, and therefore that efficiency must be sought through a proper allocation of ownership rights among individuals. By the same reason, direct contractibility on the key variables is excluded in Grossman and Hart (1986) and Hart and Moore (1988, 1990).

Also it is implicitly assumed here that, at stage 1, individuals cannot commit themselves not to exercise monopoly and monopsony power at stage 2. Such a promise might be possible under some circumstances, for example when a strong anti-trust agency is present. But a strict enforcement of anti-trust policy is often impossible due to informational deficiencies or a high cost of proving manipulation of prices. From an analytical viewpoint,

the individuals trade the physical capital services, labor, and the product in the spot market. In this process, the most efficient ownership structure of the firm will be chosen by the individuals. [22]

Independent of the organizational form of the firm, the social value of the firm is given by

$$V = \sum_{i=1}^{3} n_i u_i = n_1 v_1(k^0 - k) + n_2 v_2(l^0 - l) + n_3 v_3(x). \tag{4.12}$$

4.3 The efficient form of enterprise

By using (4.1) and (4.2), the social value of the firm (4.12) is represented as a function of the output level x, as $V(x)$. The socially optimal output level is characterized by

$$V'(x) = n_3[v_3'(x) - v_1'(k^0 - k) - v_2'(l^0 - l)] = 0 \tag{4.13}$$

with k and l being given by (4.1) and (4.2), respectively. [23] Let x^* be the output level that satisfies (4.13). [24]

Under a capitalist firm, from (4.4), each worker provides labor to the firm

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if such a promise is possible, and therefore market power is by no means exercised at stage 2, the question of the present chapter, that how market power affects enterprise form, thoroughly degenerates.

[22] In this chapter, negotiation at the first stage is assumed be made at no costs, and the payoff functions of individuals satisfy the no-wealth-effects condition. Hence, owing to the Coase Theorem (Coase (1960)), an efficient ownership structure of the firm will be chosen at stage 1. This analytical methodology is widely used in the literature with incomplete contracts, which includes Hart and Moore (1990). For the details of the discussion on the relative efficiency principle, see Milgrom-Roberts (1992), chapters 2, 4 and 9.

[23] The second derivative of V is given by

$$V''(x) = n_3[v_3''(x) + v_1''(k^0 - k) + v_2''(l^0 - l)]$$

which is negative by (A.1). The second order condition is therefore satisfied.

[24] Existence and uniqueness of x^* is shown in the proof of Lemma 4.1 in Appendix 4A.

according to

$$w = v_2'(l^0 - l). \tag{4.14}$$

This equation serves for the inverse labor supply function, $w = w(l)$ with $w' > 0$, from which we obtain the labor supply function, $l = l(w)$. [25] From (4.5), each consumer purchases the product from the firm according to

$$p = v_3'(x). \tag{4.15}$$

This equation serves for the inverse demand function for the product, $p = p(x)$ with $p' < 0$, from which we obtain the demand function for the product, $x = x(p)$. The owners of the physical capital choose an output level that maximizes (4.3), subject to (4.14), (4.15), and the technological constraints, (4.1) and (4.2). u_1 then becomes a function of x, and let $U_1(x) = n_1 u_1(x)$. The output level chosen by the owners of the physical capital is characterized by

$$U_1'(x) = n_3[(p + p'(x)x) - v_1'(k^0 - k) - (w + w'(l)l)] = 0 \tag{4.16}$$

with k and l being given by (4.1) and (4.2), respectively. [26] Let x_1 be the output level that satisfies (4.16). [27]

Under a worker owned firm, from (4.6), each owner of the physical capital provides the physical capital to the firm according to

$$r = v_1'(k^0 - k). \tag{4.17}$$

(4.17) serves for the inverse supply function for the physical capital services, $r = r(k)$ with $r' > 0$, from which we obtain the supply function for the

[25] Since $v_2'' \neq 0$ by (A.1), the inverse function of v_2' exists.

[26] The second derivative of U_1 is given by

$$U_1''(x) = n_3[v_3'''(x)x + 2v_3''(x) - v_2'''(l^0 - l)l + 2v_2''(l^0 - l) + v_1''(k^0 - k)]$$

which is negative under (A.1). The second order condition is therefore satisfied.

[27] Existence and uniqueness of x_1 is shown in the proof of Lemma 4.1 in Appendix 4A.

physical capital services, $k = k(r)$. The workers choose an output level that maximizes (4.7), subject to (4.15), (4.17), and the technological constraints, (4.1) and (4.2). [28] u_2 then becomes a function of x, and let $U_2(x) = n_2 u_2(x)$. The output level chosen by the workers is characterized by

$$U_2'(x) = n_3[(p + p'(x)x) - (r + r'(k)k) - v_2'(l^0 - l)] = 0 \tag{4.18}$$

with k and l being given by (4.1) and (4.2), respectively. [29] Let x_2 be the output level that satisfies (4.18).

Under a consumer cooperative, the consumers choose an output level that maximizes (4.11), subject to (4.14), (4.17), and the technological constraints, (4.1) and (4.2). [30] u_3 then becomes a function of x, and let $U_3(x) = n_3 u_3(x)$. The output level chosen by the consumers is characterized by

$$U_3'(x) = n_3[v_3'(x) - (r + r'(k)k) - (w + w'(l)l)] = 0 \tag{4.19}$$

with k and l being given by (4.1) and (4.2), respectively. [31] Let x_3 be the output level that satisfies (4.19).

For $i \in \{1, 2, 3\}$, let $k_i = (n_3/n_1)x_i$, $l_i = (n_3/n_2)x_i$, $r_i = r(k_i)$, $w_i = w(l_i)$, and $p_i = p(x_i)$. Further, let $\dot{k}(r) = k'(r)/k(r)$, $\dot{l}(w) = l'(w)/l(w)$, and

[28] The demand function for the product under a worker owned firm is the same as that under a capitalist firm, (4.15).

[29] The second derivative of U_2 is given by

$$U_2''(x) = n_3[v_3'''(x)x + 2v_3''(x) - v_1'''(k^0 - k)k + 2v_1''(k^0 - k) + v_2''(l^0 - l)]$$

which is negative under (A.1). The second order condition is therefore satisfied.

[30] The supply functions for the physical capital services and labor under a consumer cooperative are the same as those under a worker owned firm and a capitalist firm, (4.17) and (4.14), respectively.

[31] The second derivative of U_3 is given by

$$U_3''(x) = n_3[-v_1'''(k^0 - k)k + 2v_1''(k^0 - k) - v_2'''(l^0 - l)l + 2v_2''(l^0 - l) + v_3''(x)]$$

which is negative under (A.1). The second order condition is therefore satisfied.

$\dot{x}(p) = x'(p)/x(p)$. For example, k_1 is the supply of the physical capital services in equilibrium under a capitalist firm, r_2 is the rental rate for the physical capital in equilibrium under a worker owned firm, $\dot{k}(r_3)$ is the rate of change in the supply of the physical capital services at the equilibrium under a consumer cooperative, and so on. We now obtain the following result.

Proposition 4.1: A capitalist firm will be formed if (P.1) $\dot{k}(r_1) < \min\{\dot{l}(w_1), -\dot{x}(p_1)\}$, a worker owned firm will be formed if (P.2) $\dot{l}(w_2) < \min\{\dot{k}(r_2), -\dot{x}(p_2)\}$, and a consumer cooperative will be formed if (P.3) $-\dot{x}(p_3) < \min\{\dot{k}(r_3), \dot{l}(w_3)\}$.
[32]

Proof: See Appendix 4A. ‖

The following remark assures that Proposition 4.1 is well defined.

Remark 4.1: The three cases (P.1) through (P.3) in Proposition 4.1 are mutually exclusive. That is, no two cases out of (P.1) through (P.3) take place simultaneously.
Proof: See Appendix 4B. ‖

Proposition 4.1 above can be interpreted as follows. Let us first consider the case of monopoly. When the demand for the product is insensitive to the product price, the seller of the product will exercise a strong monopoly power over the consumers in the product market. The efficiency loss caused by the monopoly power in the product market can be prevented by forming a consumer cooperative, since the product market is not used under a consumer cooperative. (Indeed, the product is not *sold* and *bought* under a consumer

[32]If it happens that $\dot{k}(r_1) = \dot{l}(w_1) < -\dot{x}(p_1)$ in case (P.1), for instance, then capitalist and worker owned firms are equally desirable, and so individuals are indifferent to the choice between the two enterprise forms.

cooperative. Notice that the product price p does not appear in payoffs, (4.9) through (4.11), under a consumer cooperative.) A similar reasoning holds for the case of monopsony. When the supply of labor is insensitive to the wage, the employer of labor will exercise a strong monopsony power over the workers in the labor market. The efficiency loss caused by the monopsony power in the labor market can be prevented by forming a worker owned firm, since the labor market is not used under a worker owned firm. (Indeed, the labor is not hired under a worker owned firm. Notice that the wage w does not appear in payoffs, (4.6) through (4.8), under a worker owned firm.) Also, when the supply of the physical capital services is insensitive to the rental rate, the renter of the physical capital will exercise a strong monopsony power over the owners of the physical capital in the rental market for the physical capital. The efficiency loss caused by the monopsony power in the rental market for the physical capital can be prevented by forming a capitalist firm, since the rental market for the physical capital is not used under a capitalist firm. (Indeed, the physical capital is not rented under a capitalist firm. Notice that the rental rate r does not appear in payoffs, (4.3) through (4.5), under a capitalist firm.)

A key property of the model in arriving at this conclusion is that, *an allocation of ownership rights to the firm implies a choice of markets used for transactions.* In the present model, there are potentially three markets for transactional use: the rental market for physical capital, the labor market, and the product market. By giving ownership rights to the firm to one group of individuals, the corresponding market is eliminated. That is, if ownership rights are given to the owners of the physical capital, the rental market for the physical capital is eliminated, whereas the labor and the product markets are used for transactions. If ownership rights are given to the workers, the labor

market is eliminated, whereas the rental market for the physical capital and the product market are used for transactions. If ownership rights are given to the consumers, the product market is eliminated, whereas the rental market for the physical capital and the labor market are used for transactions. It is apparent that the best way of coordinating transactions is to eliminate the market in which the strongest market power exists, and leave the markets in which only weaker market power exists. For example, if market power were strongest in the product market relative to the rental market for the physical capital and the labor market, then the firm should be organized as a consumer cooperative.

4.4 Empirical observations

Various economic factors are thought to influence the actual organizational form of enterprise. Market power, as discussed in this chapter, is just one possible determinant, and it can explain one aspect of the reality at most. In this section, based on the theoretical result obtained in the previous sections, we briefly discuss possible involvement of market power in an establishment of worker owned firms and consumer cooperatives.

Worker owned firms:

Overall, labor market today appears fairly competitive in developed countries. Monopsony power hence may not be an extensive cause for an establishment of worker owned firms there. At an earlier stage of the market economy, however, the labor market was not so competitive as that of today, and some historical cases are observed in which worker owned firms were established to cope with the exploitation of labor by the capitalist firm. Even today, when mobility of labor is imperfect, monopsony power can still exist

in local labor markets, where worker owned firms are established in response.

Worker owned firms can be observed from the very beginning in the history of market economy. In the late 18th century England, where private mill owners dominated the market for flour, workers were struggling from unfavorable working conditions. They tried to cope with the situation by starting similar ventures by themselves. Workers built mills and bakeries in such places as Woolwich, Chatham, and Hull, and ran them cooperatively. [33] In the 19th century, English workers were still suffering from poor working conditions in a market dominated by capitalist firms: wages were low, jobs were hard, repetitive and long lasting, and workplaces were unsafe and unhealthy. In this background, the Rochdale Society emerged in Rochdale. The members of the society were skilled workers, such as a weaver, wool sorter, clogger, cabinet maker, tailor, joiner, hatter, and shoe maker. In 1854, they established a cotton factory by leasing a workroom. The factory was ran in a cooperative manner, in which workers were all shareholders. Many workers' cooperatives of a similar nature were established throughout the 1840s in various places of England. [34] These workers' cooperatives established in the Industrial Revolution period seem to be a pertinent example of the worker owned firms that were created to cope with the capitalist firm's exploitation of workers in monopsonistic market conditions.

A similar case can be found in the United States. In the wave of recession of the early 20th century, shingle industry workers in Washington were suffering from unfavorable working conditions. The shingle weavers had little or no job security, and had few alternatives for employment in towns controlled by large timber companies. With low capitalization requirements for entry into the industry, the shingle weavers sought a solution by establishing workers'

[33] Thornley (1981), pp. 12-13.
[34] Oakeshott (1978), chapter 5; Thornley (1981), pp. 18-20.

cooperatives. [35] With few alternative job opportunities, weavers' supply of labor was thought fairly insensitive to the wage, which put the timber companies in an easy position to exploit the weavers. It seems quite reasonable that the weavers established worker owned firms in this environment. [36]

It is argued that, when a worker chooses his job, personal reasons, such as a personal connection to, or an intimacy with, a certain place for living, play an important role, sometimes more important a role than wages. [37] Workers are therefore often imperfectly mobile between regions, thus allowing a local labor market to have a monopsonistic structure. For example, empirical research found monopsony power in the local market for school teachers, printing employees, construction workers, and hospital nurses. [38] Addison and Siebert (1979) argue that 'the fact that many nurses are often secondary workers also tends to limit geographical mobility and reduce their elasticity of supply in an area.' [39] If monopsony power exists in a local labor market, there may well be a good reason to establish worker owned firms in town to avoid the exploitation of workers. For example, some of the major characteristics of the plywood industry in the United States are its geographical concentration close to raw materials in an area distant from major markets, and a market dominated by the construction industry. [40] It is understandable that worker owned plywood cooperatives were born and grew in such market circumstances. In fact, Ben-Ner (1987) explained the prevalence of plywood manufacturing cooperatives in the Pacific Northwest due

[35] Aldrich and Stern (1983), pp. 381-384.

[36] We can see various examples for worker owned firms that are similar to the shingle industry in the modern history of the United States. For a brief summary on this issue, see Berman (1967), chapter 2.

[37] Addison and Siebert (1979), chapter 5, section 4.

[38] Addison and Siebert (1979), chapter 5, section 2.

[39] Addison and Siebert (1979), p. 166.

[40] Berman (1967), chapter 3.

to monopsony power in the local labor market. [41] If Addison and Siebert's argument cited above can be applied to other occupations in town, such as construction workers, printing employees, or transportation workers, who are also secondary, then local monopsony power may account for the worker owned firms in construction industry in Italy, printing industry in France, or transportation industry in Sweden and Israel. [42] As well, we see food processing workers' collectives in farm area of Japan, which produce foods such as jam and syrup from the raw agricultural products produced in that area. Rationality of these worker owned firms may also lie in monopsonistic labor markets in remote farm areas. [43]

Consumer cooperatives:

In the present context, a consumer cooperative is not restricted to the firm that is owned by households, such as consumer-owned grocery cooperatives. It also includes firms that are owned by producers, such as farmer-owned farm supply cooperatives or retailer-owned wholesale cooperatives.

Cooperatives of farm supplies, such as fertilizer, petroleum, farm chemicals, livestock feeds, or seeds, seem a typical example of the consumer cooperative that is established to avoid market power. Historically, farm supply cooperatives grew most rapidly during the two decades after World War -5, when investor-owned firms dominated the market for farm supplies. [44] The farm supplies as listed above are all necessities for farmers, so the demand for those goods cannot be very sensitive to the price. It then follows that a proprietary high price would prevail under monopoly by a capitalist firm. Such

[41] Ben-Ner (1987), pp. 437-438 and p. 444.

[42] For worker owned firms in these countries, refer to Oakeshott (1978), chapters 8 and 9; Thornley (1981), chapters 8 and 9; Bonin, Jones and Putterman (1993); and Hansmann (1996), chapter 5.

[43] Tomizawa and Kawaguchi (1997), chapter 7.

[44] Hansmann (1996), pp. 149-151.

exploitation can be avoided by organizing the firm as a farmer cooperative, as was discussed in the previous sections.

Retailer-owned wholesale cooperatives provide yet another example which matches our argument. Wholesale firms which supply hardware to hardware retailers, groceries to grocery stores, drugs to drug stores, and baking supplies to bakeries, are often owned by the retailers. [45] As farm supplies to farmers, those merchandise are essential for the retailers to do their business, thus making the demand for those goods insensitive to the price. If an economic condition, such as economies of scale, allows only a limited number of wholesalers to operate in the distribution system, then they would exploit the retailers were they organized as an investor-owned firm. Retailer-owned wholesale cooperatives can be a solution to avoid such exploitation of retailers and improve overall efficiency of transactions.

Consumer-owned retail cooperatives appear less common than retailer-owned wholesale cooperatives in the United States. One exception is retail of books, in which student-owned university bookstores contribute to a relatively large market share of consumer cooperatives. [46] Although books in general may not be categorized as necessary goods, textbooks are necessities for university students. Demand for textbooks is hence thought relatively insensitive to the price. Since usually only one major bookstore resides on a campus, it would exploit students were it organized as an investor-owned firm. Strong incentives thus arise for replacing investor ownership with student ownership for campus bookstores.

Customer-owned electricity cooperatives are common in rural areas of the United States. It is reported that about 50 percent of all electric power

[45] Hansmann (1996), pp. 157-158.
[46] Hansmann (1996), pp. 161-163.

consumed in rural areas are supplied by electricity cooperatives. [47] Since electricity is a fundamental resource for households, its demand cannot be very sensitive to the electricity price. Since the market for electricity becomes monopolistic by a technological reason (i.e., a decreasing average cost), customers are exposed to a proprietary high price for electricity. Price regulation by the government is one common means for dealing with this problem, which is inclusively applied to the electric power companies in urban areas. Customer ownership can be an alternative solution. That is, by organizing the firm as a customer-owned electricity cooperative, the market for electricity, which is subject to natural monopoly, can be dispensed with, and then overall efficiency of transactions is improved.

4.5 Conclusion

In this chapter we studied how market power affects the form of enterprise. The main result, Proposition 4.1, states that enterprise forms are determined by the intensity of market power in each market, which in turn depends upon how sensitive the input supply and output demand are to their prices.

In interpreting the result, we introduced a perspective of ownership of the firm as a selection of markets used for transactions among individuals. In principle, this viewpoint can be applied not only to the issue of market power as discussed in this chapter, but also to other sorts of market failure, such as asymmetric information or externalities. Whatever the cause of market failure is, individuals can be better off by choosing an enterprise form under which the market with the greatest distortion is dispense with. In this sense, firm ownership can be an effective means to deal with the market failure.

We conclude the chapter with a brief discussion on the comparison of the

[47] Berman (1967), p. 9; Hansmann (1988), pp. 297-298; Hansmann (1996), chapter 9.

present results with the conclusions presented in Ireland and Law (1982) and Stewart (1984), which made a comparative analysis between a capitalist firm and an Illyrian worker owned firm in the context of market power.

Ireland and Law (1982) compared the equilibrium output levels of a capitalist and a worker owned firms when they have monopoly power in the output market. They showed that a worker owned firm will produce a lower amount of output than a capitalist firm. The reason for this is that an Illyrian worker owned firm will restrict the number of workers who participate in production in order to realize a high net income per worker. In the present chapter, on the other hand, other things (in particular, the degree of monopsony power over input) being equal, the presence of market power in the output market makes no difference regarding the equilibrium output level between a capitalist and a worker owned firms. This is because, in the present framework, the degree of market power in the output market depends on the shape of the demand function of consumers; thus, it does not matter *who* exerts the market power on consumers as far as the distortion created in the output market is concerned. Of course, when the degree of monopsony power over input is uneven between a capitalist and a worker owned firms, some differences will arise in the equilibrium output levels between the two enterprise types.

Stewart (1984) compared the equilibrium output levels of a capitalist and a worker owned firms when they have monopsony power in hiring labor. He considered two kinds of equilibrium, one with a binding labor supply constraint (which requires that the net income per worker be greater than or equal to the wage on the labor supply function), and one without it. When the constraint is binding, a worker owned firm will produce more than a capitalist firm, since a worker owned firm will try to realize a higher

employment level. When the labor supply constraint is not binding, on the other hand, the equilibrium output level of a worker owned firm can be greater, or less than, that of a capitalist firm, depending on the shape of the marginal outlay curve (which is defined to be the derivative of total wage payment with respect to the employment level) in relation to the employment level that maximizes the net income per worker. The result obtained in the present chapter has a somewhat similar appearance to the second case of Stewart, in the sense that the output level of a worker owned firm may, or may not, be greater than that of a capitalist firm. The logic underlying our result is quite different from that of Stewart, however. In the present model, the difference in the equilibrium output levels between a capitalist and a worker owned firms derives from unequal monopsony power exercised by the two firms. Obviously, the difference in reasoning between the two studies originates from how a worker owned firm is modeled. That is, the worker owned firm in Stewart is of Illyrian type, whereas in the present chapter it is a symmetric counterpart to a capitalist firm, in which workers have the rights of making decisions and of claiming residual earnings of the firm.

Appendix 4A: Proof of Proposition 4.1

The next lemma shows that an enterprise form which realizes higher output level is socially more efficient.

Lemma 4.1: For $i, j \in \{1, 2, 3\}$ with $i \neq j$,

$$x_i > x_j \Leftrightarrow V(x_i) > V(x_j). \tag{4.20}$$

Proof:

First, in (4.13), $V'(0) > 0$ by (A.2), $V'(\hat{x}) < 0$ for some $\hat{x}$ by (A.3), V' is continuous because v_i', $i \in \{1, 2, 3\}$, is continuous by Assumption, and V' is strictly decreasing as shown in footnote 18. Therefore, there exists a unique x^*.

Next, under a capitalist firm, from (4.14) and (4.15), it holds that $w(l) = v_2'(l^0 - l)$, $w'(l) = -v_2''(l^0 - l)$, $p(x) = v_3'(x)$ and $p'(x) = v_3''(x)$. Then, (4.16) is rewritten as

$$U_1'(x) = n_3[v_3'(x) + v_3''(x)x - v_1'(k^0 - k) - v_2'(l^0 - l) + v_2''(l^0 - l)l)] = 0. \quad (4.21)$$

Since $v_i'' < 0$ for $i \in \{2, 3\}$ by (A.1), $U_1'(x) < V'(x)$ for all $x > 0$. Then, since $U_1'(0) = V'(0) > 0$ by (A.2), $U_1'(\hat{x}) < V'(\hat{x}) < 0$ for some $\hat{x} > 0$ by (A.3), U_1' is continuous because v_i' and v_i'', $i \in \{1, 2, 3\}$, are continuous by Assumption, and U_1' is strictly decreasing as shown in footnote 21, there exists a unique x_1. In particular, since $U_1'(x^*) < V'(x^*) = 0$ as shown above, it holds that $x_1 < x^*$. By a similar procedure, we obtain $x_i < x^*$ for $i \in \{2, 3\}$.

Since $V(x)$ is strictly increasing in x over $[0, x^*]$, for $i, j \in \{1, 2, 3\}$ with $i \neq j$, it holds that $x_i > x_j \Leftrightarrow V(x_i) > V(x_j)$. $\|$

Proof of Proposition 4.1:

Here we only prove the case of (P.1). The remaining two cases can be proven by a similar procedure.

From (4.16) and (4.18), together with (4.14) and (4.17), we have

$$U_1'(x_1) - U_2'(x_1) = n_3[\frac{1}{\dot{k}(r_1)} - \frac{1}{\dot{l}(w_1)}] \quad (4.22)$$

where the relations $r'(k_1) = 1/k'(r_1)$ and $w'(l_1) = 1/l'(w_1)$ are used. Hence it holds that

$$\dot{k}(r_1) < \dot{l}(w_1) \Leftrightarrow U_1'(x_1) > U_2'(x_1). \quad (4.23)$$

Next suppose that $U_1'(x_1) > U_2'(x_1)$. Notice that U_2' is continuous because v_i' and v_i'', $i \in \{1,2,3\}$, are continuous by Assumption 4.1, that U_2' is strictly decreasing as shown in footnote 24, that $U_2'(0) = V'(0) > 0$ by (A.2), and that $U_2'(x_1) < U_1'(x_1) = 0$ by assumption. Then, it holds that $x_1 > x_2$. Hence we have

$$U_1'(x_1) > U_2'(x_1) \Rightarrow x_1 > x_2. \tag{4.24}$$

Then, from (4.23) and (4.24), together with (4.20) of Lemma 4.1, it holds that

$$\dot{k}(r_1) < \dot{l}(w_1) \Rightarrow V(x_1) > V(x_2). \tag{4.25}$$

Similarly, since

$$U_1'(x_1) - U_3'(x_1) = n_3[\frac{1}{\dot{k}(r_1)} + \frac{1}{\dot{x}(p_1)}] \tag{4.26}$$

it holds that $\dot{k}(r_1) < -\dot{x}(p_1) \Leftrightarrow U_1'(x_1) > U_3'(x_1)$. By a similar procedure as above, it holds that $U_1'(x_1) > U_3'(x_1) \Rightarrow x_1 > x_3$. Hence, with (4.20), it holds that

$$\dot{k}(r_1) < -\dot{x}(p_1) \Rightarrow V(x_1) > V(x_3). \tag{4.27}$$

(4.25) and (4.27) complete the proof for the case of (P.1). ‖

Appendix 4B: Proof of Remark 4.1

We first show that, for $i, j \in \{1,2,3\}$ with $i \neq j$,

$$U_i'(x_i) > U_j'(x_i) \Leftrightarrow U_i'(x_j) > U_j'(x_j).$$

Suppose that $U_i'(x_i) > U_j'(x_i)$. Notice that U_j' is continuous because v_i' and v_i'', $i \in \{1,2,3\}$, are continuous by Assumption, that U_j' is strictly decreasing

as shown in footnotes 21, 24, and 26, that $U_j'(0) = V'(0) > 0$ by (A.2), and that $U_j'(x_i) < U_i'(x_i) = 0$ by assumption. Then, it holds that $x_j < x_i$. Since U_i' is also continuous and strictly decreasing, it holds that $U_i'(x_j) > 0$. Then, since $U_j'(x_j) = 0$ by the definition of x_j, it holds that $U_i'(x_j) > U_j'(x_j)$. The reverse direction can be proved in a similar way.

Next, since

$$\dot{k}(r_1) < (>)\dot{l}(w_1) \Leftrightarrow U_1'(x_1) > (<)U_2'(x_1)$$

and

$$\dot{k}(r_2) < (>)\dot{l}(w_2) \Leftrightarrow U_1'(x_2) > (<)U_2'(x_2)$$

it holds that

$$\dot{k}(r_1) < (>)\dot{l}(w_1) \Leftrightarrow \dot{k}(r_2) < (>)\dot{l}(w_2). \tag{4.28}$$

Similarly, it holds that

$$\dot{k}(r_1) < (>) - \dot{x}(p_1) \Leftrightarrow \dot{k}(r_3) < (>) - \dot{x}(p_3) \tag{4.29}$$

and

$$\dot{l}(w_2) < (>) - \dot{x}(p_2) \Leftrightarrow \dot{l}(r_3) < (>) - \dot{x}(p_3). \tag{4.30}$$

Suppose that (P.1) holds. Then, since $\dot{l}(w_1) > \dot{k}(r_1)$ implies $\dot{l}(w_2) > \dot{k}(r_2)$ by (4.28), (P.2) does not hold. Also, since $-\dot{x}(p_1) > \dot{k}(r_1)$ implies $-\dot{x}(p_3) > \dot{k}(r_3)$ by (4.29), (P.3) does not hold. Similarly, when (P.2) holds, (P.1) and (P.3) do not hold by (4.28) and (4.30), and when (P.3) holds, (P.1) and (P.2) do not hold by (4.29) and (4.30). ‖

Bibliography

[1] Addison, John T., and Siebert, W. Stanley, 1979, *The market for labor: An analytical treatment.* Santa Monica, CA: Goodyear Publishing Company, Inc..

[2] Aldrich, Howard, and Stern, Robert N., 1983, "Resource mobilization and the creation of US producer's cooperatives, 1835-1935." *Economic and Industrial Democracy: An International Journal* 4-3: 371-406.

[3] Ben-Ner, Avner, 1988, "Comparative Empirical Observations on Worker-Owned and Capitalist Firms." *International Journal of Industrial Organization* 6-1: 7-31.

[4] Berman, Katrina V., 1967, *Worker-owned plywood companies: An economic analysis.* Pullman, WA: Washington State University Press.

[5] Bonin, John P., Jones, Derek C., and Putterman, Louis, 1993, "Theoretical and Empirical Studies of Producer Cooperatives: Will Ever the Twain Meet?" *Journal of Economic Literature* 31-3: 1290-1320.

[6] Coase, Ronald, 1960, "The Problem of Social Cost." *Journal of Law and Economics* 3-1: 1-44.

[7] Cremer, Helmuth, and Crémer, Jacques, 1992, "Duopoly with Employee-controlled and Profit-maximizing Firms: Bertrand vs Cournot Competition." *Journal of Comparative Economics* 16-2: 241-258.

[8] Cremer, Helmuth, and Crémer, Jacques, 1994, "Employee Control and Oligopoly in a Free Market Economy." *Annales d'Économie et de Statistique* 33: 29-49.

[9] Dow, Gregory K., 1986, "Control Rights, Competitive Markets, and the Labor Management Debate." *Journal of Comparative Economics* 10-1: 48-61.

[10] Dow, Gregory K., 1993, "Why Capital Hires Labor: A Bargaining Perspective." *American Economic Review* 83-4: 118-134.

[11] Grossman, Sanford J., and Hart, Oliver D., 1986, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94-4: 691-719.

[12] Hansmann, Henry, 1988, "Ownership of the Firm." *Journal of Law, Economics and Organization* 4-2: 267-304.

[13] Hansmann, Henry, *The ownership of enterprise.* Cambridge, MA: Harvard University Press, 1996.

[14] Hart, Oliver, and Moore, John, 1988, "Incomplete Contracts and Renegotiation." *Econometrica* 56-4: 755-785.

[15] Hart, Oliver, and Moore, John, 1990, "Property Rights and the Nature of the Firm." *Journal of Political Economy* 98-6: 1119-1158.

[16] Ireland, N. J., and Law, P. J., *Economics of Labour-managed Enterprise.* London: Croom Helm, 1982.

[17] Ireland, Norman J., and Stewart, Geoff, 1995, "On the Sale of Production Rights and Firm Organization." *Journal of Comparative Economics* 21: 289-307.

[18] Labor Minister's Secretariat Department of Policy Investigation, 1997, *Nihon no Rôdô-kumiai no genjô* -5 (The present state of labor unions in Japan, volume -5). Tokyo: Ministry of Finance Printing Bureau.

[19] Meade, James E., 1975, *The Intelligent Radical's Guide to Economic Policy: The Mixed Economy.* London: George Allen and Unwin Ltd..

[20] Milgrom, Paul, and Roberts, John, 1992, *Economics, Organization and Management.* Englewood Cliffs, NJ: Prentice-Hall International.

[21] Schotter, Andrew, 1994, *Microeconomics.* New York, NY: Harper Collins College Publishers.

[22] Sexton, Richard J., and Sexton, Terri A., 1987, "Cooperatives as Entrants." *Rand Journal of Economics* 18-4: 581-595.

[23] Stewart, Geoff, 1984, "Labour-managed Firms and Monopsony Power." *International Journal of Industrial Organization* 2: 63-74.

[24] Thornley, Jenny, 1981, *Workers' co-operatives.* London: Heinemann Educational Books Ltd..

[25] Tirole, Jean, 1988, *The Theory of Industrial Organization.* Cambridge, MA: The MIT Press.

[26] Tomizawa, Kenji, and Kawaguchi, Kiyoshi, 1997, *Hieiri Kyôdô Sekutâ no Riron to Genjitsu.* (Nonprofit and Cooperative Sector: Theory and Practice.) Tokyo: Nihon Keizai Hyôronsha.

[27] Varian, Hal R., 1993, *Intermediate Microeconomics.* (Third edition.) New York, NY: W.W. Norton & Company.

[28] Ward, Benjamin, 1958, "The Firm in Illyria: Market Syndicalism." *American Economic Review* 48-4: 566-589.

[29] Williamson, Oliver E., 1979, "Transaction-Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics* 22: 233-261.

Vita

Kazuhiko Mikami

Born in Itami, Hyogo, Japan in 1963.

Diploma, Kwansei Gakuin High School, 1981. Bachelor of Economics, Kwanse Gakuin University, 1985. Master of Economics, Kobe University, 1987. Doctor of Economics (Course Doctorate), Kobe University, 1990.

Lecturer of Economics, Kobe Gakuin University, 1990-1992. Assistant Professor of Economics, Kobe Gakuin University, 1992-1997. Assistant Professor of Economics, Kwansei Gakuin University, 1997-2001. Professor of Economics, Kwansei Gakuin University, 2001-.