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Enterprise forms, ownership markets, and capital procurement of the firm[1]

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Abstract

It is often argued that cooperative firms are financially less viable than investor-owned firms. From a fundamental point of view, however, this does not seem a fair comparison, since the market for firm ownership is usually only available to investor-owned firms in our economy. This paper examines potential roles of the market for ownership rights to cooperative firms, particularly in capital procurement of the firm. We show that, with a well-functioning membership market, consumer cooperatives are not necessarily financially weaker than investor-owned firms. The consumer cooperative can thus be a promising alternative to the investor-owned firm when the latter type of the firm induces some serious market failure in the product market.

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1 Introduction

Despite their advantages in some important respects, cooperative firms have occupied only a tiny fraction of the production sector in the market economy. In an early stage of capitalism, labor-managed firms were established in various industries in an attempt to protect workers from factory owners' exploitation [Mikami (2003)]. More recently, consumer cooperatives have played a leading role in improving the quality, in particular safety, of food and household goods [Mikami (2007)]. However, activities of these types of firms have been quite limited so far. Presumably, one of the most fundamental weaknesses for cooperative firms consists in their ability of raising funds for initial investment. The investor-owned firm is designed to embody in it the mechanism of equity finance. This type of the firm issues a stock, that represents partial ownership of the firm, and sells it in the stock market to collect financial capital for investment in physical capital. In contrast, cooperative firms do no have such mechanisms of raising equity capital, and have to resort in most part to debts to finance physical capital.

In theory, however, ownership of cooperative firms can also be traded in the market, just as stocks are traded in the stock market. [1] This paper studies potential roles of the primary (in contrast to secondary) market for ownership rights to labor-managed firms and consumer cooperatives, where special attention is paid to capital procurement of the firm.

As investor-owned firms issue stocks, labor-managed firms and consumer cooperatives issue *partnership* and *membership*, respectively. As stocks are traded in the stock market, partnership and membership are traded in the partnership and membership markets, respectively. When the sales of owner-

[1] In reality, ownership rights to labor-managed firms and consumer cooperatives are traded only in special occasions. Worker-partnership is traded in the US plywood industry, where new applicants are supposed to buy worker-partnership from departing workers [Craig and Pencavel (1992)]. Markets for consumer-membership are rather rare; however, markets for membership in some golf courses and vacation resorts may be regarded as markets for ownership rights to consumer cooperatives.

ship rights are expended on physical capital, the markets for firm ownership constitute part of the financial market of the economy. We thus have three different, symmetrically designed enterprise-market systems: the system of investor-owned firms with the stock market, which we call the *capitalistic system*; the system of labor-managed firms with the partnership market, which we call the *labor-managed system*; and the system of consumer cooperatives with the membership market, which we call the *cooperative system*.

We obtain some important results from the comparative study on these different enterprise-market systems. Firstly, if all the markets are complete, the three systems are equally efficient and profitable (Propositions 1 and 2). Secondly, however, equity capital that is procured in the markets for firm ownership is not equal among the three types of firms; it is greatest for a consumer cooperative, second greatest for an investor-owned firm, and smallest for a labor-managed firm (Proposition 3). This property has an important implication when the financial market is incomplete. That is, if firm owners are privately informed of the project risk, adverse selection may hinder outside investors from providing sufficient financial capital to the firm in the money market [Stiglitz and Weiss (1981)]. In such circumstances, Proposition 3 implies that consumer cooperatives are financially more viable than investor-owned firms (Proposition 4). Thirdly, investor-owned firms are more vulnerable to the market failure in the labor market than labor-managed firms (Proposition 5); similarly, investor-owned firms are more vulnerable to the market failure in the product market than consumer cooperatives (Proposition 6). Referring to these theoretical results, the consumer cooperative looms up as a promising alternative to the investor-owned firm when the latter type of the firm induces serious market failure in the product market.

The novelty of this paper can be described as follows. First of all, the study of the partnership market for labor-managed firms is not new itself. It has been discussed in the literature that an introduction of the market

for partnership can eliminate 'perversities' of labor-managed firms [Sertel (1991); Fehr (1993); Dow (1996)]. Although these works and ours share a common idea of using the partnership market to restore efficiency of labor-managed firms, there are major differences between the two. In principle, the existing literature considered the *secondary* market for partnership, which, in the absence of the labor market, aligns incentives of departing and incoming partners of the firm. In this paper, on the other hand, we attempt to examine implications of the *primary* market for partnership, which serves as a complete substitute for the labor market. Such a difference in the expected roles of the partnership market comes from how the labor-managed firm is portrayed in the first place. In the existing literature, labor-managed firms are characterized as so-called Illyrian firms, where inefficiencies arise from the behavioral assumption that the firms maximize the net income per worker. In the present paper, on the other hand, labor-managed and investor-owned firms are modeled symmetrically, where both types of firms are analogously driven by the firm owners' utility maximization. They are equally efficient in complete markets, and inefficiencies can emanate from exogeneously given causes for market failure. Secondly, and more importantly, this paper discusses potential roles of the membership market for consumer cooperatives, which has attracted little attention of economists so far.

The rest of the paper is constructed as follows. The next section presents a model of the firm. Section 3 compares the three types of enterprise-market systems under complete markets. Sections 4 and 5 explore the effects of market failure in the financial and real markets, respectively. Section 6 summarizes the results obtained in sections 3 through 5, and discusses some extensions and remarks.

2 The model

Let $N := \{1, ..., n\}$ be the set of households. Household $i \in N$ has initial wealth $\overline{I}^i > 0$. His preference is represented by a utility function of the form

$$u^i = \sum_{j=1}^{m} \left(a_j^i v_j^i(x_j^i) - b_j^i g_j^i(l_j^i) \right) + I^i \tag{1}$$

where $x_j^i \geq 0$ is his consumption of good $j = 1, ..., m$, v_j^i his utility from x_j^i, $l_j^i \geq 0$ his supply of labor to firm $j = 1, ..., m$, g_j^i his disutility of l_j^i, and I^i his money holdings. We assume that v_j^i is continuously differentiable, strictly concave, and

$$\lim_{x_j^i \to 0} \frac{dv_j^i(x_j^i)}{dx_j^i} = +\infty$$

and that g_j^i is continuously differentiable, strictly convex, and

$$\lim_{l_j^i \to 0} \frac{dg_j^i(l_j^i)}{dl_j^i} = 0.$$

a_j^i takes either 1 or 0. If $a_j^i = 1$, household i will consume some positive amount of good j. If $a_j^i = 0$, he will not consume good j. Similarly, b_j^i takes either 1 or 0. If $b_j^i = 1$, household i will supply some positive amount of labor to firm j. If $b_j^i = 0$, he will not supply labor to firm j. Therefore, the set of workers, N_j^2, and the set of customers, N_j^3, of firm j are given by

$$N_j^2 := \{i \in N : b_j^i = 1\}$$

and

$$N_j^3 := \{i \in N : a_j^i = 1\}$$

respectively.

There are m projects, $j = 1, ..., m$. Project j is undertaken by entrepreneur j. Project j requires a fixed amount of project-specific physical capital, which costs $\kappa_j > 0$, and labor $l_j \geq 0$ to produce x_j units of consumption good j. The production technology is represented by

$$x_j = f_j(l_j; \kappa_j) \tag{2}$$

where f_j is assumed continuously differentiable and strictly concave in l_j for given κ_j.

A project proceeds in two stages. In the investment stage (stage 0), entrepreneur j procures financial capital for investment in physical capital. In the production stage (stage 1), firm j produces good j according to production function (2), which is consumed by households.

The investment stage is involved with investment risks. Investment j is either *safe* with prior probability α_j, $0 \leq \alpha_j \leq 1$, or *risky* with $1 - \alpha_j$. For simplicity, we assume that a safe investment succeeds for sure, and a risky investment fails for sure. [2] If an investment fails, the firm-specific physical capital is not usable and investment κ_j is not recouped by any means. In addition, entrepreneur j incurs a sufficiently large private cost of bankruptcy.

The production stage is involved with accident risks in the workplace and in the consumption of the products. The workplace of firm j is either *safe* with prior probability β_j, $0 \leq \beta_j \leq 1$, or *hazardous* with $1 - \beta_j$. No accidents occur in a safe workplace, and an accident surely occurs in a hazardous workplace. If an accident takes place in the workplace of firm j, household $i \in N_j^2$ incurs a loss $y_j^i > 0$. In addition, entrepreneur j incurs a sufficiently large private cost from the accident. Similarly, good j is either *safe* with prior probability γ_j, $0 \leq \gamma_j \leq 1$, or *hazardous* with $1 - \gamma_j$. No accidents occur in consuming a safe good, and an accident surely occurs in consuming a hazardous good. If an accident takes place in consuming good j, household $i \in N_j^3$ incurs a loss $z_j^i > 0$. In addition, entrepreneur j incurs a sufficiently large private cost from the accident. [3]

Let

$$U = \sum_{i \in N} u^i. \tag{3}$$

[2] Therefore, production function (2) is for project j with a safe investment opportunity.
[3] Therefore, utility function (1) is for projects with safe workplaces and safe goods.

[4] Maximizing (3) subject to market clearing conditions, $\sum_i x_j^i = x_j$ and $\sum_i l_j^i = l_j$, and technological constraint (2) yields

$$\frac{g_j^{k\prime}(l_j^k)}{v_j^{h\prime}(x_j^h)} = f_j{}'(l_j;\kappa_j) \tag{4}$$

for all $h \in N_j^3$ and $k \in N_j^2$, $j = 1, ..., m$. (4) implies that the marginal rate of substitution equals the marginal rate of technical transformation between good j and the labor.

The entrepreneur has three ways to organize the firm.

Investor-owned firm. In the investment stage, entrepreneur j sells the firm's stock in the (primary) stock market to collect financial capital for investment. The stock is allocated to the public in proportion to the contribution of financial capital to the firm. Stockholders are the legal owners of the firm and are entitled to receive the firm's dividends as well as to hold control rights to the firm. The latter includes the rights to decide a performance pay for and replacement of the manager, and to decide how to dispose of the firm's remaining assets on dissolution. If the equity capital so procured is in short of acquiring physical capital, entrepreneur j issues a debt to complement the expenses. If the investment proves to be a success, in the production stage, firm j hires labor in the labor market, produces good j, sells it in the product market, redeems the debt (if any), and pays dividends to the stockholders. In this paper, we call the system of investor-owned firms combined with the stock market the *capitalistic system.* In the present context, the stock market facilitates an arrangement to collect financial capital in advance, within the limit of the firm's expected profit, in exchange for cash payment from the firm's earnings in the future.

Labor-managed firm. In the investment stage, entrepreneur j offers the firm's partnership in the (primary) partnership market to secure labor that is

[4](3) represents the social welfare when all the investment opportunities, workplaces and products are of safe type.

used in the production stage. [5] (In other words, households 'buy' partnership with labor, not with money.) The partnership is allocated to the public in proportion to the contribution of labor to the firm. Partners are the legal owners of the firm and are entitled to receive cash distribution from the firm's earnings as well as to hold control rights to the firm. The latter includes the rights to decide a performance pay for and replacement of the manager, and to decide how to dispose of the firm's remaining assets on dissolution. Entrepreneur j procures all financial capital for investment by a debt. If the investment proves to be a success, in the production stage, firm j produces good j, sells it in the product market, redeems the debt, and makes cash distribution to the partners. We call the system of labor-managed firms combined with the partnership market the *labor-managed system*. The partnership market facilitates an arrangement to secure labor in advance in exchange for cash payment from the firm's earnings in the future.

Consumer cooperative. In the investment stage, entrepreneur j sells the firm's membership in the (primary) membership market to collect financial capital for investment. [6] The membership is allocated to the public in proportion to the consumption of the firm's product. Members are the legal owners of the firm and are entitled to receive the firm's product as well as to hold control rights to the firm. The latter includes the rights to decide a performance pay for and replacement of the manager, and to decide how to dispose of the firm's remaining assets on dissolution. If the investment proves to be a success, in the production stage, firm j hires labor in the labor market, produces good j and distributes it to the members. We call the system of consumer cooperatives combined with the membership market

[5] Although the term 'membership market' seems commoner to refer to the market for ownership for labor-managed firms, here we use the term 'partnership market' instead in order to reserve the term for the market for ownership for consumer cooperatives.

[6] As it will be shown in Lemma 3.5, sales of membership cover the costs of physical capital for a profitable project. Therefore, the entrepreneur need not issue a debt to finance physical capital.

the *cooperative system*. The membership market facilitates an arrangement to collect financial capital in advance, within the limit of the value of the product, in exchange for the distribution of the firm's product in the future.

In order to focus on the effects of ownership structure of the firm to the efficiency of the enterprise-market systems, we assume that there is no agency relationship between the entrepreneur, who will manage the firm, and the firm owners, who have the ultimate rights to replace the manager [Manning (1989); Ben-Ner and Jun (1996)]. We therefore consider the circumstance where the entrepreneur and the firm owners share the private information on the project type (*i.e.* the types of investment, workplace and the product.)

3 Enterprise-market systems with complete markets

This section assumes complete markets ($\alpha_j = \beta_j = \gamma_j = 1$) and compares the three enterprise-market systems in economic efficiency, retained earnings of the firm, and the firm's procurement of equity capital. The results obtained in this section will become the benchmark for the analysis of incomplete markets in the next two sections.

3.1 The capitalistic system

Let θ_j^i be the amount of firm j's stock that is held by household i. The set of firm j's stockholders is given by

$$N_j^1 := \{i \in N : \theta_j^i > 0\}.$$

θ_j^i units of firm j's stock entitle household $i \in N_j^1$ to a profit and vote share that is equal to θ_j^i/θ_j. Firm j's profit π_j is defined by

$$\pi_j := p_j x_j - \kappa_j - w_j l_j \tag{5}$$

where p_j is the price of good j and w_j the wage.

Let τ_j be the price of firm j's stock in the (primary) stock market. A household wishes to buy an infinite amount of firm j's stock if τ_j is lower than the dividends per stock π_j/θ_j, and does not buy any if τ_j is higher than π_j/θ_j. A household would buy an indefinite amount of the stock if

$$\tau_j = \frac{\pi_j}{\theta_j}. \tag{6}$$

Therefore, the market for stock j can clear only if (6) holds. If this is the case, in the investment stage, by issuing θ_j units of the stock, firm j raises cash proceeds μ_j by

$$\mu_j = \tau_j \theta_j = \pi_j. \tag{7}$$

If $\pi_j \geq \kappa_j$, firm j is able to finance the physical capital without resorting to a debt. In the production stage, firm j earns revenue $p_j x_j$, expends $w_j l_j$ for labor costs, and pays $p_j x_j - \kappa_j - w_j l_j$ to the stockholders as dividends. Then, the firm is left with retained earnings e_j by

$$e_j = \pi_j. \tag{8}$$

A lump-sum reward to entrepreneur j is paid from (8).

If $\pi_j < \kappa_j$, firm j issues a debt d_j such that

$$\pi_j + d_j = \kappa_j$$

to finance the physical capital. [7] In the production stage, firm j earns revenue $p_j x_j$ and expends $w_j l_j$ for labor costs. For simplicity, we assume that the market interest rate is zero. Then, firm j pays $d_j (= \kappa_j - \pi_j)$ back to the lenders, where the discount factor for the loan is $\delta_j = 1$. The firm pays $p_j x_j - \kappa_j - w_j l_j$ to the stockholders as dividends, and is left with retained earnings (8). Again, a reward is paid to entrepreneur j from (8) in a lump-sum manner.

[7] In response, households lend money $d_j^i \geq 0$ to firm j such that $\sum_{i \in N} d_j^i = d_j$.

Since retained earnings of the firm (8) are their common assets, stockholders will agree on maximizing the profit (5) subject to the technological constraint (2). This yields the firm's supply function for good j, $x_j(w_j/p_j)$, and the demand function for labor, $l_j(w_j/p_j)$. From the first-order condition for profit maximization, we obtain

$$f_j{}'(l_j;\kappa_j) = \frac{w_j}{p_j} \tag{9}$$

which implies that the marginal rate of technical transformation equals the wage-price ratio.

Household i's budget constraint is given by

$$\sum_j p_j a_j^i x_j^i + I^i = \sum_j w_j b_j^i l_j^i + \overline{I}^i. \tag{10}$$

[8] Maximizing (1) subject to (10) yields the demand function for good j, $x_j^h(p_j)$ for $h \in N_j^3$, and the supply function of labor to firm j, $l_j^k(w_j)$ for $k \in N_j^2$. From the first-order conditions for utility maximization, we obtain

$$\frac{g_j^{k\prime}(l_j^k)}{v_j^{h\prime}(x_j^h)} = \frac{w_j}{p_j} \tag{11}$$

for $h \in N_j^3$ and $k \in N_j^2$. (11) implies that the marginal rate of substitution equals the wage-price ratio.

In equilibrium, demand equals supply for the product and labor, so that

$$\sum_{i \in N_j^3} x_j^i(p_j) = x_j\left(\frac{w_j}{p_j}\right) \tag{12}$$

[8] In fact, household i's budget constraint is given by

$$\sum_j p_j a_j^i x_j^i + \sum_j \tau_j \theta_j^i + \sum_j d_j^i + I^i = \sum_j w_j b_j^i l_j^i + \sum_j \left(\frac{\theta_j^i}{\theta_j}\right)\pi_j + \sum_j d_j^i + \overline{I}^i.$$

Since $\tau_j \theta_j^i = (\theta_j^i/\theta_j)\pi_j$ by (6) and d_j^i is redeemed as it is, the budget constraint is reduced to (10).

and

$$\sum_{i \in N_j^2} l_j^i(w_j) = l_j\left(\frac{w_j}{p_j}\right). \tag{13}$$

(12) and (13) yield the equilibrium price for the product and wage in the capitalistic system,

$$(p_j^K, w_j^K). \tag{14}$$

Putting (14) back into (12) and (13) yields equilibrium quantities for the product and labor, (x_j^K, l_j^K). Referring to (5) and (14), let

$$\pi_j^K := p_j^K x_j^K - \kappa_j - w_j^K l_j^K.$$

We assume that

$$\pi_j^K > 0. \tag{15}$$

Then, from (6), the equilibrium stock price is given by

$$\tau_j^K := \frac{\pi_j^K}{\theta_j}.$$

Also, retained earnings (8) and cash proceeds (7) in equilibrium are given by

$$e_j^K = \mu_j^K = \pi_j^K = p_j^K x_j^K - \kappa_j - w_j^K l_j^K. \tag{16}$$

Since (9) and (11) yield (4), we obtain the following property.

Lemma 3.1:

When $\alpha_j = \beta_j = \gamma_j = 1$, the capitalistic system is efficient.

3.2 The labor-managed system

The set of firm j's partners is given by N_j^2. Let q_j be firm j's rate of cash distribution to the partners in the (primary) partnership market. Then, l_j^i units of the partnership require partner $i \in N_j^2$ to provide l_j^i units of labor

to firm j, and entitle him to receive cash distribution $q_j l_j^i$ as well as to hold an l_j^i/l_j vote share. [9] Firm j's surplus s_j is defined by

$$s_j := p_j x_j - \kappa_j - q_j l_j. \tag{17}$$

In the investment stage, since it is labor, not financial capital, that households provide to the firm in exchange for partnership, issuance of partnership brings about firm j no cash proceeds,

$$\mu_j^L = 0. \tag{18}$$

Therefore, firm j procures all financial capital for investment by a debt d_j,

$$d_j = \kappa_j.$$

In the production stage, firm j earns revenue $p_j x_j$, redeems the debt $d_j (= \kappa_j)$, and distributes the sum $q_j l_j$ to the partners. The firm is then left with retained earnings e_j that coincide with the firm's surplus (17),

$$e_j = s_j. \tag{19}$$

A lump-sum reward is paid to the entrepreneur from (19).

Since retained earnings of the firm (19) are their common assets, partners will agree on maximizing the surplus (17) subject to the technological constraint (2). This yields the firm's supply function for good j, $x_j(q_j/p_j)$, and the supply function for partnership, $l_j(q_j/p_j)$. From the first-order condition for surplus maximization, we obtain

$$f_j{}'(l_j; \kappa_j) = \frac{q_j}{p_j} \tag{20}$$

which implies that the marginal rate of technical transformation equals the ratio of the rate of cash distribution to the product price.

[9] In other words, l_j^i units of the partnership entitle partner $i \in N_j^2$ to receive an l_j^i/l_j share of cash distribution, where $q_j l_j$ is the sum of firm j's cash distribution to the partners.

Household i's budget constraint is given by

$$\sum_j p_j a_j^i x_j^i + I^i = \sum_j q_j b_j^i l_j^i + \overline{I}^i. \tag{21}$$

Maximizing (1) subject to (21) yields the demand function for good j, $x_j^h(p_j)$ for $h \in N_j^3$, and the demand function for firm j's partnership, $l_j^k(q_j)$ for $k \in N_j^2$. From the first-order conditions for utility maximization, we obtain

$$\frac{g_j^{k\prime}(l_j^k)}{v_j^{h\prime}(x_j^h)} = \frac{q_j}{p_j} \tag{22}$$

for $h \in N_j^3$ and $k \in N_j^2$. (22) implies that the marginal rate of substitution equals the ratio of the rate of cash distribution to the product price.

In equilibrium, demand equals supply for the product and partnership, so that

$$\sum_{i \in N_j^3} x_j^i(p_j) = x_j\left(\frac{q_j}{p_j}\right) \tag{23}$$

and

$$\sum_{i \in N_j^2} l_j^i(q_j) = l_j\left(\frac{q_j}{p_j}\right). \tag{24}$$

(23) and (24) yield the equilibrium price for the product and rate of cash distribution in the labor-managed system,

$$(p_j^L, q_j^L). \tag{25}$$

Lemma 3.2:

$$(p_j^L, q_j^L) = (p_j^K, w_j^K). \tag{26}$$

Proof:

In the system of simultaneous equations (12)-(13), $x_j^i(p_j)$ solves $v_j^{i\prime}(x_j^i) = p_j$, $l_j^i(w_j)$ solves $g_j^{i\prime}(l_j^i) = w_j$, $l_j(w_j/p_j)$ solves (9), and $x_j(w_j/p_j) = f_j(l_j(w_j/p_j), \kappa_j)$. In the system of simultaneous equations (23)-(24), $x_j^i(p_j)$ solves $v_j^{i\prime}(x_j^i) = p_j$, $l_j^i(q_j)$ solves $g_j^{i\prime}(l_j^i) = q_j$, $l_j(q_j/p_j)$ solves (20), and $x_j(q_j/p_j) = f_j(l_j(q_j/p_j), \kappa_j)$. Since functional forms for the two systems of simultaneous equations are identical, we obtain (26). ‖

Putting (25) back into (23) and (24) yields equilibrium quantities for the product and partnership, (x_j^L, l_j^L). Referring to (17) and (25), retained earnings (19) in equilibrium are given by

$$e_j^L = s_j^L := p_j^L x_j^L - \kappa_j - q_j^L l_j^L \tag{27}$$

which is positive by (15) and (26).

Since (20) and (22) yield (4), we obtain the following property.

Lemma 3.3:

When $\alpha_j = \beta_j = \gamma_j = 1$, the labor-managed system is efficient.

3.3 The cooperative system

The set of firm j's members is given by N_j^3. Let r_j be the price of firm j's membership in the (primary) membership market. x_j^i units of the membership entitle household $i \in N_j^3$ to receive x_j^i units of firm j's product as well as to hold an x_j^i/x_j vote share. [10] Firm j's surplus t_j is defined by

$$t_j := r_j x_j - \kappa_j - w_j l_j. \tag{28}$$

In the investment stage, by issuing x_j units of the membership, firm j raises cash proceeds μ_j by

$$\mu_j = r_j x_j. \tag{29}$$

[10] In other words, x_j^i units of the membership entitle member $i \in N_j^3$ to receive an x_j^i/x_j share of the total quantity of the product, x_j.

Suppose that

$$\mu_j \geq \kappa_j. \tag{30}$$

Then, firm j is able to finance κ_j without resorting to a debt. In the production stage, firm j expends $w_j l_j$ for labor costs and distributes the product to the members. The firm is then left with retained earnings e_j which coincide with the firm's surplus,

$$e_j = t_j. \tag{31}$$

A lump-sum reward is paid to entrepreneur j from (31).

Since retained earnings of the firm (31) are their common assets, members will agree on maximizing the surplus (28) subject to the technological constraint (2). This yields the firm's supply function for membership, $x_j(w_j/r_j)$, and the demand function for labor, $l_j(w_j/r_j)$. From the first-order condition for surplus maximization, we obtain

$$f_j{}'(l_j;\kappa_j) = \frac{w_j}{r_j} \tag{32}$$

which implies that the marginal rate of technical transformation equals the wage-price ratio.

Household i's budget constraint is given by

$$\sum_j r_j a_j^i x_j^i + I^i = \sum_j w_j b_j^i l_j^i + \overline{I}^i. \tag{33}$$

Maximizing (1) subject to (33) yields the demand function for firm j's membership, $x_j^h(p_j)$ for $h \in N_j^3$, and the supply function of labor to firm j, $l_j^k(w_j)$ for $k \in N_j^2$. From the first-order conditions for utility maximization, we obtain

$$\frac{g_j^{k\prime}(l_j^k)}{v_j^{h\prime}(x_j^h)} = \frac{w_j}{r_j} \tag{34}$$

for $h \in N_j^C$ and $k \in N_j^W$. (34) implies that the marginal rate of substitution equals the wage-price ratio.

In equilibrium, demand equals supply for the membership and labor, so that

$$\sum_{i \in N_j^3} x_j^i(r_j) = x_j \left(\frac{w_j}{r_j} \right) \tag{35}$$

and

$$\sum_{i \in N_j^2} l_j^i(w_j) = l_j \left(\frac{w_j}{r_j} \right). \tag{36}$$

(35) and (36) yield the equilibrium price for the membership and wage in the cooperative system,

$$(r_j^C, w_j^C). \tag{37}$$

Lemma 3.4:

$$(r_j^C, w_j^C) = (p_j^K, w_j^K). \tag{38}$$

Proof:

In the system of simultaneous equations (12)-(13), $x_j^i(p_j)$ solves $v_j^{i\prime}(x_j^i) = p_j$, $l_j^i(w_j)$ solves $g_j^{i\prime}(l_j^i) = w_j$, $l_j(w_j/p_j)$ solves (9), and $x_j(w_j/p_j) = f_j(l_j(w_j/p_j), \kappa_j)$. In the system of simultaneous equations (35)-(36), $x_j^i(r_j)$ solves $v_j^{i\prime}(x_j^i) = r_j$, $l_j^i(w_j)$ solves $g_j^{i\prime}(l_j^i) = w_j$, $l_j(w_j/r_j)$ solves (32), and $x_j(w_j/r_j) = f_j(l_j(w_j/r_j), \kappa_j)$. Since functional forms for the two systems of simultaneous equations are identical, we obtain (38). ‖

Putting (37) back into (35) and (36) yields equilibrium quantities for the membership and labor, (x_j^C, l_j^C). Referring to (28) and (37), retained earnings (31) and cash proceeds (29) in equilibrium are given by

$$e_j^C = t_j^C := r_j^C x_j^C - \kappa_j - w_j^C l_j^C \tag{39}$$

and

$$\mu_j^C = r_j^C x_j^C \tag{40}$$

respectively.

Lemma 3.5:

$$\mu_j^C > \kappa_j. \tag{41}$$

Proof:

It holds from (15) and (38) that $r_j^C x_j^C - \kappa_j - w_j^C l_j^C > 0$, which implies (41). ‖

(30) thus holds true in equilibrium, and the consumer cooperative does not issue a debt for initial investment.

Since (32) and (34) yield (4), we obtain the following property.

Lemma 3.6:

When $\alpha_j = \beta_j = \gamma_j = 1$, the cooperative system is efficient.

3.4 Comparison

Proposition 1:

Suppose that $\alpha_j = \beta_j = \gamma_j = 1$. Then, the capitalistic, labor-managed and cooperative systems are all efficient.

Proof:

The property directly follows from Lemmas 3.1, 3.3 and 3.6. ‖

Proposition 2:

Suppose that $\alpha_j = \beta_j = \gamma_j = 1$, Then,

$$e_j^K = e_j^L = e_j^C.$$

Proof:

With (26) and (38), the property follows from (16), (27) and (39). ‖

Proposition 1 states that labor-managed firms and consumer cooperatives are intrinsically as efficient as investor-owned firms if the markets for partnership and membership exist and function well. In addition, as Proposition 2 insists, since firm j produces an equal amount of retained earnings by being organized as an investor-owned firm, a labor-managed firm and a consumer cooperative, there are equal incentives to establish the three types of firms. Hence, the enterprise-market system does not matter under complete markets.

Obviously, this is not what we observe in the real economy, where various causes of market failure prevent an economic system from working efficiently. The following property is important when we think of the failure of the financial market in the next section.

Proposition 3:

Suppose that $\alpha_j = \beta_j = \gamma_j = 1$, Then,

$$\mu_j^C > \mu_j^K > \mu_j^L. \tag{42}$$

Proof:

With (26) and (38), the property follows from (16), (18) and (40). ‖

Intuitively, the first inequality of (42) may be interpreted as follows. An investor-owned firm raises equity capital up to the amount of its *profit*, which

equals *revenue* minus *costs*. A consumer cooperative raises equity capital up to the amount of its *revenue*, which by definition exceeds the profit for an investor-owned firm.

4 Failure in the financial market

This section introduces an investment risk ($\alpha_j < 1$) to the model and examines its implications to the efficiency of enterprise-market systems. We think of the case that investment for project j is safe, although potential existence of the risky type leaves uncertainties to the individuals outside the firm. [11]

In order to focus on the effects of asymmetric information in the financial market, we assume that $\beta_j = \gamma_j = 1$.

4.1 The capitalistic system

In the investment stage, since the type of investment is known to households in N_j^1, firm j collects cash proceeds (7) just as it does under complete markets.

If $\pi_j \geq \kappa_j$, firm j acquires physical capital without resorting to a debt. Once investment is made successfully, no more uncertainties remain in the production stage. Hence, the rest of the transactions proceeds in the same way as in subsection 3.1, and efficient equilibrium (14) is sustained.

If $\pi_j < \kappa_j$, firm j issues an internal debt $\tilde{d}_j$ to its stockholders and an external debt $\hat{d}_j$ to the outside investors such that

$$\pi_j + \tilde{d}_j + \hat{d}_j = \kappa_j.$$

Stockholders know that the investment is safe and claim no surcharges on their loan. The discount factor for $\tilde{d}_j$ is therefore $\tilde{\delta}_j = 1$. Let R_j be the return on $\hat{d}_j$. Since outside investors expect to receive $\alpha_j R_j$, firm j offers $R_j = \hat{d}_j/\alpha_j$ for the external debt $\hat{d}_j$, where $\hat{\delta}_j = \alpha_j$ is the discount factor.

[11] Because of the private cost of bankruptcy to the entrepreneur, a risky investment will not be undertaken.

Firm j therefore has to incur a surcharge

$$R_j - \hat{d}_j = \frac{1-\alpha_j}{\alpha_j}\hat{d}_j$$

on the external debt $\hat{d}_j$. Again, once investment is made successfully, no uncertainties remain in the production stage, and firm j is left with retained earnings

$$e_j = \pi_j - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \pi_j - \tilde{d}_j). \tag{43}$$

Firm j therefore maximizes the (gross) profit (5), and the rest of the transactions proceeds in the same way as in subsection 3.1. Hence, if

$$\pi_j^K - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \pi_j^K - \tilde{d}_j) > 0 \tag{44}$$

firm j carries out production and efficient equilibrium (14) is sustained. On the other hand, if

$$\pi_j^K - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \pi_j^K - \tilde{d}_j) \leq 0 \tag{45}$$

firm j withdraws from the market. The capitalistic system is inefficient in this case in the sense that a socially profitable project is not undertaken.

We summarize these results in the following lemma.

Lemma 4.1:

Suppose that $\alpha_j < 1$ and $\beta_j = \gamma_j = 1$. When $\pi_j^K \geq \kappa_j$, the capitalistic system is efficient. When $\pi_j^K < \kappa_j$, the capitalistic system is efficient if (44) holds, and inefficient if (45) holds.

When financial capital is provided to the firm through the stock market, private information on the type of investment is conveyed to the investors. When it is provided to the firm through the money market, the private information is withheld from the investors. Hence, if the equity capital does not cover the costs of investment, adverse selection may prevent the firm from raising sufficient funds for investment in the money market, where uninformed investors are reluctant to lend money to the firm fearing that the

investment can be risky. In that case, the firm is obliged to withdraw from the market and the socially profitable project is not undertaken.

4.2 The labor-managed system

In the investment stage, since $\mu_j = 0$, firm j issues an internal debt $\tilde{d}_j$ to its partners with the discount factor $\tilde{\delta}_j = 1$, and an external debt $\hat{d}_j$ to the outside investors with the discount factor $\hat{\delta}_j = \alpha_j$, such that

$$\tilde{d}_j + \hat{d}_j = \kappa_j.$$

By the same reason as in subsection 4.1, in the production stage, firm j is left with retained earnings

$$e_j = s_j - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \tilde{d}_j). \tag{46}$$

Firm j therefore maximizes the (gross) surplus (17). Then, if

$$s_j^L - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \tilde{d}_j) > 0 \tag{47}$$

firm j carries out production and efficient equilibrium (25) is sustained. If

$$s_j^L - \frac{1-\alpha_j}{\alpha_j}(\kappa_j - \tilde{d}_j) \leq 0 \tag{48}$$

firm j withdraws from the market. The labor-managed system is inefficient in this case.

Lemma 4.2:

Suppose that $\alpha_j < 1$ and $\beta_j = \gamma_j = 1$. The labor-managed system is efficient if (47) holds, and inefficient if (48) holds.

It is often argued that wealth constraint of workers is a major weakness for a labor-managed firm [Dow (2001)]. In our model, notice that

$$\tilde{d}_j \leq \sum_{i \in N_j^2} \overline{I}^i.$$

The less wealthy the workers are, and hence the more the firm has to rely on an external debt, the more likely adverse selection occurs in the money market and profitable labor-managed firms are crowded out by unprofitable ones [Mikami and Tanaka (2004)].

4.3 The cooperative system

In the investment stage, since the type of investment is known to households in N_j^3, firm j collects cash proceeds (29) just as it does under complete markets. Once investment is made successfully, no more uncertainties remain in the production stage. Hence, the efficient equilibrium (37) is sustained.

Lemma 4.3:

When $\alpha_j < 1$ and $\beta_j = \gamma_j = 1$, the cooperative system is efficient.

4.4 Comparison

Proposition 4 (Investment risks):

Suppose that $\alpha_j < 1$ and $\beta_j = \gamma_j = 1$.

(a) When $\pi_j^K \geq \kappa_j$, the capitalistic system is efficient. When $\pi_j^K < \kappa_j$, it is efficient if (44) holds, and inefficient if (45) holds.

(b) The labor-managed system is efficient if (47) holds, and inefficient if (48) holds.

(c) The cooperative system is always efficient.

Proof:

The property directly follows from Lemmas 4.1, 4.2 and 4.3. ‖

Proposition 4 is shown in the second column of Table 1.

An essential difference between the costs of physical capital and other costs such as labor costs is that the former costs have to be paid *before* the value of the project realizes (*i.e.* in the investment stage), whereas the

latter costs can be paid *when* the value is created (*i.e.* in the production stage). Therefore, if the financial market is incomplete, the firm's ability to procure equity capital in advance (*i.e.* in the investment stage) matters to its efficiency. Since firms can raise more equity capital by issuing membership than by issuing stocks, it turns out that consumer cooperatives are financially more viable than investor-owned firms.

5 Failure in the real markets

This section introduces into the model uncertainties about (a) workplace safety ($\beta_j < 1$, $\alpha_j = \gamma_j = 1$), and (b) product safety ($\gamma_j < 1$, $\alpha_j = \beta_j = 1$). In both circumstances, we think of the case that project j is of safe type, although potential existence of a hazardous type leaves uncertainties to the individuals outside the firm. [12] [13]

5.1 The capitalistic system

Workplace safety

Suppose that initial investment is made and production of good j takes place. Since household $i \in N_j^2 \setminus N_j^1$ is not informed of the type of workplace in firm j, his payoffs from providing $l_j^i > 0$ units of labor to firm j are $w_j l_j^i - g_j^i(l_j^i)$ with probability β_j, and $w_j l_j^i - g_j^i(l_j^i) - y_j^i$ with probability $1-\beta_j$. His expected payoffs ζ_j^i are therefore given by

$$\zeta_j^i(w_j, l_j^i) := w_j l_j^i - g_j^i(l_j^i) - (1-\beta_j) y_j^i. \tag{49}$$

Maximizing (49) with respect to l_j^i yields household i's supply function of labor such that $l_j^i = l_j^i(w_j)$ if $\zeta_j^i(w_j, l_j^i(w_j)) \geq 0$ and $l_j^i = 0$ otherwise. Then, if

$$w_j^K l_j^i(w_j^K) - g_j^i(l_j^i(w_j^K)) - (1-\beta_j) y_j^i \geq 0 \quad \forall i \in N_j^2 \setminus N_j^1 \tag{50}$$

[12] Because of the private cost of an accident to the entrepreneur, a hazardous project will not be undertaken.

[13] In principle, discussion in this section holds true even in the absence of the partnership and membership markets [Mikami (2007)].

all households in N_j^2 continue to work in firm j. By backward induction, initial investment will be made, and efficient equilibrium (14) is sustained. On the other hand, if

$$w_j^K l_j^i(w_j^K) - g_j^i(l_j^i(w_j^K)) - (1-\beta_j)y_j^i < 0 \quad \exists i \in N_j^2 \setminus N_j^1 \tag{51}$$

some households in $N_j^2 \setminus N_j^1$ decline to work in firm j. Equilibrium (14) is thus not sustained and the capitalistic system is inefficient. [14]

Lemma 5.1

Suppose that $\beta_j < 1$ and $\alpha_j = \gamma_j = 1$. The capitalistic system is efficient if (50) holds, and inefficient if (51) holds.

(51) implies adverse selection in the labor market, in which uninformed workers hesitate to work in the firm, which in fact has a safe workplace, fearing that it can be hazardous. [15]

Product safety

Suppose that initial investment is made and production of good j takes place. Since household $i \in N_j^3 \setminus N_j^1$ is not informed of the type of good j, his payoffs from consuming $x_j^i > 0$ units of good j are $v_j^i(x_j^i) - p_j x_j^i$ with probability γ_j, and $v_j^i(x_j^i) - p_j x_j^i - z_j^i$ with probability $1-\gamma_j$. His expected payoffs ξ_j^i are therefore given by

$$\xi_j^i(p_j, x_j^i) := v_j^i(x_j^i) - p_j x_j^i - (1-\gamma_j) z_j^i. \tag{52}$$

Maximizing (52) with respect to x_j^i yields household i's demand function for good j such that $x_j^i = x_j^i(p_j)$ if $\xi_j^i(p_j, x_j^i(p_j)) \geq 0$ and $x_j^i = 0$ otherwise.

[14] In this case, initial investment may not be made in the first place.

[15] Investor-owned firms are motivated to adopt production processes that reduce the costs of production at the sacrifice of the safety of workers. For example, despite of its well-known risks to the human body, asbestos had been widely used in industries as an economical insulation material. Companies that dealt with asbestos did not take effective measures, such as introducing dust collectors to the factories or providing workers with dust protective masks. The lack of effective measures in factories has caused illnesses on ex-workers such as lung cancer and other serious respiratory problems. Other examples include safety measures taken in coal mines in China.

Then, if

$$v_j^i(x_j^i(p_j^K)) - p_j^K x_j^i(p_j^K) - (1-\gamma_j)z_j^i \geq 0 \quad \forall i \in N_j^3 \setminus N_j^1 \tag{53}$$

all households in N_j^3 continue to consume good j. By backward induction, initial investment will be made, and efficient equilibrium (14) is sustained. On the other hand, if

$$v_j^i(x_j^i(p_j^K)) - p_j^K x_j^i(p_j^K) - (1-\gamma_j)z_j^i < 0 \quad \exists i \in N_j^3 \setminus N_j^1 \tag{54}$$

some households in $N_j^3 \setminus N_j^1$ decline to buy good j. Equilibrium (14) is thus not sustained and the capitalistic system is inefficient. [16]

Lemma 5.2

Suppose that $\gamma_j < 1$ and $\alpha_j = \beta_j = 1$. The capitalistic system is efficient if (53) holds, and inefficient if (54) holds.

(54) implies adverse selection in the product market, in which uninformed customers hesitate to buy the firm's product, which in fact is safe, fearing that it can be hazardous. [17]

5.2 The labor-managed system

Workplace safety

Since the workers know that the workplace is safe, transactions in the production stage proceed in the same way as under complete markets. Since

[16] In this case, initial investment may not be made in the first place.

[17] When the safety of goods is not observable and it costs the firms to maintain the safety level, investor-owned firms may intentionally provide consumers with unsafe products and the consumers are necessarily exposed to potential risks of accidents. For instance, in the well-known drug scandal in 1980s, major pharmaceutical companies kept supplying blood products for profit that they reasonably doubted could be tainted with HIV-viruses. For other examples, mishaps in air, railroad and road transport are often attributed to the firm's excess emphasis on profit. Also, it is observed that likelihood of clinical negligence rises when hospitals are pressed to decrease the number of staff in an attempt to reduce deficit. A formal study on the product safety in relation to the enterprise form is found in Mikami (2007).

there are no uncertainties in the investment stage, initial investment is made successfully. Equilibrium (25) is thus sustained and the labor-managed system is efficient.

Lemma 5.3

When $\beta_j < 1$ and $\alpha_j = \gamma_j = 1$, the labor-managed system is efficient.

The labor-managed system owes its success in this case to the use of the partnership market, which conveys private information on the type of the workplace to the workers, instead of the labor market, which withholds the information from the workers.

Product safety

The effects of the risk of products in the labor-managed system are the same as those in the capitalistic system discussed in subsection 5.1.

Suppose that initial investment is made and production of good j takes place. Since household $i \in N_j^3 \setminus N_j^2$ is not informed of the type of good j, his expected payoffs from consuming good j are given by (52). Maximizing (52) with respect to x_j^i yields household i's demand function for good j such that $x_j^i = x_j^i(p_j)$ if $\xi_j^i(p_j, x_j^i(p_j)) \geq 0$ and $x_j^i = 0$ otherwise. Then, if

$$v_j^i(x_j^i(p_j^L)) - p_j^L x_j^i(p_j^L) - (1-\gamma_j)z_j^i \geq 0 \quad \forall i \in N_j^3 \setminus N_j^2 \tag{55}$$

efficient equilibrium (25) is sustained. If

$$v_j^i(x_j^i(p_j^L)) - p_j^L x_j^i(p_j^L) - (1-\gamma_j)z_j^i < 0 \quad \exists i \in N_j^3 \setminus N_j^2 \tag{56}$$

equilibrium (25) is not sustained and the labor-managed system is inefficient.

Lemma 5.4

Suppose that $\gamma_j < 1$ and $\alpha_j = \beta_j = 1$. The labor-managed system is efficient if (55) holds, and inefficient if (56) holds.

5.3 The cooperative system

Workplace safety

The effects of the risk of workplaces in the cooperative system are the same as those in the capitalistic system discussed in subsection 5.1.

Suppose that initial investment is made and production of good j takes place. Since household $i \in N_j^2 \setminus N_j^3$ is not informed of the type of workplace in firm j, his expected payoffs from providing labor to firm j are given by (49). Maximizing (49) with respect to l_j^i yields supply function of labor such that $l_j^i = l_j^i(w_j)$ if $\zeta_j^i(w_j, l_j^i(w_j)) \geq 0$ and $l_j^i = 0$ otherwise. Then, if

$$w_j^C l_j^i(w_j^C) - g_j^i(l_j^i(w_j^C)) - (1-\beta_j)y_j^i \geq 0 \quad \forall i \in N_j^2 \setminus N_j^3 \tag{57}$$

efficient equilibrium (37) is sustained. If

$$w_j^C l_j^i(w_j^C) - g_j^i(l_j^i(w_j^C)) - (1-\beta_j)y_j^i < 0 \quad \exists i \in N_j^2 \setminus N_j^3 \tag{58}$$

equilibrium (37) is not sustained and the cooperative system is inefficient.

Lemma 5.5

Suppose that $\gamma_j < 1$ and $\alpha_j = \beta_j = 1$. The cooperative system is efficient if (57) holds, and inefficient if (58) holds.

Product safety

Since the customers know that the product is safe, transactions in the production stage proceed in the same way as under complete markets. Since there are no uncertainties in the investment stage, initial investment is made successfully. Equilibrium (37) is thus sustained and the cooperative system is efficient.

Lemma 5.6

When $\gamma_j < 1$ and $\alpha_j = \beta_j = 1$, the cooperative system is efficient.

The cooperative system owes its success in this case to the use of the membership market, which conveys private information on the type of the product to the customers, instead of the product market, which withholds the information from the customers.

5.4 Comparison

Proposition 5 (Workplace safety):

Suppose that $\beta_j < 1$ and $\alpha_j = \gamma_j = 1$.

(a) The capitalistic system is efficient if (50) holds, and inefficient if (51) holds.

(b) The labor-managed system is always efficient.

(c) The cooperative system is efficient if (57) holds, and inefficient if (58) holds.

Proof:

The property follows from Lemmas 5.1, 5.3 and 5.5. ‖

Proposition 6 (Product safety):

Suppose that $\gamma_j < 1$ and $\alpha_j = \beta_j = 1$.

(a) The capitalistic system is efficient if (53) holds, and inefficient if (54) holds.

(b) The labor-managed system is efficient if (55) holds, and inefficient if (56) holds.

(c) The cooperative system is always efficient.

Proof:

The property follows from Lemmas 5.2, 5.4 and 5.6. ‖

Propositions 5 and 6 are shown in the third and fourth columns of Table 1, respectively.

If workplace safety is more important than product safety, worker ownership is better than customer ownership for the firm, and vice versa. In any case, when safety of workplaces or products is the major concern, there seem no reasons to choose investor ownership.

6 Conclusion

6.1 Summary

The equivalence results obtained in section 3 suggest that, in theory, labor-managed firms and consumer cooperatives are as efficient, and also as profitable, as investor-owned firms in the presence of the corresponding market for firm ownership (Propositions 1 and 2).

Enterprise forms do matter in the economy with market failure. We first pointed out that consumer cooperatives, which issue membership, can procure more equity capital than investor-owned firms, which issue stocks (Proposition 3). This is because investor-owned firms collect equity capital in advance in return for the dividends from the *profit* in the future, whereas consumer cooperatives do so in return for the distribution of the *product* in the future. Therefore, when asymmetric information on project risks works in favor of equity finance rather than debt finance, the consumer cooperative turns out to be a financially more viable institution than the investor-owned firm (Proposition 4; Table 1, Column 2). As for transactions of products, we showed that the cooperative system outperforms the capitalistic system when opportunistic behavior of investor-owned firms undermines efficiency of the product market (Proposition 6; Table 1, Column 4).

A negligible market share of consumer cooperatives in our economy may be due in part to the absence of a proper market for their ownership. Our theoretical results suggest that, with a well-functioning membership market, the consumer cooperative is potentially no less a lucrative corporate form than the investor-owned firm in the market economy.

6.2 Extensions and remarks

The secondary market for firm ownership

In this paper, we constructed a one-period model of the firm and examined the roles of the primary markets for firm ownership. In order to study the function of the secondary markets for firm ownership, we need to extend the model to one with a multi-period framework. Let us briefly consider this question in the simplest possible case where physical capital does not depreciate over time and the firm continues to exist permanently.

In the capitalistic system, if an investor buys the stock of an investor-owned firm in the primary stock market, he expects to receive the firm's dividends every year from that time. If he wishes, he can resell his stock in the secondary stock market at the price that is equal to the discounted present value of the stream of dividends paid by the investor-owned firm thereafter.

The secondary membership market would work just in a similar way in the cooperative system. If a consumer buys the membership of a consumer cooperative in the primary membership market, he expects to receive the firm's product every year from that time. If he wishes, he can resell his membership in the secondary membership market at the price that matches the discounted present utility from the stream of the product delivered by the consumer cooperative thereafter.

In a sense, the membership market of this kind resembles the housing market. If one buys a new house in the primary housing market, he can enjoy the residential services that arise from the house from that day on. If he wishes, he can resell the house in the secondary housing market at the price that matches the discounted present utility from the stream of the residential services produced by the house thereafter.

Hence, in theory, the secondary membership market works in the cooperative system just as the secondary stock market does in the capitalistic

system. The only difference between them is that a stock generates a stream of cash flow whereas membership generates a stream of real goods and services. The presence of the housing market in our economy may suggest that the market for the latter type of securities could function well in the market economy.

The cooperative system with intermediaries

In our economy, transactions between the industry and household sectors are often facilitated by intermediary institutions, such as banks, mutual funds, real estate agents, wholesalers and retailers. We here examine a possible configuration of such an intermediary institution in the cooperative system.

Let us begin the discussion by reviewing the relationship between transactions of firm ownership and transactions of real goods and services in the three enterprise-market systems. An essential difference between the capitalistic system and the other two systems is that, transactions of firm ownership are separated from transactions of goods and services in the former system, whereas they are tied together in the latter systems. In the capitalistic system, households supply financial capital to the firm in exchange for the firm ownership (*i.e.* the stock), which is independent of their supply of labor to the firm or demand for the firm's product. We will call this property *disjunction of the market for firm ownership and the transactions of goods and services*. Indeed, we may assert that the investor-owned firm is an invention to separate firm ownership from the transactions of real goods and services. In contrast, in the labor-managed system, households supply labor to the firm in exchange for the firm ownership (*i.e.* the partnership), which depends proportionately on the quantity of labor they supply to the firm. Similarly, in the cooperative system, households supply financial capital to the firm in exchange for the firm ownership (*i.e.* the membership), which depends proportionately on the quantity of the firm's product they consume.

We will call this property *conjunction of the market for firm ownership and the transactions of goods and services*.

We thus may well predict that, in the capitalistic system, intermediaries that help transact firm ownership are necessarily pure financial institutions. In reality, various types of financial intermediaries help the trade in stocks. For example, a mutual fund collects financial capital from households, invests the sum in stocks and other securities, and distributes the proceeds from investment back to the households. Often, the mutual fund holds the voting rights for the investor-owned firms and casts them at the shareholders' meetings on behalf of the investors.

In the cooperative system, on the other hand, an intermediary that helps transact firm ownership would naturally play both roles of a financial institution and a distributor of real goods and services. Such an organization — which we may call a 'credit-retail union' — would collect financial capital from households, invest the sum in membership of (manufacturing) consumer cooperatives, receive their products, and distribute them to the households. It would retain the voting rights for the consumer cooperatives and cast them at the members' meetings on behalf of the households.

Coexistence of different systems and generalization of the business law

In our model, the labor-managed and cooperative systems can coexist consistently with the capitalistic system. Entrepreneurs can choose the system in which their firms incorporate according to the possible market failure the firms will face. Firms with different ownership structure and markets for firm ownership thus coexist in one economy. It would be an interesting extension of the model to generalize utility function (1) so that it allows interrelation between goods and services that are produced in different systems.

The description of the three types of firms — investor-owned firm, labor-managed firm and consumer cooperative — gives us a useful insight how

the business law that mainly assumes investor ownership of the firm can be extended to include the other types of firms. In our model, a labor-managed firm is characterized as a firm in which firm owners are supposed to contribute labor (which is real goods and services) and receive cash flow as the distribution of the firm's surplus. If the business law is amended to allow investors of labor (instead of money) to become the firm's shareholders, labor-managed firms can be incorporated within the current framework of the law. Similarly, we characterized a consumer cooperative as a firm in which firm owners are supposed to contribute money and receive distribution of the firm's products, which is real goods and services. If the business law allows dividends in the form of the firm's products, consumer cooperatives can be consistently incorporated within the framework of the law. Thus, current business laws become applicable to both labor-managed firms and consumer cooperatives by allowing investment and dividends with real goods and services. In principle, no brand new legislation is necessary for the labor-managed and cooperative systems to start in our economy.

Risk diversification

In this paper, we did not discuss the aspect of risk diversification, which is another important factor to determine comparative efficiency of enterprise-market systems.

In the capitalistic system, shareholders can diversify project risks by investing in many different firms. Apparently, the labor-managed system is handicapped in this respect. In order to diversify project risks, workers have to divide their labor and work for several firms. In many occasions, however, it is efficient that a worker works for a single firm for an extended period of time in order to develop firm-specific human capital. The cooperative system seems to be in a much better position for this point. A household may well be the customer of several consumer cooperatives at the same time, thus reasonably diversifying project risks.

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Table 1
Vulnerability of enterprise-market systems to market failure

	Failure of the financial market (Proposition 4)	Failure of the labor market (Proposition 5)	Failure of the product market (Proposition 6)
Capitalistic system	△	×	×
Labor-managed system	×	○	×
Cooperative system	○	×	○

○: Immune to the market failure

△: Immune or vulnerable to the market failure (that depends)

×: Vulnerable to the market failure