COLLECTIVE CHOICE AND CONTROL RIGHTS IN FIRMS

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Abstract. Recent writers have asserted that firms controlled by workers are rare because workers have diverse preferences over firm policies, and thus suffer from high transaction costs in making collective decisions. This is contrasted with firms controlled by investors, who all support the goal of wealth maximization. However, the source of the asymmetry between capital and labor has not been clearly identified. For example, firms could attract labor inputs by selling transferable shares, and well-known unanimity theorems from the finance literature carry over to models of this kind. We resolve this puzzle by arguing that because financial capital is exceptionally mobile, capital markets are sufficiently competitive to induce unanimity. The lower mobility of human capital implies that labor markets are monopolistically competitive and hence that unanimity cannot be expected in labor-managed firms. Moreover, such firms are vulnerable to takeover by investors while capital-managed firms are substantially less vulnerable to takeover by workers.

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1. Introduction

In a Walrasian world of complete and competitive markets, the goal of a commercial enterprise does not depend on the identities of its decision-makers or the inputs they happen to supply. Consumption and production plans are determined independently, and therefore the agents controlling the enterprise unanimously favor policies that maximize the firm's net market value. This proposition underpins Paul Samuelson's well-known comment (1957) that in a competitive economy, it is irrelevant whether capital hires labor or vice versa.

Real market economies are, however, a different matter. The general pattern is that control rights within large firms are held by a subset of the firm's capital suppliers. Labor-managed firms (LMFs), which allocate control rights based upon labor supply rather than capital supply, are rare, and account for less than 1% of total employment in most countries of North America and Western Europe. Where LMFs do occur, they are often found in sectors characterized by small scale, high labor intensity, and limited task differentiation (Ben-Ner, 1988; Bonin, Jones, and Putterman, 1993; Hansmann, 1996; Dow, 2003).

One reason for the rarity of LMFs is that such firms sometimes sell out to external investors and thus become capital-managed firms (KMFs). Examples can be found among the plywood cooperatives of the U.S. Northwest (Pencavel, 2002), as well as professional partnerships in advertising, investment banking, and health care (Hansmann, 1996). Most durable LMFs avoid direct democracy and thus limit the capacity of individual members to shape firm policy. They also frequently avoid an open market for membership shares. The highly successful Mondragon group in Spain is a notable example (Dow, 2003: ch. 3).

The employees of KMFs seldom enjoy substantial influence over decisions about product mix, investment in production facilities, research and development, or mergers and acquisitions. The spread of employee stock ownership plans (ESOPs) in the U.S. does not alter this assessment. ESOPs rarely hold a majority of the voting shares in publicly-traded firms (Blair, Kruse, and Blasi, 2000), and almost never result in employee representation on boards of directors (Blasi and Kruse, 1991).

How can these regularities be explained? A coherent choice-theoretic account must start from the fact that markets are incomplete, and that firms offer differentiated bundles of product attributes, workplace attributes, and state-contingent incomes. In this context, the consumption opportunities of stakeholders generally depend on the production decisions of individual firms. Accordingly, input suppliers may want firms in which they hold control rights to pursue goals other than the maximization of net market value.

To put the same point another way, in a world of incomplete markets any change in a firm's production plan typically yields direct consumption effects in addition to the more familiar wealth effect. If these consumption effects differ across agents, a collective choice problem can arise among the decision-makers within the firm. For example, stakeholders may disagree over the nature of the firm's products, the working conditions it provides, the riskiness of its net income, or the temporal pattern of net income.

A number of writers have attempted to explain the allocation of enterprise control rights by appealing to transaction costs associated with collective choice problems in firms. In particular, Hansmann (1996: chs. 5-6) has argued that higher costs of reaching collective decisions in LMFs systematically disadvantage these firms relative to KMFs. In his view, near-unanimous support among investors for the pursuit of value maximization ensures that KMFs have lower decision-making costs than LMFs, whose worker-members have more diverse preferences. Hence LMFs thrive only where technological conditions such as small scale or low task differentiation limit the scope for disagreement among workers. Similar views have been expressed by Benham and Keefer (1991) and Gordon (1999).

There is a fundamental problem with this argument: standard unanimity theorems could potentially rule out preference heterogeneity in both KMFs and LMFs. Makowski (1983a, b) shows that even with incomplete markets, the consumption effects of firm decisions vanish, and thus unanimity with respect to value maximization is restored, if all agents believe that marginal rates of substitution are unaffected by an individual firm's production plan. Hart (1979a,b) shows that such competitive conjectures are rational when each firm is small enough relative to the potential market for its shares. In Hart's model, consumption effects approach zero as the number of potential share buyers becomes large. The firm's stakeholders will then unanimously support value-maximizing production plans.

Nothing in the literature indicates why these theoretical results from finance would not apply to LMFs that attract labor by selling tradeable membership shares. But if Hart's argument also applies to labor, there is no basis for the preference heterogeneity stressed by Hansmann and others. One cannot use collective choice to explain empirical asymmetries between KMFs and LMFs without first identifying some asymmetry between the markets for capital and labor that affects individual preferences over firm policies.

This insight is the point of departure for our contribution. We explain the incidence of firm control rights by a difference in mobility across firms for suppliers of financial and human capital. The competitiveness conditions identified by Makowski and Hart can be approximated only in markets for financial capital. The inalienable nature of human capital implies substantial mobility costs for workers and rules out a scenario in which individual LMFs are vanishingly small relative to the potential market for their ownership shares. This asymmetry is reflected in the robustness of modern equity markets as against the rarity and thinness of markets for membership in LMFs.

We develop this idea using a two-period stock market model, augmented to allow simultaneous trade in both capital and labor shares. This dual markets approach has not previously been used to study control rights in firms but it is essential in understanding how asymmetries between KMFs and LMFs can arise despite the apparent formal parallelism of the relevant asset markets. The standard conception of asset market equilibrium is then bolstered by a robustness condition we term *sustainability against takeover* by outside coalitions. This enables us to establish a basic asymmetry: LMFs are prone to takeover by investor coalitions unless the preference profiles of their members satisfy highly restrictive conditions, while KMFs are often sustainable against takeover by worker coalitions. In contrast to Hansmann, we do not invoke the transaction costs of collective decision-making.

Our argument bears some relation to that of Dreze and Hagen (1978). Their main result (Theorem 1) establishes that the product characteristics chosen by profit-maximizing firms are Pareto efficient only if one imposes severe restrictions on consumer preferences. This is consistent with our analysis, but we make the stronger point that even when worker-controlled firms depart from profit maximization and do achieve Pareto efficient allocations, they remain prone to takeover by profit-seeking investors. On the other hand, unanimously profit-maximizing KMFs that fail to attain Pareto efficiency can nevertheless be sustainable against worker takeover. Unlike Dreze and Hagen, we do not take the goals of firm owners as given, but instead derive them from the underlying structure of capital and labor markets.

The analysis is organized as follows. In the next section, the model is presented and conditions ensuring the existence and differentiability of share market equilibria are stated in Propositions 1 and 2. The linkage between the competitiveness of share markets and the nature of shareholder objectives is developed in section 3. In section 4, we introduce the notion of sustainability against takeover and contrast the sustainability of KMFs and LMFs. Proposition 3 shows that LMFs are prone to investor takeover unless the preference profiles of their members satisfy conditions virtually as restrictive as unanimity, while Proposition 4 shows that KMFs are sustainable against worker takeover under realistic circumstances.

The final section discusses empirical implications. The present theory is shown to account for several stylized facts about the incidence and behavior of LMFs, and to supply a plausible explanation for employee buyouts of KMFs when these occur. Proofs of all propositions are available from the authors upon request.

2. The Model

We modify the standard two-period stock market model, due initially to Diamond (1967), to include both capital and labor shares. There are finitely many agents, partitioned into two classes K and L depending on whether the agent is endowed with capital or labor;

no one is endowed with both. We write $i \in K$ for capital suppliers and $i \in L$ for labor suppliers. There is an exogenously given set of firms indexed by $f \in F$.

Endowments

There are two periods, $t = 0, 1$. In period $t = 0$, each $i \in K$ has an endowment $\underline{K}_i > 0$ of a capital good and each $i \in L$ has an endowment $\underline{L}_i > 0$ of hours. Each $i \in K$ also has an endowment of (ex ante) *capital shares* in firms $(\underline{\kappa}_{i1}, \underline{\kappa}_{i2}, \ldots \underline{\kappa}_{iF}) \in R_+^F$ with $\sum_{i \in K} \underline{\kappa}_{if} = 1$ for all $f \in F$. There is a parallel system of ex ante *labor shares* where each $i \in L$ has the share endowment $(\underline{\lambda}_{i1}, \underline{\lambda}_{i2}, \ldots \underline{\lambda}_{iF}) \in R_+^F$ with $\sum_{i \in L} \underline{\lambda}_{if} = 1$ for all $f \in F$.

Consumption

The consumption of individual i in period 0 is x_{i0}. Consumption at $t = 1$ is state-contingent, with uncertain states indexed by $s \in S$. Let x_{is} be state-s consumption for agent i, so i's *consumption plan* is $x_i = (x_{i0}, x_{i1}, \ldots x_{iS}) \in R_+^{S+1}$. Preferences over consumption plans are represented by utility functions u_i: $R_+^{S+1} \rightarrow R$ that are strictly increasing, strictly quasi-concave, and twice continuously differentiable in R_+^{S+1} with finite derivatives.

Production

Since there are no endowments of the state-contingent period-1 goods, these goods must be produced by firms. Firm $f \in F$ produces the output vector $y_f^1 = (y_{f1}, y_{f2}, \ldots y_{fS}) \in R_+^S$ in period 1 using capital and labor inputs (k_f, l_f) acquired in period 0. The firm's overall *production plan* is denoted by $y_f = (k_f, l_f, y_f^1) \in R_+^{S+2}$. Input requirements are given by $k_f = l_f = g_f(y_f^1)/2$ where g_f: $R_+^S \rightarrow R_+$ is increasing and continuously differentiable with $g_f(\underline{0}) = 0$. Whenever k_f or l_f is finite the set of feasible output vectors y_f^1 is bounded.

Policies

The fraction of output distributed to firm f's labor suppliers as a group (in every state) is $\mu_f \in [0,1]$, with $1-\mu_f$ paid out to capital suppliers. We refer to $\phi_f = (y_f^1, \mu_f)$ as the *policy* of firm f and denote the vector of firms' policies by ϕ.

Markets

Markets operate only in period 0. All agents secure claims on period-1 goods via shares in firms. There are two types of output claims, both associated with the supply of an input: capital shares κ_{if} indicating capital supplier i's claim on firm f, and labor shares λ_{if} indicating labor supplier i's claim on the same firm. We call κ_{if} and λ_{if} *ex post shares* to distinguish them from the ex ante share endowments $\underline{\kappa}_{if}$ and $\underline{\lambda}_{if}$. We also use κ_{i0} and λ_{i0} to denote period-0 consumption. The resulting portfolios are $\kappa_i = (\kappa_{i0}, \kappa_{i1} . . \kappa_{iF}) \in R_+^{F+1}$ and $\lambda_i = (\lambda_{i0}, \lambda_{i1} . . \lambda_{iF}) \in R_+^{F+1}$ with $\kappa = \{\kappa_i\}_{i\in K}$ and $\lambda = \{\lambda_i\}_{i\in L}$.

Portfolios induce consumption bundles according to the following mapping.

(1a) $$x_{i0} = \kappa_{i0} \quad \text{and}$$
$$x_{is} = \sum_{f\in F} \kappa_{if}(1-\mu_f)y_{fs} \quad \text{for all } s \in S \text{ and } i \in K;$$

(1b) $$x_{i0} = \lambda_{i0} \quad \text{and}$$
$$x_{is} = \sum_{f\in F} \lambda_{if}\mu_f y_{fs} \quad \text{for all } s \in S \text{ and } i \in L.$$

In our framework shares reflect commitments to supply inputs as well as claims on the resulting output. If firm f has the total capital requirement $k_f = g_f(y_f^1)/2$ then purchasing the capital share κ_{if} entails an obligation to supply $\kappa_{if}g_f(y_f^1)/2$ units of capital to firm f, and likewise purchasing the labor share λ_{if} entails an obligation to supply $\lambda_{if}g_f(y_f^1)/2$ units of labor. It is therefore natural to rule out short sales. This feature of the model leads to a physical restriction on feasible portfolios because it must be possible to comply with all input supply obligations simultaneously. Thus portfolios need to satisfy

(2a) $$\sum_{f\in F} \kappa_{if}g_f(y_f^1)/2 \leq \underline{K}_i \quad \text{all } i \in K$$

(2b) $$\sum_{f\in F} \lambda_{if}g_f(y_f^1)/2 \leq \underline{L}_i \quad \text{all } i \in L$$

For simplicity, we assume that any physical endowment not supplied to firms is converted into the period-0 consumption good on a one-for-one basis. We define consumption sets (relative to fixed firm policies ϕ) by $\Omega_i^K = \{\kappa_i \geq 0: \sum_f \kappa_{if} g_f/2 \leq \underline{K}_i\}$ for all $i \in K$ and $\Omega_i^L = \{\lambda_i \geq 0: \sum_f \lambda_{if} g_f/2 \leq \underline{L}_i\}$ for all $i \in L$.

Agents can sell off their ex ante shares in firms ($\underline{\kappa}_{if}$ or $\underline{\lambda}_{if}$) in exchange for period-0 consumption. The price of a capital share in firm f is p_f and the price of a labor share is q_f. The price of the period-0 consumption good is $p_0 \equiv q_0$. The price vectors facing agents are $p = (p_0, p_1 \ldots p_F) \in R_+^{F+1}$ and $q = (q_0, q_1 \ldots q_F) \in R_+^{F+1}$ for K and L respectively. The budget constraints for the two types of agents are given by

$$\text{(3a)} \qquad p\kappa_i \leq W_i^K(p,q) \equiv p_0\underline{K}_i + \sum_{f \in F} (1-\underline{\mu}_f)\underline{\kappa}_{if} v_f \qquad \text{for all } i \in K \text{ and}$$

$$\text{(3b)} \qquad q\lambda_i \leq W_i^L(p,q) \equiv q_0\underline{L}_i + \sum_{f \in F} \underline{\mu}_f \underline{\lambda}_{if} v_f \qquad \text{for all } i \in L$$

where $v_f \equiv p_f + q_f - p_0 g_f(y_f^1)$ is the net market value of firm f and $\underline{\mu}_f$ is defined below.

To see how these constraints arise, first consider a firm f organized solely by some individual investor $i \in K$. This investor can obtain $p_f - p_0 g_f/2$ by selling off the firm's ex ante capital shares, where p_f is the price of the pure financial claim on period-1 consumption associated with firm f's capital shares and $p_0 g_f/2$ is the cost of satisfying the firm's capital requirements, expressed as foregone period-0 consumption. Although the ex post owner of a capital share must supply capital inputs to the firm, the resulting loss in consumption is borne by the ex ante owner through the price of capital shares. If the ex ante owner keeps some or all capital shares and personally supplies this input, again the opportunity cost falls on the ex ante owner. For this reason it is convenient to define prices so that the cost of firm f's capital input is deducted from the value of the ex ante owner's endowment in (3a).

By virtue of organizing the firm, investor i is also endowed with the firm's ex ante labor shares. Because $i \in K$ has no endowment of this input, firm f can only obtain labor if these shares are sold to one or more workers. The investor receives $q_f - q_0 g_f/2$ through such transactions, where q_f is the price paid for the period-1 consumption claim associated with a labor share and $q_0 g_f/2$ is foregone period-0 consumption resulting from the ex post owner's supply obligation. Again, the cost of labor supplied to firm f falls ultimately on the ex ante owner even though this agent does not personally provide any of this input, and share prices are defined so that this cost is deducted from the value of the ex ante owner's endowment.

The founder of the firm thus captures the overall net market value v_f from the sale of ex ante capital and labor shares. The set of feasible portfolios is unaffected by whether the founder supplies inputs directly or sells shares to other agents who take on this role. When $i \in K$ is the sole founder, we set $\underline{\mu}_f = 0$ and $\underline{\kappa}_{if} = 1$ in (3), with $\underline{\kappa}_{jf} = 0$ for all $j \in K$ such that $j \neq i$. The analysis is symmetric when some individual worker $i \in L$ is the sole founder of firm f. In that case we set $\underline{\mu}_f = 1$ and $\underline{\lambda}_{if} = 1$ in (3), with $\underline{\lambda}_{jf} = 0$ for all $j \in L$ such that $j \neq i$.

More generally, firm f could be organized by a coalition consisting of some capital suppliers and some labor suppliers. The net market value v_f is then divided by its founders through a bargaining process we do not model here. Let $\underline{\mu}_f$ be the fraction of net firm value v_f captured by labor suppliers as a group and let $1-\underline{\mu}_f$ be the fraction captured by capital suppliers as a group, where $(1-\underline{\mu}_f)\underline{\kappa}_{if}$ is the share of v_f obtained by an individual investor $i \in K$ and $\underline{\mu}_f\underline{\lambda}_{if}$ is the share obtained by an individual worker $i \in L$. Assigning the ex ante capital shares in proportion to $\underline{\kappa}_{if}$ and the ex ante labor shares in proportion to $\underline{\lambda}_{if}$ implies that the generalized ownership shares $(1-\underline{\mu}_f)\underline{\kappa}_{if}$ and $\underline{\mu}_f\underline{\lambda}_{if}$ in (3) reflect the bargaining power of the agents with respect to the entrepreneurial rent generated by firm f.

From (2) and (3) the budget sets for each type of agent are

$$B_i^K(p,q) \equiv \{\kappa_i \in \Omega_i^K: p\kappa_i \leq W_i^K(p,q)\}$$

$$B_i^L(p,q) \equiv \{\lambda_i \in \Omega_i^L: q\lambda_i \leq W_i^L(p,q)\}$$

Define $\underline{\kappa}_{i0} \equiv \underline{K}_i - \sum_f (1-\underline{\mu}_f)\underline{\kappa}_{if}g_f(y_f^1)$ and $\underline{\lambda}_{i0} \equiv \underline{L}_i - \sum_f \underline{\mu}_f\underline{\lambda}_{if}g_f(y_f^1)$, which can be regarded as physical endowments net of agent i's endowed share in the cost of each firm's production plan. We impose two restrictions on the production plans (y_f) of firms.

<u>Ex ante feasibility</u> (EAF): $\underline{\kappa}_{i0} > 0$ for all $i \in K$ and $\underline{\lambda}_{i0} > 0$ for all $i \in L$

<u>Ex post feasibility</u> (EPF): $\sum_{f\in F} g_f(y_f^1)/2 < \sum_{i\in K} \underline{K}_i$ and $\sum_{f\in F} g_f(y_f^1)/2 < \sum_{i\in L} \underline{L}_i$

EAF says that each agent can cover her ex ante share in firm costs by liquidating part of her input endowment. Because the price vectors p and q are non-negative, this ensures that each consumer has positive wealth in (3a) and (3b). EPF ensures that total endowments are large enough to implement all production plans simultaneously.

Time Sequence

Agents with ex ante control rights in each firm establish a tentative policy for that firm. If there is a takeover market, coalitions lacking control rights in a given firm can now bid to acquire such rights. If there is no takeover market or no bid is accepted, the original policies stand, but otherwise they are modified according to the terms of successful bids. After policies are fixed, markets for capital and labor shares open and inputs are supplied in proportion to ex post shares. Production takes place in period 1. Finally, the realized state-contingent outputs are divided as specified by firm policies and the ex post share allocation.

For given policies ϕ let $U_i(\kappa_i)$ be the utility function induced over κ_i for $i \in K$ by (1a). Similarly let $U_i(\lambda_i)$ be the utility function induced for $i \in L$ by (1b).

A *share market equilibrium* relative to fixed policies ϕ is a set of portfolios (κ^*,λ^*) and a non-negative price vector $(p,q) \neq \underline{0}$ (with $p_0 \equiv q_0$) having the following properties.

<u>Optimization</u>

<u>E1a</u> For each $i \in K$, κ_i^* maximizes $U_i(\kappa_i)$ subject to $\kappa_i \in B_i^K(p,q)$

<u>E1b</u> For each $i \in L$, λ_i^* maximizes $U_i(\lambda_i)$ subject to $\lambda_i \in B_i^L(p,q)$

<u>Market clearing</u>

<u>E2a</u> $\sum_{i\in K} \kappa_{i0}^* + \sum_{i\in L} \lambda_{i0}^* = \sum_{i\in K} \underline{K}_i + \sum_{i\in L} \underline{L}_i - \sum_{f\in F} g_f$

<u>E2b</u> For each $f \in F$, $\sum_{i\in K} \kappa_{if}^* = 1$

<u>E2c</u> For each $f \in F$, $\sum_{i\in L} \lambda_{if}^* = 1$

<u>Proposition 1</u>. Fix any firm policies ϕ satisfying EAF and EPF. A share market equilibrium exists relative to ϕ.

Proposition 2. Suppose there is a share market equilibrium with the following properties.

(a) All shares are non-null: that is, $0 < \mu_f < 1$ and $y_f^1 \neq \underline{0}$ for all $f \in F$.

(b) The output vectors $\{y_f^1\}$ for $f \in F$ are linearly independent.

(c) For each $i \in K$ and $i \in L$ there is a neighborhood around current prices and policies in which the set of binding constraints on portfolio choice does not change.

(d) The Jacobian matrix resulting from differentiation of the aggregate excess demands for shares is non-singular at the equilibrium.

Then in a neighborhood of the current policies ϕ, the share prices (p,q) are continuously differentiable functions of firm policies.

Assumption (a) ensures that all prices are strictly positive, while (b) guarantees that optimal portfolios are unique for given prices and policies. This implies that the number of firms cannot exceed the number of states; linear independence of output vectors is a generic feature of firm policies in this situation. Assumption (c) avoids the problem that arbitrarily small changes in parameters could move an agent from zero to positive shareholdings in a firm or vice versa. Along with a standard strengthening of strict quasi-concavity to ensure the sufficiency rather than just the necessity of second order conditions, this implies that the portfolios are continuously differentiable in prices and policies. Finally, (d) permits the use of the implicit function theorem. Assumptions (c) and (d) can be regarded as the 'typical' case, but a formal genericity proof is beyond the scope of this paper.

3. Market Structure and Policy Preferences

As discussed in the introduction, differences in mobility costs lead to differences in the structures of the capital and labor markets. The market for each firm's capital shares is competitive because an investor encounters no cost in shifting financial capital across firms, and an individual firm is negligible relative to the economy as a whole. Thus no single firm can alter the implicit prices of state-contingent consumption for investors. However, each firm is significant in the market for its own labor shares due to costly worker mobility, and its policies can affect the prices for period-1 consumption that implicitly confront workers participating in this market. We generally picture labor markets as geographically localized, but the operative notion of 'distance' could also reflect costly search or mismatches in skill.

It will frequently be necessary in what follows to consider the preferences of agents toward local policy changes in some firm f. Given fixed policies for all other firms, the maximized utility of $i \in K$ as a function of the policy ϕ_f can be written

$$(4a) \qquad T_i(\phi_f) = U_i[\kappa_i^*(\phi_f);\phi_f] + \eta_i^*(\phi_f)[\underline{K}_i - g(\phi_f)\kappa_i^*(\phi_f)/2] + \theta_i^*(\phi_f)[W_i^K(p(\phi_f),q(\phi_f),\phi_f) - p(\phi_f)\kappa_i^*(\phi_f)]$$

where U_i is the utility function over capital shares induced by equation (1a); $\kappa_i^*(\phi_f)$ is an optimal portfolio in the share market equilibrium associated with policy ϕ_f; η_i^* is the Kuhn-Tucker multiplier for the physical input constraint in (2a), with $g = (g_0,g_1 \,.\,.\, g_F)$ and $g_0 \equiv 0$; and θ_i^* is the multiplier for the budget constraint defined by (3a). Multipliers for the non-negativity constraints on capital shares can be ignored by assumption (c) of Proposition 2. Due to the structure of the budget constraint, firm f's policy influences agent i's wealth W_i^K only through the net values $v_h(\phi_f) = p_h(\phi_f) + q_h(\phi_f) - g_h(\phi_f)$ for $h \in F$ rather than the prices p_h and q_h separately, where we have now set $p_0 \equiv q_0 \equiv 1$. The counterpart to (4a) for $i \in L$ is

$$(4b) \qquad T_i(\phi_f) = U_i[\lambda_i^*(\phi_f);\phi_f] + \eta_i^*(\phi_f)[\underline{L}_i - g(\phi_f)\lambda_i^*(\phi_f)/2] + \theta_i^*(\phi_f)[W_i^L(p(\phi_f),q(\phi_f),\phi_f) - q(\phi_f)\lambda_i^*(\phi_f)]$$

The effects on the utility of an agent $i \in K$ of changing firm f's policy variables y_{fs} and μ_f are given respectively by

$$(5a) \qquad \partial T_i/\partial y_{fs} = \theta_i^*(1-\underline{\mu}_f)\underline{\kappa}_{if}(\partial v_f/\partial y_{fs}) + \theta_i^*\textstyle\sum_{h\neq f}(1-\underline{\mu}_h)\underline{\kappa}_{ih}(\partial v_h/\partial y_{fs}) + \kappa_{if}^*[(1-\mu_f)u_{is} - \eta_i^*(\partial g_f/\partial y_{fs})/2 - \theta_i^*(\partial p_f/\partial y_{fs})] - \theta_i^*\textstyle\sum_{h\neq f}\kappa_{ih}^*(\partial p_h/\partial y_{fs})$$

(6a) $$\partial T_i/\partial \mu_f = \theta_i^*(1-\underline{\mu}_f)\underline{\kappa}_{if}(\partial v_f/\partial \mu_f) + \theta_i^*\sum_{h\neq f}(1-\underline{\mu}_h)\underline{\kappa}_{ih}(\partial v_h/\partial \mu_f)$$
$$- \kappa_{if}^*[\sum_s u_{is}y_{fs} + \theta_i^*(\partial p_f/\partial \mu_f)] - \theta_i^*\sum_{h\neq f}\kappa_{ih}^*(\partial p_h/\partial \mu_f)$$

where u_{is} is the partial derivative of the utility function u_i with respect to consumption x_{is} in state s. The first line in each of equations (5a) and (6a) is the *wealth effect*, which we split into a direct effect involving firm f's own net value v_f and an indirect effect involving the values of other firms. The second line in each of (5a) and (6a) is the *consumption effect*, which again has direct and indirect components. The consumption effect captures changes in utility resulting from changes in the implicit prices of state-contingent output.

The corresponding derivatives for $i \in L$ are

(5b) $$\partial T_i/\partial y_{fs} = \theta_i^*\underline{\mu}_f\underline{\lambda}_{if}(\partial v_f/\partial y_{fs}) + \theta_i^*\sum_{h\neq f}\underline{\mu}_h\underline{\lambda}_{ih}(\partial v_h/\partial y_{fs})$$
$$+ \lambda_{if}^*[\mu_f u_{is} - \eta_i^*(\partial g_f/\partial y_{fs})/2 - \theta_i^*(\partial q_f/\partial y_{fs})] - \theta_i^*\sum_{h\neq f}\lambda_{ih}^*(\partial q_h/\partial y_{fs})$$

(6b) $$\partial T_i/\partial \mu_f = \theta_i^*\underline{\mu}_f\underline{\lambda}_{if}(\partial v_f/\partial \mu_f) + \theta_i^*\sum_{h\neq f}\underline{\mu}_h\underline{\lambda}_{ih}(\partial v_h/\partial \mu_f)$$
$$+ \lambda_{if}^*[\sum_s u_{is}y_{fs} - \theta_i^*(\partial q_f/\partial \mu_f)] - \theta_i^*\sum_{h\neq f}\lambda_{ih}^*(\partial q_h/\partial \mu_f)$$

where again in each equation the first line represents the wealth effect and the second line represents the consumption effect from a given policy change.

Now consider a local policy change $d\phi_f = (dy_{f1} \,.\,.\, dy_{fS}, d\mu_f)$. The change in firm f's net market value resulting from $d\phi_f$ is $dv_f = \sum_s (\partial v_f/\partial y_{fs})dy_{fs} + (\partial v_f/\partial \mu_f)d\mu_f$. The effect on agent i's utility is given by $dT_i = \theta_i^*dw_{if} + dz_{if}$ where $\theta_i^*dw_{if}$ is the overall wealth effect from $d\phi_f$ and dz_{if} is the consumption effect. Notice that the change in wealth dw_{if} includes both the direct effect from dv_f and indirect effects operating through dv_h for $h \neq f$.

We next state our key assumption.

CC: Markets for capital shares are perfectly competitive in the sense of Hart (1979a,b) and Makowski (1983a,b) while markets for labor shares are not.

CC implies that the consumption effect of firm f's policy on investor i's utility in (5a) and (6a) is zero, so all investors evaluate policy changes in firm f solely by their wealth effects. But workers will generally differ both with respect to the sign of the consumption effect dz_{if} from a local policy change $d\phi_f$ and the relative size of the consumption and wealth effects. We assume that scale economies rule out an assignment of workers such that all workers in each firm have identical tastes (otherwise, no collective choice issue arises for the LMF).

To justify our claim that capital share markets are perfectly competitive, we need to link our model with Hart (1979a). The assumptions used by Hart are either implied by our framework or consistent with it, but due to space limitations we will not delve into technical details. Instead, we take a more intuitive approach.

Interpret the model in section 2 as describing a geographic region containing finitely many capital suppliers, labor suppliers, and firms. Suppose there are R identical regions of this kind. Capital moves freely across regions, but workers can supply labor only to firms in their region. Suppose for the moment that all regions are 'capitalist': that is, all firms are KMFs with $\underline{\mu}_f = 0$ for all f so workers have no ex ante claim on the net market value of any firm. The prices of labor shares (q_f) for firms in a particular region are determined solely by the policies of the firms in that region, the preferences of the local workers, and the time endowments of these workers. The policies of firms in other regions are irrelevant because local workers cannot supply labor to such firms and worker wealth is unaffected by capital share prices. Fix the policies of all firms.

Now interpret each $i \in K$ from section 2 as a 'type' of investor in Hart's sense, implying that all investors of a given type have identical preferences and wealth. Regions are replicated by increasing R. As R goes to infinity, each firm becomes negligible relative to the aggregate capital market because its output is constrained by the finite labor endowment of its own region. In the limit economy no firm can influence the implicit prices of state-contingent output facing investors, and capital share prices are determined by

(7) $$p_f(\phi_f) = \max_{i\in K^*} \{\Sigma_{s\in S}\, z_{is}(x_i)(1-\mu_f)y_{fs}\}$$

where $z_{is}(x_i) \equiv u_{is}(x_i)/u_{i0}(x_i)$ is investor i's marginal rate of substitution between state s and period 0, and the maximization is over the set K* of investor types whose consumption bundles x_i have positive measure in the limit economy defined by Hart (1979a). Each type's bundle x_i is independent of any individual firm's policy ϕ_f because each firm is small and can affect the consumption of only finitely many investors. Some implications of this pricing formula are developed by Makowski (1983a,b) and Makowski and Pepall (1985).

Against this backdrop we add a new region where some firms are LMFs with $\underline{\mu}_f > 0$. This captures the empirical reality that the LMF sector is small relative to the aggregate economy, which is dominated by capitalist firms. Although LMFs may have some ability to affect the implicit prices facing workers in a local labor market, they must attract investors who have access to a perfectly competitive capital market. The policies of firms in the LMF region have a negligible effect on the capital market as a whole so the pricing formula for capital shares given by (7) applies to this region as well.

The prices in (7) are well-defined but could be non-differentiable. This is true at the policy ϕ_f only if $\Sigma_{s\in S}\, z_{is}(x_i)(1-\mu_f)y_{fs} = \Sigma_{s\in S}\, z_{js}(x_j)(1-\mu_f)y_{fs}$ for two distinct investor types $i \neq j$, implying $\Sigma_{s\in S}\, \Delta z_s(1-\mu_f)y_{fs} = 0$ where $\Delta z_s \equiv z_{is} - z_{js}$. The output vector $(1-\mu_f)y_f^1$ for capital suppliers as a group is therefore orthogonal to $\Delta z \neq \underline{0}$ and lies in a subspace of dimension S-1. If there are finitely many investor types there are only finitely many such subspaces, and p_f is differentiable at almost all ϕ_f. We assume this in the rest of the paper.

4. Takeover Bids and Sustainability

Suppose now that before share markets open, the ex ante shareholders of firms can be bought out by alternative coalitions who will implement policies differing from those of the initial owners. We will show that the asymmetric structure of capital and labor markets discussed in section 3 affects the survival properties of KMFs and LMFs in asymmetric ways. In particular, LMFs are prone to takeover by wealth-maximizing investors except under highly restrictive conditions, while KMFs are sustainable against takeover by worker coalitions under conditions that seem likely to be met in practice.

Let the *controlling group* C_f for firm f be the set of agents entitled to vote on firm f's policies. A necessary condition for membership in C_f is that an agent have a positive ex ante stake in the firm, that is, $(1-\underline{\mu}_f)\underline{\kappa}_{if} > 0$ for $i \in K$ or $\underline{\mu}_f\underline{\lambda}_{if} > 0$ for $i \in L$. Voting rights may be confined to a proper subset of the ex ante shareholders. A firm is defined to be a KMF if $C_f \subseteq K$ and all i with $\underline{\kappa}_{if} > 0$ have a vote. Likewise an LMF has $C_f \subseteq L$ and all i with $\underline{\lambda}_{if} > 0$ have a vote. In each case, votes are proportional to the endowments $\underline{\kappa}_{if}$ or $\underline{\lambda}_{if}$. It is natural to suppose that KMFs have $\underline{\mu}_f = 0$ and LMFs have $\underline{\mu}_f = 1$ (agents without voting rights also lack ex ante claims on the firm's net market value), but this is not essential.

A majority rule equilibrium in the sense of Plott (1967) is defined as follows. The policy ϕ_f* is a *majority rule equilibrium* in firm f if for any local deviation $d\phi_f$ there is some majority coalition $M \subseteq C_f$ such that no $i \in M$ is strictly better off when $d\phi_f$ is implemented. A majority coalition is a subset $M \subseteq C_f$ having 50% or more of the total votes in firm f. A deviation $d\phi_f$ from the status quo can be blocked by any such M if all members of M vote against it. Each $i \subseteq C_f$ votes against $d\phi_f$ unless this deviation strictly increases her utility. The concept of majority rule equilibrium has previously been applied to collective choice in firms by Sadanand and Williamson (1991) and deMarzo (1993).

An equilibrium of this sort does not generally exist when voters have heterogeneous preferences and the policy space has high dimensionality. Kramer (1973) has shown that the restrictions on preference profiles needed to guarantee majority-rule transitivity do not differ significantly from the condition of identical preferences. Further, McKelvey (1979) demonstrates that when majority rule intransitivity obtains, it may be extreme, in the sense that majority decisions can cycle over virtually all alternatives in the relevant choice set.

For our purposes it is unimportant how status quo policies are determined, because all we need below is the generic non-existence of majority rule equilibrium in LMFs (for a discussion of policy equilibrium in a related context, see Magill and Quinzii, 1996: ch. 6).

Thus we simply assume the existence of some collective choice procedure that defines a tentative policy ϕ_f for each $f \in F$. In order to stress that transaction costs of the Hansmann sort are not essential to our story, we further suppose that this choice procedure costlessly picks a policy that is Pareto efficient relative to the preferences of the controlling group C_f, given the policies of all other firms. This biases the analysis in favor of LMF viability, and hence strengthens our conclusions about the vulnerability of such firms to takeover bids.

Now let a market for control rights open in period 0 after tentative policy decisions have been made but before these policies are finalized. Transactions on this market involve takeovers, which occur when a bidding coalition purchases a majority of the shares owned by the ex ante controlling group. After the takeover market closes the policies proposed by successful takeover coalitions are adopted, and tentative policies become final otherwise.

Let B_f be a coalition seeking to take over firm f, where $B_f \cap C_f = \emptyset$. A controlling group C_f is sustainable only if there are no gains from trade between the outsider group B_f and any strict voting majority M of the insider group C_f (for related ideas see Hart, 1977). A *takeover bid* for firm f consists of a firm valuation v_f' at which B_f offers to buy all ex ante shares held by a particular strict majority M, together with a local policy change $d\phi_f$ that B_f promises to adopt if it gains control. All members of M must expect $(v_f', d\phi_f)$ to increase their utilities for the bid to succeed. Each member of B_f contributes a positive fraction of the payment to M and acquires a corresponding claim on the firm's new market value.

Formally, the controlling group C_f is *sustainable against takeover by B_f* when there is no feasible bid $(v_f', d\phi_f)$ such that

T1: All $i \in M \subseteq C_f$ for some strict majority M of the controlling group C_f increase their utility by selling their ex ante shares at price v_f' when $d\phi_f$ is implemented; and

T2: All $i \in B_f$ increase their utility by acquiring the ex ante shares of M at price v_f' when $d\phi_f$ is implemented.

If the coalition B_f can commit itself to arbitrary policy changes, whether contractually or by reputation, then $d\phi_f$ is unrestricted. Otherwise $d\phi_f$ must be confined to a subset of credible proposals. Since we are interested only in local changes, and takeover bids are formulated by coalitions rather than individuals, the usual notion of subgame perfection is difficult to apply. An approach that is similar in spirit is to require that $d\phi_f$ make all members of B_f strictly better off once this coalition takes control. Thus when commitment is impossible, the proposal $d\phi_f$ is said to be *credible* if $dT_i > 0$ for all $i \in B_f$ where dT_i is the change in utility induced by $d\phi_f$ after B_f has acquired control and the side payment v_f' is sunk.

<u>Proposition 3</u> (sustainability of LMFs).

Consider an LMF and any takeover coalition $B_f \subseteq K$ consisting entirely of investors with a zero ex ante capital share for all firms in the LMF's labor market.

(a) Suppose takeover coalitions can commit themselves to arbitrary policy changes. The controlling group $C_f \subseteq L$ is sustainable against takeover by B_f if and only if its tentative policy ϕ_f^* is a majority rule equilibrium.

(b) Suppose takeover coalitions cannot commit themselves to arbitrary policy changes and bids must therefore be credible. The controlling group $C_f \subseteq L$ is sustainable against takeover by B_f if and only if there is no policy change $d\phi_f$ that induces $dv_f > 0$ and makes some strict majority $M \subseteq C_f$ better off.

Proposition 3(a) says that if commitment to policy changes is feasible, an LMF with individually tradeable shares will be taken over by outside investors unless it has achieved a majority rule equilibrium. But we know from the discussion earlier in this section that this is very unlikely. Such an equilibrium can only arise if a share-weighted majority of worker-members has essentially identical preferences toward the firm's policies. The problem for the LMF is that some frustrated majority is generally willing to bribe a coalition of outside investors to implement a new policy.

The prospects for LMF viability are less bleak when outside investors can credibly commit only to policy changes that increase the market value of the firm. Proposition 3(b) says that in this case an LMF is sustainable as long as there is no way to increase firm value that would be supported by a majority of the current worker-members. A fortiori, the firm is sustainable if it is already maximizing its market value. But takeover bids that target non-value-maximizing LMFs will also fail as long as any policy change that wealth-maximizing investors can credibly deliver would be opposed by some majority of the firm's insiders.

Proposition 4 (sustainability of KMFs).

Consider a KMF that adopts a tentative policy ϕ_f* which maximizes its market value v_f. Assume each investor $i \in C_f$ has a zero ex ante capital share for all other firms in the same labor market as firm f. The following results hold whether or not a takeover coalition B_f can commit to arbitrary policy changes.

(a) The controlling group $C_f \subseteq K$ is sustainable against takeover by any coalition B_f that includes an outside investor $i \in K$ who has a zero ex ante capital share for all firms in the same labor market as firm f.

(b) The controlling group $C_f \subseteq K$ is sustainable against a worker coalition $B_f \subseteq L$ if and only if for every local policy change $d\phi_f$ there is some $i \in B_f$ whose utility does not increase when $d\phi_f$ is adopted.

The first message of Proposition 4 is that a capitalist firm generally faces a threat of takeover only from worker coalitions. Because KMFs are already value-maximizing, there are no gains from trade between inside and outside investors. The only caveat is that the firm could be vulnerable to a takeover coalition consisting entirely of investors with ex ante claims on firms $h \neq f$ operating in the same local labor market. Such investors may want to implement policies that decrease one firm's value in order to increase the value of another firm. The assumptions of Proposition 4 rule out such indirect wealth effects.

Worker teams could nevertheless take over a KMF in order to pursue consumption goals at the expense of value maximization. For a worker buyout to succeed, the takeover coalition must unanimously agree on the desirability of some local policy shift. If it does, commitment issues are irrelevant because the change is automatically credible. In principle a single employee with a sufficiently large endowment could always buy out a KMF for consumption purposes, since one-person coalitions never have internal disagreements. But a realistic view of worker wealth and credit markets suggests that labor coalitions must be sizable in order to take over large firms. We will return to this point in section 5.

Proposition 4 does not require that workers participating in a takeover bid intend to work in the firm ex post ($\lambda_{if}^* > 0$). It might appear that only employees of firm f could obtain consumption benefits by changing its policy so viable takeover coalitions could only emerge from within this subset of workers. This is not correct because the consumption effects in (5b) and (6b) include terms involving the prices of labor shares for other firms, which could be non-zero even though $\lambda_{if}^* = 0$. In a monopolistically competitive labor market, a worker who does not supply labor to firm f might want to change its policies in order to change the price of labor shares at some firm $h \neq f$ where she does plan to work.

This complication clearly cannot arise for monopsony (one firm per labor market), since then $\lambda_{if}^* = 0$ implies a zero consumption effect. Even without monopsony, though, a KMF will generally be open to takeover only by its own employees because workers will seldom find it attractive to buy a firm that does not employ them merely to influence prices elsewhere in the local labor market.

5. Conclusion

Several factors not captured in our formal analysis tend to reduce the likelihood of a worker takeover beyond what is described in Proposition 4. First, small employee groups with parallel consumption interests may encounter liquidity problems in buying out capital-intensive KMFs, while larger coalitions that could potentially overcome such problems may be unable to agree on firm policies. Second, when unanimity cannot be achieved, coalition size is likely to matter due to transaction costs of the sort emphasized by Hansmann (1996). Again, this makes it less likely that a large employee coalition could take over a KMF, but has no effect on investors who want to take over an LMF. Finally, collective bargaining is often a good substitute for control rights from the standpoint of KMF employees who want to pursue consumption goals within the firm, as long as the consumption benefits involved can be specified and enforced contractually. But there is no real alternative to takeover for investors who would like to profit by reorganizing a LMF in a wealth-enhancing direction.

The theory developed here is consistent with numerous stylized facts about labor-managed firms. Foremost among these is the emphasis LMFs commonly give to achieving homogeneity among members with respect to rewards, skills, attitudes, and organizational roles (Rothschild and Whitt, 1986: 95-100). Our analysis also accounts for the tendency of LMFs to cluster in craft manufacturing and professional services such as law and medicine. The small scale of such firms helps facilitate bargaining and informal side payments among workers, while a uniform occupation may promote homogeneity of attitudes and beliefs. It is probably also not a coincidence that workers' cooperatives often demand conformity to religious or ideological principles, recruit from particular ethnic groups, or have a cohesive group of founders who share a common vision of the firm's objectives.

These regularities are also consistent with the transaction cost approach of Benham and Keefer (1991) and Hansmann (1996). However, in contrast to these writers we have shown that LMFs concerned with organizational stability will limit preference heterogeneity even if the cost of collective decision-making is zero. Another contrast involves credibility. In our model, LMFs are generically unstable if investors can make binding commitments about firm policies, but may become stable if investors can credibly promise only wealth-increasing deviations. This prediction does not emerge from the transaction cost approach. Most fundamentally, we derive asymmetries in preferences from the differing structures of capital and labor markets. These asymmetries are left unexplained in the existing literature.

Our theory does not assert that KMFs will never be taken over by their employees, but it highlights the need for a uniform motivation within the takeover coalition. From this perspective it is interesting that employee buyouts tend to occur disproportionately often in KMFs facing financial difficulties (Dow, 2003: ch. 10). The prospect of a plant closing or bankruptcy likely affects many employees in a parallel way, and thus gives rise to takeover coalitions that might lack cohesion at other times. The fact that employee buyouts are more common in troughs of the business cycle (Ben-Ner and Jun, 1996) is consistent with the notion that collective bargaining is a poor substitute for takeover when liquidation is likely.

Our theory also highlights a tension between the organizational stability of the LMF and reliance on individually tradeable membership rights. Rare as LMFs are, markets for LMF membership are much rarer. This is true despite theoretical arguments favoring such markets (Sertel, 1982; Dow, 1986, 1996). One possible explanation is that if LMFs want to avoid takeover bids, they may find it attractive to prohibit internal majorities from selling their voting rights. In practice this is likely to mean banning the sale of membership rights entirely, since otherwise an outside investor could gain control through a series of bilateral bargains with individual members (see Dow, 2003: ch. 7 for a further discussion).

Worker participation in decision-making has well-documented benefits, especially when it is accompanied by participation in financial results (Doucouliagos, 1995; Ben-Ner, Han, and Jones, 1996). There have also been remarkably successful experiments with full workers' control, including many cooperatives in Italy, France, and Spain (Bonin, Jones, and Putterman, 1993; Dow, 2003: chs. 3-4). But these success stories generally involve muted or indirect forms of worker participation. In our view a serious program for worker control of firms must reconcile democratic participation with organizational stability. The advocates of such programs thus need to address collective choice problems explicitly.

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