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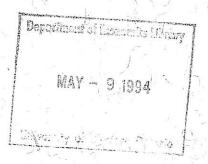
PAPERS IN POLITICAL ECONOMY

Paper No. 46

"Entry Fees, Firing Threats, and Work Incentives: Capitalist and Labor-Managed Firms in Market Equilibrium"

Gregory K. Dow

The UNIVERSITY of WESTERN ONTARIO

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ENTRY FEES, FIRING THREATS, AND WORK

INCENTIVES: CAPITALIST AND LABOR-MANAGED

FIRMS IN MARKET EQUILIBRIUM

by

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ENTRY FEES, FIRING THREATS, AND WORK INCENTIVES:

CAPITALIST AND LABOR-MANAGED FIRMS IN MARKET EQUILIBRIUM

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April 1993

Abstract: Capitalist firms rarely require job applicants to pay up-front fees at the time of employment, even if employed workers receive substantial rents ex post. However, labor-managed firms often do collect entry fees from incoming members, and sometimes sell membership rights on open markets. This difference in firm behavior can be explained by differing degrees of firm-side moral hazard in capitalist and labor-managed firms. A capitalist firm which sells jobs will be tempted to dismiss incumbent workers in order to collect new fees from their replacements. Labor-managed firms internalize the rent losses inflicted on incumbent workers by dismissal, and hence do not succumb to this temptation.

ENTRY FEES, FIRING THREATS, AND WORK INCENTIVES:

CAPITALIST AND LABOR-MANAGED FIRMS IN MARKET EQUILIBRIUM

1. Introduction

Capitalist firms rarely require workers to pay up-front fees to the firm when they are first hired. This is puzzling, because econometric evidence suggests that workers frequently appropriate rents once they are employed.[1] If labor markets were competitive firms would recapture this rent by collecting an offsetting entry fee at the start of the employment contract.[2]

Labor-managed firms (LMFs), on the other hand, often collect up-front payments from new members. In many instances, including the Italian producer cooperatives, such fees can be quite sizable (Estrin, Jones and Svejnar, 1987). For the plywood cooperatives located in the U.S. Pacific Northwest, the fee is just the market price of a membership share (Berman, 1967; Bellas, 1972; Berman and Berman, 1989).[3] More often, as in the case of the Mondragon cooperatives, these fees are regarded as mandatory contributions to the working capital of the firm (Bradley and Gelb, 1981). But regardless of the particular rationale used to justify membership fees in any given firm, it is striking that LMFs routinely impose such conditions on incoming members while capitalist firms (KMFs)

only rarely do so.

The importance of this puzzle is heightened by theoretical research showing that marketable membership rights are essential to the allocative efficiency of LMFs. Early writers on the LMF maintained that such firms would maximize net revenue per worker, with perverse comparative static consequences (Ward, 1958; Domar, 1966; Vanek, 1970). Other authors have argued that LMFs tend to underinvest because the current membership cannot capture future investment returns (Furubotn, 1976; Jensen and Meckling, 1979). In principle, both of these difficulties can be eliminated by the establishment of competitive markets for LMF membership (for the static case, see Sertel, 1982, 1991; Dow, 1992; Fehr, 1993; for models of investment behavior, see Dow, 1986, 1993a).

Two related analytic tasks can thus be identified. First we need to explain why KMFs do not collect ex ante fees from workers (even when these workers appropriate rents ex post). Second, we must show that the same considerations do not preclude LMFs from charging membership fees. A number of proposed solutions to the first problem fail this second test. For example, it has often been asserted that capitalist firms will not collect an entry fee because workers have limited personal wealth and are rationed by lenders. This story is not easily reconciled with the empirical fact that workers do pay such fees to LMFs.[4]

I focus here on a different hypothesis, involving firm-side moral hazard. Consider an efficiency wage model along the lines of Shapiro and Stiglitz (1984) or Bowles (1985). In such models, firms and workers cannot contract directly on the effort level to be supplied by the worker. This contractual problem is avoided if firms pay wages above the market-clearing level and threaten to fire employees who shirk. Due to the wage premium, workers who are fired lose a rent. If this rent is large enough, each worker prefers to supply the effort level demanded by the firm.

Critics of these models have objected that firms would seek to recapture the labor rent by means of an entry fee paid at the outset of the employment contract. If this fee adjusts to clear the labor market, then workers will not receive any rent ex ante, and efficiency wage theory fails to attain its goal of explaining involuntary unemployment (Carmichael, 1990). In reply, defenders of the efficiency wage framework have claimed that positive entry fees are infeasible for economic, legal, or sociological reasons (Dickens, Katz, Lang, and Summers, 1989; Lang and Kahn, 1990).

One problem with such fees is the danger of firm-side moral hazard. Contracts where workers pay the firm for jobs will tempt the firm to dismiss employees (whether they shirked or not), in order to collect additional entry fees from their replacements. If firms cannot precommit to refrain from opportunistic behavior

of this sort, equilibria with positive entry fees may not exist. This idea has been explored by MacLeod and Malcomson (1989, 1993) and Dow (1993b), who establish that it is sometimes necessary for ex ante labor rents to be positive in equilibrium even when labor is in excess supply and entry fees are not prohibited a priori.

Now consider LMFs with marketable membership rights, having the same production and monitoring technology as KMFs. It might appear that the same moral hazard problem arises, because current members could dismiss a colleague and share in the membership fee collected from that worker's replacement. But when all incumbent members are equally likely to be singled out for expulsion, any gain from excessive turnover is offset by the prospect that each existing member will be expelled. Since workers themselves run the firm, the temptation to dismiss non-shirkers disappears. Or, to put it another way, the LMF internalizes the rent losses borne by expelled workers while the capitalist firm does not. For this reason, the LMF membership market is not as prone to moral hazard problems as a parallel market for jobs in a capitalist economy.

This reasoning is compatible with efficiency wage theory but does not stand or fall with the validity of the efficiency wage approach. The same argument applies when KMF workers enjoy an ex post rent for other reasons, such as bargaining power on the part of 'insider' employees.[5] Here the firm would like to collect an

entry fee by having applicants bid ex ante for the opportunity to engage in bilateral bargaining with the firm. Unless the cost of labor turnover is prohibitive, firms would be tempted to dismiss insiders in order to extract further fees from their successors.

Section 2 introduces the basic model and characterizes the circumstances under which viable employment contracts exist for capitalist firms. Proposition 1 shows that when firms can fill job vacancies immediately, positive entry fees are impossible. Section 3 models a parallel economy with LMFs where workers pay membership fees. Proposition 2 shows that for this economy, any fee up to the present value of membership can be charged by firms without provoking opportunistic dismissals.

Section 4 considers long run equilibria with free entry by new firms. Proposition 3 derives the unique market equilibrium for a capitalist economy, while Proposition 4 does the same for the LMF economy. In the KMF case equilibrium contracts involve no entry fee, zero profit for capital suppliers, and an ex ante rent for labor. The LMF equilibrium involves a market-clearing entry fee so that ex ante labor rent is zero; but the founders of the firm (who function as capitalists) do capture a rent. There is greater entry in the LMF case (product market price is lower), because LMFs can get effort from workers at a lower wage premium than corresponding KMFs. Section 5 concludes with some caveats.

2. Entry Fees in the Capitalist Economy

Each firm uses two inputs in fixed proportions: machines (K) and labor (L). I will also use this notation in referring to the individual agents who supply each type of input. All agents are risk neutral and infinitely-lived, with a common discount factor $\delta \in (0,1)$. Time is discrete and indexed by $t \in \{0, 1 . . \}$.

In the period where some worker L is initially hired by some employer K, a contract is signed under which L pays a fee (x) to K immediately, and receives a wage (w) in each period as long as the employment relationship continues. In each period where L is employed, L chooses an effort $e_t \in \{0, 1\}$ where $e = 1$ indicates maximum effort and $e = 0$ indicates shirking.[6] The payoffs are

(1a) $$u_K(w,e_t) = qe_t - w$$

(1b) $$u_L(w,e_t) = w - ve_t$$

where $q > 0$ is the value of the output produced when $e = 1$ and $v > 0$ is the associated disutility of effort. To ensure that there are gains from production, I assume $q \geq v$ throughout. All agents can secure a zero payoff at the start of any period t by leaving the labor market. K's outside option is the profit obtainable by shifting machines to some other use. L's outside option is the utility of home production, a secondary sector job, or leisure.

After seeing L's period-t effort choice, K decides whether

to fire or retain L.[7] If K fires L at the end of period t, the employment relationship dissolves and K and L both search for new production partners at the start of period t+1. If K chooses to retain L, there is a probability 1-α that K and L will separate for exogenous reasons (e.g. L moves elsewhere). Accordingly the probability of continuation if K retains L is $\alpha \in (0,1)$.

Now suppose the employment relationship dissolves at the end of period t. The probability that the resulting job vacancy can be filled by K at the beginning of period t+1 is $\beta_K \in (0,1]$. The probability that L is hired by a new firm at the start of period t+1 is $\beta_L \in (0,1]$. Those agents who find new partners restart production under a new employment contract (x,w) in period t+1. Because we are interested only in stationary market equilibria, this contract is taken to be identical at the start of each new employment relationship. Those agents who cannot fill a vacancy or find a job in period t+1 try again at the beginning of period t+2 and repeat this process until they are successfully matched.

I will call a contract (x,w) <u>viable</u> when four conditions are met, assuming that each firm commits itself to adopt (x,w) in all present and future employment relationships.[8]

(a) <u>Incentive compatibility for L</u>: employed workers are willing to supply e = 1.

(b) <u>Voluntary participation by L</u>: workers are willing to search for jobs when unemployed.

(c) <u>Incentive compatibility for K</u>: employers do not fire workers who supply $e = 1$.

(d) <u>Voluntary participation by K</u>: employers with vacancies are willing to search for replacement workers.

Sections 2 and 3 characterize viable contracts for KMFs and LMFs. For this purpose, I regard revenue per worker (q) as exogenously given. Section 4 endogenizes this parameter and shows that under free entry and exit there is a unique viable employment contract for each economy.[9]

2.1 Incentive Compatibility for Workers

By stationarity a worker either finds it optimal to set $e = 1$ in every period, or else $e = 0$. If the worker adopts $e = 1$ and firms retain non-shirkers, the value of employment V_L satisfies

$$(2) \qquad V_L = w - v + \delta[\alpha V_L + (1-\alpha)U_L]$$

The term V_L appears on the right side of (2) because L stays with the firm in the next period with probability α, and this outcome again yields V_L. The present value obtained from unemployment is

$$(3) \quad U_L = \beta_L(V_L - x) + \delta(1-\beta_L)\beta_L(V_L - x) + \delta^2(1-\beta_L)^2\beta_L(V_L - x) \cdots$$

$$= \frac{\beta_L(V_L - x)}{1 - \delta(1-\beta_L)}$$

where β_L is the probability that an unemployed worker finds a job in each period. The ex ante value of a new job is $V_L - x$; that is, the present value of being employed minus the entry fee paid at the start of the employment relationship. Negative values of x indicate a transfer from K to L when employment commences. By substituting (3) into (2) we obtain

$$(4) \qquad V_L = \frac{(w-v)[1-\delta(1-\beta_L)] - x\delta(1-\alpha)\beta_L}{(1-\delta)[1-\alpha\delta(1-\beta_L)]}$$

The value of employment to an L who sets $e = 0$ in every period is

$$V_L^o = w + \delta U_L^o \qquad \text{where} \qquad U_L^o = \frac{\beta_L(V_L^o - x)}{1 - \delta(1-\beta_L)}$$

because such workers receive the wage (w) in the current period with no effort disutility, and are fired immediately. This gives

$$(5) \qquad V_L^o = \frac{w[1-\delta(1-\beta_L)] - x\delta\beta_L}{1 - \delta}$$

The incentive compatibility constraint for L is $V_L \geq V_L^o$ so that positive effort is optimal. From (4) and (5) this gives

$$\underline{IC}_L: \qquad x \geq x^L_{min} = \frac{v - \alpha\delta(1-\beta_L)w}{\alpha\delta\beta_L}$$

At a given wage, large entry fees deter shirking because a worker who is fired must pay the fee before getting another job. Higher wages reduce the lower bound x^L_{min} by providing a larger stream of rents in the current job. This gives workers more reason to fear dismissal, so that the entry fee collected by other employers can be reduced without jeopardizing incentives in the present firm.[10]

2.2 The Participation Constraint for Workers

Unemployed workers look for jobs only when $V_L - x \geq 0$. This inequality yields[11]

$$\underline{PC}_L: \qquad x \leq x^L_{max} = \frac{w - v}{1 - \alpha\delta}$$

The fee x cannot exceed the present value of the payoff flow $w-v$ from any individual firm, because it must be paid at the start of each new employment relationship.

2.3 Incentive Compatibility for the Firm

Work incentives require that firms dismiss shirkers.[12] But in a non-trivial equilibrium firms must also retain non-shirkers. Agreements not to dismiss conscientious workers are unenforceable because effort cannot be verified by third parties. Retention of non-shirkers must therefore be incentive compatible for the firm.

The value V_K of a firm which retains non-shirkers satisfies

$$(7) \qquad V_K = q - w + \delta[\alpha V_K + (1-\alpha)U_K] \qquad \text{where } U_K = \frac{\beta_K(V_K + x)}{1 - \delta(1-\beta_K)}$$

Combining these we obtain

$$(8) \qquad V_K = \frac{(q-w)[1-\delta(1-\beta_K)] + x\delta(1-\alpha)\beta_K}{(1-\delta)[1-\alpha\delta(1-\beta_K)]}$$

By firing incumbent workers, K obtains

$$(9) \qquad V_K^o = q - w + \delta U_K^o \qquad \text{where} \qquad U_K^o = \frac{\beta_K(V_K^o + x)}{1 - \delta(1-\beta_K)}$$

The incentive compatibility condition is $V_K \geq V_K^o$ which implies

$$\underline{IC}_K: \qquad x \leq x_{max}^K = \frac{(q-w)(1-\beta_K)}{\beta_K}$$

A higher probability β_K of filling a vacancy reduces the feasible size of entry fees, since otherwise firms will fire non-shirkers.

2.4 The Participation Constraint for the Firm

Firms with vacancies search for workers only if $V_K + x \leq 0$. This inequality yields[13]

$$\underline{PC}_K: \qquad x \geq x_{min}^K = \frac{-(q-w)}{1 - \alpha\delta}$$

If x is too negative, K prefers not to fill vacancies because the ex ante transfer to L through the entry fee is too large.

2.5 Viable Contracts for KMFs

The preceding results are listed in the left column of Table 1 for convenience. We now examine the set of viable contracts.

Proposition 1.

(a) The set of viable contracts for the KMF economy is non-empty if and only if

$$q \geq \min \left\{ \frac{v}{\alpha\delta(1-\beta_K)} ; \frac{v}{\alpha\delta(1-\beta_L)} \right\}$$

For any such contract the wage satisfies $q \geq w \geq v/\alpha\delta$.

(b) When jobs are filled immediately ($\beta_K = 1$), the entry fee is non-positive and labor receives an ex ante rent.

Proof: See Appendix A.

Figure 1 shows an illustrative situation. The set of viable contracts (x,w) is given by the shaded region. The participation constraints PC_K and PC_L are parallel (with the common slope $1-\alpha\delta$) and indicate the loci where ex ante rent falls to zero for K and L respectively. PC_K lies above PC_L when $q > v$ (production yields a positive surplus). The slope of the no-shirking constraint IC_L

is $-\beta_L/(1-\beta_L)$ while the slope of the no-firing constraint IC_K is $-\beta_K/(1-\beta_K)$. Figure 2 shows a degenerate case where PC_K, IC_K, and IC_L have a common intersection denoted by point E. In this case point E is the only viable contract if $\beta_K > \beta_L$ (IC_K steeper than IC_L). There are other viable contracts when $\beta_K \leq \beta_L$ (as shown).

Part (a) of Proposition 1 states that viable contracts exist only if the value of output (q) is large enough. Existence also requires that at least one of β_K and β_L be less than unity. This follows from the fact that dismissal must have a cost for workers if effort incentives are to be maintained. There are two ways to impose such a cost. One is to have shirkers face an interval of unemployment ($\beta_L < 1$) as in conventional efficiency wage models. If instead we have $\beta_L = 1$, implying that dismissed employees are immediately rehired, shirking is deterred only when x > 0 so that shirkers pay entry fees to future firms. But then $\beta_K = 1$ cannot hold because if it did, firms could fill vacancies without delay and would fire non-shirkers to collect additional entry fees.

Part (b) of Proposition 1 has the following interpretation. Suppose that labor is in excess supply so that $\beta_K = 1$. In this situation the IC_K constraint coincides with the vertical axis in Figures 1 and 2 and x $\leq$ 0 holds at every point in the viable set. Since every point in the shaded region with x $\leq$ 0 lies above the zero-rent locus PC_L there must be an ex ante labor rent.[14]

3. Membership Fees in the Labor-Managed Economy

This section constructs a model of the labor market for an economy where production is organized by means of labor-managed firms. Apart from this institutional distinction, the analysis parallels that of section 2. I assume LMF members share equally in the revenue from production because contracts which tie income to effort are not enforceable. LMFs also need to distribute the membership fees paid when vacancies are filled. These fees are shared equally at the start of period t+1 by those workers who were incumbent members in period t. Just as it is impossible to share production revenues on the basis of effort, the LMF cannot distribute membership revenues according to the effort levels of period-t incumbents. The only way for an LMF to punish shirkers is thus to expel them from the firm.[15]

For simplicity I will assume that LMFs collectively own the physical assets used in production (rather than leasing machines from outside owners as in Dow, 1993c). This does not affect the long run LMF equilibrium in section 4. I also assume that each firm's capital stock remains constant over time.[16]

3.1 Incentive Compatibility for Workers

In a stationary world where all workers set $e = 1$ and firms retain non-shirkers, the value of LMF membership is

(10) $M = q - v + \delta[\alpha M + (1-\alpha)U_L + (1-\alpha)x]$

with

(11) $U_L = \dfrac{\beta_L(M - x)}{1-\delta(1-\beta_L)}$

The derivation of equation (11) follows that for (3) in section 2.1, but equation (10) requires some elaboration.

The term q-v reflects the fact that all members set e = 1. Since firm revenue is shared equally and there is no wage, income per capita is q. The disutility v is deducted from this payment. Each member stays in the next period with probability α. Workers who exit obtain the present value of unemployment (U_L) as before.

The last term in (10) arises as follows. Suppose the number of potential jobs in the firm is fixed at $\bar{n}$ by the firm's capital stock and let $n_t \le \bar{n}$ be the actual number of members in period t. At the end of the period $(1-\alpha)n_t$ workers depart, so that the firm attempts to fill a total of $\bar{n} - n_t + (1-\alpha)n_t$ vacancies in period t+1. The probability of successfully filling each vacancy is β_K and each new member pays the entry fee x. The resulting revenue is distributed equally among the period-t incumbents (whether or not they leave the firm). Each can therefore expect to receive

$$x\beta_K[\bar{n} - n_t + (1-\alpha)n_t]/n_t$$

Now consider n_t. The steady state probability that any specific job will be occupied is $\beta_K/[1-\alpha(1-\beta_K)]$.[17] If workers come and go independently and the firm is large, this is also the fraction of jobs occupied in each period. In a steady state we can therefore set $n_t = \bar{n}\beta_K/[1-\alpha(1-\beta_K)]$. Inserting this into the expression for per capita membership revenue gives $(1-\alpha)x$ as in equation (10).

Upon substituting (11) into (10) we obtain

$$(12) \qquad M = \frac{(q-v)[1-\delta(1-\beta_L)] + x\delta(1-\delta)(1-\alpha)(1-\beta_L)}{(1-\delta)[1-\alpha\delta(1-\beta_L)]}$$

From the stationarity of the model, a worker either sets $e = 1$ or $e = 0$ in every period. A worker who sets $e = 0$ receives

$$(13) \qquad M^O = q + \delta[U_L^O + (1-\alpha)x] \qquad \text{where} \qquad U_L^O = \frac{\beta_L(M^O - x)}{1 - \delta(1-\beta_L)}$$

We derive (13) as follows. If one member of the firm shirks in period t, per capita income falls to $q(n_t-1)/n_t$. But in a large firm this effect is negligible, and the shirker just receives an income of q while avoiding the disutility v. Upon being expelled the shirker gets U_L^O in the next period. The shirker also obtains revenue from membership fees in period t+1 amounting to

$$x\beta_K[\bar{n} - n_t + 1 + (1-\alpha)(n_t-1)]/n_t$$

where the bracketed expression takes account of the shirker's own

departure. For a large firm under steady state conditions, this reduces to $(1-\alpha)x$ as before.

The incentive compatibility condition for positive effort supply is $M \geq M^o$ which implies

$$\underline{IC_L}: \qquad x \geq x^L_{min} = \frac{v - \alpha\delta(1-\beta_L)q}{\alpha\delta[\beta_L + \delta(1-\alpha)(1-\beta_L)]}$$

This resembles the IC_L condition in section 2.1, except that the wage (w) has been replaced by production revenue per worker (q), and an additional term appears in the denominator to reflect the sharing of revenue from membership fees among incumbent workers. Firm size does not appear in the IC_L constraint because: (i) the firm is large enough that shirking by one member has a negligible impact on per capita income; (ii) per capita revenue derived from membership fees is independent of firm size so long as membership approximates the steady state level; and (iii) the technology of production involves constant returns to scale.[18]

3.2 The Participation Constraint for Workers

Workers will join LMFs only if $M \geq x$. This gives[19]

$$\underline{PC_L}: \qquad x \leq x^L_{max} = \frac{q - v}{1 - \delta}$$

This differs from PC_L for the KMF (section 2.2) in that revenue per worker (q) replaces the wage (w), and the denominator is $1-\delta$

rather than $1-\alpha\delta$,due to the sharing of membership fees.

3.3 Incentive Compatibility for the Firm

The key distinction between KMFs and LMFs involves firm-side moral hazard. Imagine that LMF members can raise labor turnover by reducing α (the probability that each worker remains a member of the firm). Any artificial increase in turnover must be borne equally by all current workers (a majority cannot single out one colleague for discriminatory treatment). In the extreme, setting $\alpha = 0$ implies that all incumbent members depart. This parallels the firing of non-shirkers by a capitalist firm. Because the LMF searches for new members when vacancies arise, and entry fees are paid to the incumbents by these new members, it might appear that the revenue derived from replacement workers could compensate the incumbents for the forfeiture of their own membership rights. We will show that this is impossible: incumbents never put their own jobs at risk merely to increase the flow of membership revenue.

Consider a one-shot decrease in the retention rate in period t (that is, $\alpha_t < \alpha$). Because the period-t incumbents cannot bind the decisions of later worker cohorts, it suffices to show that a one-period deviation of this sort is unattractive when the normal retention rate is expected to be maintained in the future. Using results from section 3.1, the value of membership in period t is

$$q - v + \delta\{\alpha_t M + (1-\alpha_t)U_L + x\beta_K[\bar{n} - n_t + (1-\alpha_t)n_t]/n_t\}$$

where M and U_L are calculated using the normal retention rate α.
An artificial increase in turnover ($\alpha_t < \alpha$) is unprofitable for
the period-t members if and only if $M \geq U_L + x\beta_K$. Because $x \geq 0$
will be imposed by the constraint PC_K in section 3.4 below, it is
enough to show that $M \geq U_L + x$. The latter inequality yields

$\underline{IC_K}$: $(1-\beta_L)[q - v - x(1-\delta)] \geq 0$

This holds whenever PC_L from section 3.2 is satisfied. The IC_K
constraint therefore places no restriction on entry fees beyond
those already imposed by the two participation constraints.

3.4   The Participation Constraint for the Firm

The counterpart to the participation constraint for capital
suppliers from section 2.4 is simply that incumbent members find
it attractive to recruit new workers when a vacancy arises. When
the incumbents from period t seek to fill a vacancy, they receive
the expected revenue $\beta_K x$ at the beginning of period t+1. If they
do not attempt to fill the vacancy, they receive nothing since no
membership fee is paid. We therefore write

$\underline{PC_K}$: $x \geq x_{min}^K = 0$

Current members are indifferent toward the filling of vacancies

except insofar as they can collect a toll from newcomers.[20]

3.5 Viable Contracts for LMFs

The right column of Table 1 summarizes the results obtained for LMFs. Since there is no wage, an employment contract for the LMF is just a membership fee (x).

Proposition 2.

(a) The set of viable contracts for the LMF economy is non-empty if and only if

$$q \geq \frac{v[1 - \delta(1-\alpha)]}{\alpha\delta}$$

This holds whenever viable contracts exist for the KMF case.

(b) If the above condition holds, there exists a viable positive membership fee such that LMF members have zero ex ante rent.

Proof: See Appendix B.

Proposition 2 provides a less stringent existence condition than Proposition 1. In particular, the existence of viable KMF contracts required $\beta_K < 1$ or $\beta_L < 1$, so that factor suppliers on at least one side of the market faced intervals of unemployment. Proposition 2, however, permits viable LMF membership fees even when $\beta_K = \beta_L = 1$. The LMF has two advantages which account for

this difference.

More attractive jobs. The workforce in the LMF appropriates the non-negative profit stream q-w which would otherwise flow to the KMF owner. In addition, when vacancies are filled in the LMF the resulting entry fees are shared by the workforce. Both of these effects lead LMF members to value their jobs more highly than KMF employees. Since dismissal is a stronger sanction, this relaxes the no-shirking constraint (IC_L). For similar reasons, the labor participation constraint (PC_L) is more readily satisfied by LMFs at any given entry fee.

Hiring and firing incentives. When a KMF decides whether to fire an employee, the owner does not treat the rent lost by the fired worker as a cost to the firm. But LMF members do internalize the rent losses resulting from opportunistic dismissals, because they bear these costs themselves. Hence the no-firing constraint IC_K does not restrict the set of viable contracts in the LMF economy, and incentives can be maintained even when both inputs are fully utilized ($\beta_K = \beta_L = 1$). Shirkers can be disciplined without any reliance on unemployment simply by setting the membership fee at a market-clearing level. This guarantees that shirkers get zero present values when dismissed, even if they are hired immediately by some other firm.

This reasoning is illustrated by Figure 3, which shows the viable fees (x) for the LMF economy. To facilitate comparisons with the KMF contracts in Figures 1 and 2, I retain the wage on the vertical axis and write IC_L and PC_L for the LMF as functions of w rather than q. This is done with the understanding that an LMF actually operates along the horizontal line where w = q. The PC_K line coincides with the vertical axis because it requires $x \geq$ 0. The lowest value of q compatible with the existence of viable contracts is shown in Figure 4, where the only possible entry fee is $x = v/\alpha\delta$ (at point F).

From Figures 3 and 4 it is clear that the LMF can always set w = q and $x = x_{max}^L$ if a viable contract exists at all. But this is a market-clearing membership fee because the firm operates on the PC_L locus where ex ante labor rent is zero. By contrast, it is impossible for the KMF to locate on the PC_L locus in Figure 1 when β_K is large, since then IC_K is steep enough to intersect IC_L above the PC_L line (β_K = 1 implies that IC_K becomes vertical in Figures 1 and 2). Market-clearing entry fees are thus impossible in the capitalist economy when job vacancies are easily filled.

4. Long Run Equilibrium

In sections 2 and 3 the value of output (q) was regarded as an exogenously fixed parameter. However, at some levels of q it may be profitable for new firms to enter. Entry places downward

pressure on the production surplus (q-v).[21] In equilibrium this surplus reaches the lowest level at which work incentives can be maintained. Section 4.1 describes the long run contracts for the KMF and LMF models, and section 4.2 interprets these results.

4.1 Free Entry

We begin with some definitions for the KMF case.

D1: For a given q and a viable contract $(\hat{x}, \hat{w})$ used by existing firms, entry occurs if there is some (x', w') such that

(a) The contract (x', w') permits positive effort supply and retention of non-shirkers in the entering firm;

(b) The contract (x', w') provides positive ex ante rent to the entering firm; and

(c) Unemployed workers who are matched with the entrant strictly prefer employment under (x', w') as compared with rejection of this offer and continued job search.

D2: For a given q, exit occurs if no viable contract exists.

D3: A long run KMF equilibrium is a q_K^* and a viable contract (x^*, w^*) such that neither entry nor exit occurs.

The definitions for the LMF economy are the same except that

the wage is identically equal to q. Incentive and participation constraints for the entering firm are derived in Appendices C and D. The only unusual feature of these definitions is Dl(c), which states that employment in the entering firm is strictly preferred by workers hired into this firm. In effect, we require that both the firm and its workforce share in the surplus obtained through entry. This condition is imposed because a viable contract must involve positive surplus for incentive reasons (see section 4.2). If entry were permitted in response to rent opportunities on only one side of the market, the existence of equilibrium would become problematic (for a related discussion of equilibrium requirements in markets where input suppliers capture rents, see Dow 1993c).

Proposition 3.

The unique long run equilibrium for the KMF economy is

$$q_K^* = w^* = \frac{v}{\alpha\delta(1-\beta_L)} \qquad \text{and} \qquad x^* = 0.$$

Ex ante rent for capital suppliers is zero but ex ante labor rent is strictly positive.

Proof: See Appendix C.

Proposition 4.

The unique long run equilibrium for the LMF economy is

$$q_L^* = \frac{v[1-\delta(1-\alpha)]}{\alpha\delta} \qquad \text{and} \qquad x^* = \frac{v}{\alpha\delta} .$$

Incumbent members of each LMF receive an ex post rent equal to the membership fee x^*, but ex ante labor rent is zero.

Proof: See Appendix D.

The KMF equilibrium in Proposition 3 is indicated by point E in Figure 2. The corresponding LMF equilibrium in Proposition 4 is indicated by point F in Figure 4. The labor market clears for the LMF case because the membership fee precisely extracts the ex post labor rent (point F is located on the PC_L line). Unemployed workers are therefore indifferent between joining LMFs and taking up their outside options. This is not the case in the capitalist economy. Here the ex post profit stream $(q-w)$ is driven to zero, there are no entry fees, and workers capture ex ante rents (point E in Figure 2 is located above the PC_L line). These conclusions hold for all values of the search parameters β_K and β_L and do not require $\beta_K = 1$ (vacancies filled immediately), as assumed in most efficiency wage models. However, KMF equilibrium still requires

$\beta_L < 1$ (fired workers face a risk of unemployment). Because q_K^* > q_L^* the LMF equilibrium involves a lower production surplus.

4.2 Surplus, Incentives, and Equilibrium

The crucial point in appreciating Propositions 3 and 4 is to recognize the incentive functions performed by the surplus q-v. There are two incentive restrictions: firms should not fire their workers, and workers should not shirk. Because effort has a cost and the only possible penalty for shirkers is dismissal, a worker has to prefer continued employment over unemployment in order to choose e = 1. Production must therefore generate a surplus, some of which can be given to labor as an inducement for work (MacLeod and Malcomson, 1989, 1993). But there is no incentive reason for KMF owners to receive any surplus if x ≤ 0., since then IC_K can be satisfied even when profit (q-w) is zero. Because the process of entry reduces the total surplus to the minimum feasible level, in equilibrium all surplus goes to labor in the form of a rent.

The same reasoning applies to the LMF economy, except that the surplus necessary to maintain work incentives is smaller so that entry drives q down to a lower level than was achievable in the KMF case. Several factors are involved.

(a) For the LMF economy, the distributional constraint x ≤ 0 is irrelevant because IC_K plays no role. Hence entry fees can

be used to divide surplus between present and future members in any manner consistent with the participation constraints. Specifically, the fee can be used to clear the labor market.

(b) A smaller surplus is compatible with work incentives in the LMF for two reasons.

(i) Since labor gets an ex ante rent in the capitalist economy, shirkers get strictly positive present values by searching for new jobs after they are fired. But LMF membership fees clear the market so that shirkers get a payoff of zero upon departure. Since dismissal is a more severe penalty in the LMF case, less surplus is needed for work incentives.

(ii) In the LMF, entry fees are collected by incumbent members as the workers lost through normal attrition are replaced. For incentive purposes, this stream of membership revenue serves as a partial substitute for production surplus. The size of the necessary surplus is correspondingly reduced.

One remaining question needs to be addressed: who claims the production surplus in the LMF economy? Since LMF membership fees clear the labor market, the present value of this surplus goes to the founders of firms. These agents may, for example, supply the physical assets of the LMF to the first generation of workers by

selling membership shares. In equilibrium, the surplus needed to maintain effort incentives is fully capitalized in the price paid for membership by each successive worker cohort.

5. Conclusion

Sections 2-4 have shown that labor-managed firms can charge a price for membership even when capitalist firms cannot collect entry fees. We will now attach some caveats to this conclusion.

Solutions to the KMF moral hazard problem. There are two common objections to the claim that capitalist entry fees are thwarted by firm-side moral hazard. First, one could grant that ex post labor rents exist, but deny that moral hazard by the firm is an insuperable problem. The temptation to fire honest workers might be outweighed by a desire to maintain one's reputation as a fair employer, for example, or the replacement of incumbent employees might be costly enough to deter unwarranted dismissals. Neither argument is decisive, however. The role of reputation depends on the information workers have about the firm's previous employment practices, and workers are unlikely to know whether past firings were justified. If the cost of replacing incumbents is positive but not too large, firm-side moral hazard still imposes an upper bound on entry fees and workers will still capture rents (though the absence of even small KMF entry fees then becomes puzzling).

A more radical objection is to deny that firms provide wage premiums at all. If there are other solutions to the problem of work incentives (e.g. having workers post bonds) then the absence of entry fees is unsurprising, since there is no ex post rent for employers to extract (Carmichael, 1990). Of course, if bonds are forfeited to the firm the same moral hazard problem arises, since firms can seize the bonds of honest workers. But even when bonds are forfeited to third parties, the firm can blackmail employees opportunistically by threatening to forfeit the bond unless the worker provides a side payment (Dickens, Katz, Lang, and Summers, 1989).[22] In any case, the general argument here does not depend upon the validity of efficiency wage theory; as was noted in the introduction, similar problems arise when workers appropriate ex post rents for non-incentive reasons (such as bargaining power).

Impediments to LMF membership markets. We have shown that moral hazard does not generally preclude LMFs from charging membership fees, or selling membership rights at a market price. But other problems remain. One danger is that of informational asymmetry: incumbent LMF members typically know more about the firm's future profitability (and thus the value of membership) than outside job applicants. This adverse selection problem could well undermine markets for membership. Related problems include heterogeneity of workers and the potential thinness of LMF membership markets.

Perhaps for these reasons, open markets for LMF membership rights are less common than fixed entry fees (which do not require new members to know as much about the future prospects of the firm).

LMF disadvantages. Earlier sections established that LMFs have advantages over capitalist firms with respect to work incentives. In the absence of some offsetting LMF disadvantage this gives the (generally false) prediction that LMFs will prevail over KMFs in market competition. The nature of possible LMF disadvantages is controversial: among the candidates are moral hazard problems in credit markets (Eswaran and Kotwal, 1989; Gintis, 1989); problems of collective choice within worker teams (Hansmann, 1990; Benham and Keefer, 1991); and investment problems (Dow, 1993a, 1993c). This list is not exhaustive, but may convey the range of possible hypotheses about why capital hires labor rather than the reverse.

The relevance of firing threats. Finally, one might question the empirical relevance of a model where firms have the power to fire incumbent workers. It is unclear whether firms in Western Europe or Scandinavia actually have this power to any meaningful extent, or whether it can be exercised at reasonable cost. Even in North America the courts are increasingly inclined to rule in favor of disgruntled workers who claim that they were wrongfully dismissed by an employer. Nonetheless, dismissal is the strongest sanction

firms can impose on workers in contemporary market economies, and is clearly used (despite attendant costs) in some circumstances.

I conclude with an observation about the benefits of worker control. The temptation for capitalist firms to dismiss workers arises because the owners of the firm fail to internalize a cost borne by workers: namely, the rent lost by workers who are fired by the firm. LMFs overcome this problem of firm-side opportunism by internalizing the cost of dismissal to workers.

This point can be generalized. Any time workers bear a cost (effort, poor working conditions) which cannot be transferred to the firm contractually, and cannot be shifted indirectly through compensating wage differentials, there are efficiency gains to be achieved by giving workers control over decisions concerning this non-contractible variable.[23] This is true simply because workers are interested in the relevant costs, while the firm's owners are not. LMFs undoubtedly have some disadvantages, but their ability to internalize non-contractible worker costs counts as a point in favor of this organizational form.

APPENDIX A

Proof of Proposition 1

(a) The contract (x,w) is viable if it meets the four conditions listed in the left column of Table 1. A necessary condition for this to occur is that there exist a wage w such that

$$(*) \qquad \max \{x_{min}^{L}, x_{min}^{K}\} \leq \min \{x_{max}^{L}, x_{max}^{K}\}$$

Conversely, if $(*)$ holds for some w then we can choose x to satisfy the conditions of Table 1 at this value of w, and a viable contract exists.

The inequalities

(i) $x_{min}^{K} \leq x_{max}^{K}$

(ii) $x_{min}^{L} \leq x_{max}^{L}$

(iii) $x_{min}^{K} \leq x_{max}^{L}$

hold, respectively, iff

(i) $q \geq w$

(ii) $w \geq v/\alpha\delta$

(iii) $q \geq v$

Thus all three inequalities hold simultaneously iff $q \geq w \geq$

$v/\alpha\delta$. The fourth inequality $x_{min}^{L} \leq x_{max}^{K}$ holds iff

$$\phi(w) \equiv \alpha\delta\beta_{L}(1-\beta_{K})q + \alpha\delta(\beta_{K} - \beta_{L})w - \beta_{K}v \geq 0$$

The wage can therefore be chosen so that (*) holds iff

$$\max_{w \in [v/\alpha\delta,q]} \phi(w) \geq 0$$

This is true iff $q \geq \min \{v/\alpha\delta(1-\beta_{K}) \; ; \; v/\alpha\delta(1-\beta_{L})\}$.

(b) When $\beta_{K} = 1$, we have $x \leq 0$ for any viable contract from IC_{K} (the IC_{K} line in Figures 1 and 2 coincides with the vertical axis). From IC_{L} we have $w \geq v/\alpha\delta(1-\beta_{L})$ whenever $x \leq 0$. It follows that PC_{L} holds with inequality:

$$x \leq 0 < \frac{\dfrac{v}{\alpha\delta(1-\beta_{L})} - v}{1 - \alpha\delta} \leq \frac{w - v}{1 - \alpha\delta} = x_{max}^{L}$$

This implies a positive ex ante labor rent.

Q.E.D.

APPENDIX B

Proof of Proposition 2

(a) From the right column of Table 1, the fee x is viable iff

$$\max \{0, x^L_{min}\} \leq x \leq x^L_{max}$$

(i) Suppose $q \geq v/\alpha\delta(1-\beta_L)$ so that $x^L_{min} \leq 0$. A viable contract always exists since $0 \leq x^L_{max}$ whenever $q \geq v$.

(ii) Suppose $q < v/\alpha\delta(1-\beta_L)$ so that $x^L_{min} > 0$. A viable contract exists iff $x^L_{min} \leq x^L_{max}$. By the right column of Table 1, this holds iff $q \geq v[1 - \delta(1-\alpha)]/\alpha\delta$. This condition is met whenever the KMF existence condition in part (a) of Proposition 1 is satisfied.

(b) Since viable contracts exist, we have $x^L_{min} \leq x^L_{max}$. Set

$$x = x^L_{max} = \frac{q - v}{1 - \delta}$$

so that PC_L is satisfied with equality. This entry fee is positive (and hence satisfies PC_K) because the existence of a viable contract implies $q > v$. IC_L is also satisfied. Because PC_L holds with equality we have zero ex ante rent for labor (see section 3.2).

Q.E.D.

APPENDIX C

Proof of Proposition 3

First we derive the incentive and participation constraints for an entrant who commits to the contract (x',w') when established firms all use the viable contract $(\hat{x},\hat{w})$.

Lemma 1: The no-shirking constraint for an entering KMF is

$$\underline{IC}_L': \qquad (1-\alpha\delta)\{\alpha\delta[\beta_L\hat{x} + (1-\beta_L)\hat{w}] - v\} \; +$$

$$(w' - \hat{w})\alpha\delta[1 - \alpha\delta(1-\beta_L)] \; \geq \; 0$$

The expression on the first line is zero when IC_L from section 2.1 holds with equality for $(\hat{x},\hat{w})$ and positive when IC_L holds with inequality for $(\hat{x},\hat{w})$.

Proof: A worker employed by the entrant who does not shirk and is not fired obtains the present value V_L' where

$$V_L' = w' - v + \delta[\alpha V_L' + (1-\alpha)\hat{U}_L]$$

$\hat{U}_L$ is the value of U_L from section 2.1 at the contract $(\hat{x},\hat{w})$. For $e = 1$ to be optimal, we require $V_L' \geq w' + \delta\hat{U}_L$. Computing $\hat{U}_L$ and V_L' gives IC_L' above.

Lemma 2: The labor participation constraint for an entering

firm is given by

$$\underline{PC_L}': \qquad w' - v - x'(1-\alpha\delta) \quad > \quad \frac{\alpha\delta\beta_L[\hat{w} - v - \hat{x}(1-\alpha\delta)]}{1 - \alpha\delta(1-\beta_L)}$$

The right hand side is zero when PC_L from section 2.2 holds with equality for $(\hat{x},\hat{w})$, and positive when PC_L holds with inequality for $(\hat{x},\hat{w})$.

Proof: An entrant has to offer some (x',w') which a worker prefers to rejection and continued search. Accepting (x',w') yields the present value $V_L' - x'$. Rejection provides δU_L since L gets zero in the current period followed by search among firms offering the contract $(\hat{x},\hat{w})$. The relation $V_L' - x' > \delta U_L$ gives PC_L' above.

Lemma 3: The no-firing constraint for an entering KMF is

$$\underline{IC_K}': \qquad x' \leq \frac{(q - w')(1 - \beta_K)}{\beta_K}$$

Proof: The entrant uses (x',w') in all periods. It follows that IC_K' is identical to the IC_K constraint derived in section 2.3 of the text.

Lemma 4: The participation constraint for an entering firm is

$$\underline{PC}_K' : \qquad x' > \frac{-(q - w')}{1 - \alpha\delta}$$

Proof: The entrant uses (x',w') in all periods. PC_K' holds if and only if the entering firm receives a positive present value from (x',w'). Except for the strict inequality, this is the same as PC_K in section 2.4.

We are now ready to prove Proposition 3.

(a) Suppose $(\hat{x},\hat{w})$ is a viable point where PC_K and PC_L both hold with inequality (see Figure 1). Then entry occurs because $(x',w') = (\hat{x},\hat{w})$ satisfies all requirements in Lemmas 1-4.

(b) Suppose $(\hat{x},\hat{w})$ is a viable point where PC_L is satisfied with equality. Viability implies that PC_K holds with inequality at $(\hat{x},\hat{w})$. Entry occurs because the requirements of Lemmas 1-4 are satisfied for $w' = \hat{w}$, $x' = \hat{x} - \epsilon$ where $\epsilon > 0$ is a sufficiently small number.

(c) Suppose $(\hat{x},\hat{w})$ is a viable point where PC_K is satisfied with equality. Viability implies that PC_L holds with inequality at $(\hat{x},\hat{w})$. Also, assume IC_K holds with inequality at $(\hat{x},\hat{w})$. This implies $\hat{x} < 0$ (see Figure 1). Entry occurs because the requirements of Lemmas 1-4 are satisfied for $w' = \hat{w}$, $x' = \hat{x} + \epsilon$, where $\epsilon > 0$ is a sufficiently small number.

Steps (a)-(c) show that any long run equilibrium must occur at a point $(\hat{x},\hat{w})$ where PC_K and IC_K both hold with equality. This implies $\hat{x} = 0$ and $\hat{w} = q$ (the intersection of the PC_K and IC_K loci in Figure 1). But if $q > v/\alpha\delta(1-\beta_L)$ then IC_L and PC_L both hold with inequality at $(\hat{x},\hat{w})$. Entry occurs because the requirements of Lemmas 1-4 are satisfied for w' = $\hat{w} - \epsilon$, $x' = \hat{x}$ where $\epsilon > 0$ is small. On the other hand, q < $v/\alpha\delta(1-\beta_L)$ contradicts the viability of $(\hat{x},\hat{w})$ because IC_L is violated. Hence the only possible long run equilibrium is $q = \hat{w} = v/\alpha\delta(1-\beta_L)$ with $\hat{x} = 0$. This requires that PC_K, IC_K, and IC_L have a common intersection, denoted by point E in Figure 2.

To finish the proof, we need to show that point E actually is an equilibrium. Since this point is viable, exit does not occur and it suffices to show that entry does not occur. But when $(\hat{x},\hat{w})$ is point E in Figure 2, it is impossible to choose (x',w') so that the requirements of Lemmas 1-4 are satisfied simultaneously. We establish this as follows.

(i) From Lemma 1, IC_L' reduces to $w' \geq \hat{w}$ because the expression on the first line of IC_L' vanishes (point E lies on the IC_L constraint in Figure 2). Using $w' \geq \hat{w} = q$ we have

$$q - w' + x'(1-\alpha\delta) \leq q - \hat{w} + x'(1-\alpha\delta) = x'(1-\alpha\delta)$$

where the right hand expression is ≤ 0 for $x' \leq 0$. But PC_K' in Lemma 4 demands that the left hand expression be strictly positive. Thus no (x',w) with $x' \leq 0$ satisfies Lemmas 1-4.

(ii) From Lemma 3, IC_K' requires

$$\beta_K x' \leq (q - w')(1 - \beta_K) \leq (q - \hat{w})(1 - \beta_K) = 0$$

which is violated whenever $x' > 0$ because $\beta_K > 0$.

Since there is no (x',w') which allows entry, point E in Figure 2 is a long run KMF equilibrium. Ex ante rent to capital suppliers is zero because point E is located on PC_K. Ex ante rent to labor suppliers is positive because point E is above PC_L.

Q.E.D.

APPENDIX D

Proof of Proposition 4

Throughout the following proof I assume that the entering LMF is already at its steady-state membership level (see section 3.1). First, we derive the incentive and participation constraints for an entering LMF which commits to some membership fee x' when all existing firms use the viable membership fee $\hat{x}$.

Lemma 5. The no-shirking constraint for an entering LMF is

IC_L':

$$(1-\alpha\delta)\{\alpha\delta(1-\beta_L)q - v + \hat{x}\alpha\delta[\beta_L + \delta(1-\alpha)(1-\beta_L)]\}$$

$$+ (x' - \hat{x})\alpha\delta^2(1-\alpha)[1-\alpha\delta(1-\beta_L)] \geq 0$$

The expression on the first line is zero when IC_L from section 3.1 holds with equality for $\hat{x}$, and positive if IC_L holds with inequality for $\hat{x}$.

Proof: A worker who chooses $e = 1$ in the entering LMF obtains the present value of membership

$$M' = q - v + \delta[\alpha M' + (1-\alpha)\hat{U}_L + (1-\alpha)x']$$

where we use the procedures of section 3.1 to obtain $(1-\alpha)x'$ and $\hat{U}_L$ is the present value U_L from section

3.1 evaluated at the membership fee x. Non-shirking requires $M' \geq q + \delta U_L + \delta(1-\alpha)x'$. Solving for $\hat{U}_L$ as in section 3.1 and then computing M' we obtain IC_L'.

Lemma 6. The labor participation constraint for an entering LMF is given by

PC_L':

$$(1-\alpha\delta)[q - v - \hat{x}(1-\delta)]$$

$$+ (\hat{x} - x')(1-\delta)[1-\alpha\delta(1-\beta_L)] > 0$$

The expression on the first line is zero when PC_L from section 3.2 holds with equality for $\hat{x}$, and positive if PC_L holds with inequality for $\hat{x}$.

Proof: The entering firm's offer of $M' - x'$ must be strictly preferred to rejection and renewed search, which gives $\delta\hat{U}_L$. Solving for M' and $\hat{U}_L$ we obtain PC_L'.

Lemma 7. The no-firing constraint for an entering LMF is

IC_K':

$$(1-\alpha\delta)(1-\beta_L)[q - v - \hat{x}(1-\delta)]$$

$$+ (\hat{x} - x')(1-\delta)[1-\alpha\delta(1-\beta_L)] \geq 0$$

The expression on the first line is zero when IC_K from section 3.3 holds with equality for $\hat{x}$, and positive if IC_K holds with inequality for $\hat{x}$.

Proof: We require $M' - \hat{U}_L - \beta_K x' \geq 0$ as in section 3.3. As before, it is sufficient for this to hold when $\beta_K = 1$. This yields IC_K'.

Lemma 8. Participation by the entering LMF requires

$$\underline{PC_K}': \qquad\qquad x' > 0$$

Proof: We require a strictly positive membership fee so that the organizers of the entering LMF receive an ex ante rent (see sections 3.4 and 4.1 of the text).

We are now ready to prove Proposition 4.

(a) Suppose $0 < \hat{x} < x_{max}^L$ (see Figure 3). Entry occurs because the requirements of Lemmas 5-8 are met for $x' = \hat{x}$.

(b) Suppose $\hat{x} = 0$ (this requires $x_{min}^L \leq 0$ as shown in Figure 3). We have $x_{max}^L > 0$ since $q > v$ from Proposition 2. For small $x' > 0$, it can be verified that conditions IC_L', PC_L', and PC_K' are satisfied. IC_K' in Lemma 7 reduces to

$$(1-\alpha\delta)(q-v)(1-\beta_L) - x'(1-\delta)[1 - \alpha\delta(1-\beta_L)] \geq 0$$

We have $q > v$, and viability of $\hat{x} = 0$ implies $\beta_L < 1$ from IC_L. Hence IC_K' holds for small $x' > 0$ and entry occurs.

(c) Suppose $\hat{x} = x_{max}^L$ so that PC_L holds with equality in Figure 3, and assume that IC_L holds with inequality at $\hat{x}$. We have $x_{max}^L > 0$ because $q > v$ from Proposition 2. For $x' = \hat{x} - \epsilon$, with $\epsilon > 0$ and small, the conditions of Lemmas 5-8 are met and entry occurs.

Since viability of $\hat{x}$ requires $0 \leq \hat{x} \leq x_{max}^L$, steps (a)-(c) show that equilibrium can only occur if $\hat{x} = x_{max}^L$ and IC_L holds with equality. This requires that the horizontal line $w = q$ passes through the intersection of IC_L and PC_L as in Figure 4. Call this intersection point F. We need to show that point F actually is an equilibrium.

(d) Suppose $\hat{x} = x_{max}^L$ so that PC_L holds with equality and assume IC_L is also satisfied with equality. Then $x' < \hat{x}$ violates IC_L' (note that $0 < \alpha < 1$) and $x' \geq \hat{x}$ violates PC_L'. Since it is impossible to satisfy the requirements of Lemmas 5-8 simultaneously, entry does not occur and point F in Figure 4 is an equilibrium.

Solving from IC_L and PC_L gives the equilibrium values q_L* and $x*$ stated in Proposition 4. Because PC_L holds with equality we have $M = x*$. This implies that the ex post value of membership is $x*$ and ex ante labor rent is zero.

Q.E.D.

NOTES

1. The relevant empirical evidence has been gathered mainly by efficiency wage proponents (Katz, 1986; Dickens and Katz, 1987; Krueger and Summers, 1988), and authors interested in rent-sharing between owners and workers when firms benefit from entry barriers or regulatory protection (Pugel, 1980; Clark, 1984; Salinger, 1984).

2. Baker, Jensen, and Murphy (1988: 613) note that capitalist firms may charge franchise fees but remark that "substantial entry fees and bonds are virtually never observed." Firms could collect implicit entry fees by paying low entry-level wages followed by higher wages later as workers accumulate seniority (Lazear, 1981; Akerlof and Katz, 1989). But the mere existence of a rising wage profile does not imply that a fee is paid, since the present value of the wage profile could equal or exceed the worker's reservation alternative.

3. Another case where membership shares were apparently traded at market prices is provided by the fishing cooperatives in the Sri Lankan village of Mawelle (Ostrom, 1990: 149-157).

4. If workers get rents for adverse selection reasons (Weiss, 1990) then entry fees would be self-defeating in capitalist firms because they would lower the quality of the applicant

pool. However, LMF entry fees would have the same problem.

5.   The insider-outsider view of wage determination is surveyed
     by Lindbeck and Snower (1988). References to the bargaining
     literature are provided by Dow (1993c).

6.   No results would change if L were allowed to vary the effort
     level within some continuous interval $[0,\bar{e}]$.

7.   I drop the assumption of imperfect effort monitoring used by
     Shapiro and Stiglitz (1984) and Bowles (1985) since all that
     matters here is the non-contractibility of effort.

8.   The commitment to use (x,w) in the future could be achieved
     in various ways, apart from explicit legal promises. Labor
     market equilibrium might involve shirking by future workers
     if the firm deviates from an earlier contract (Dow, 1993b).
     Revision of existing employment contracts could also provoke
     costly resistance from incumbent workers.

9.   There are always trivial equilibria where workers provide no
     effort. I will ignore these equilibria throughout.

10. It may be useful to compare IC_L with conventional efficiency
     wage models. Such models assume $x = 0$ and write IC_L as $w \geq$
     $v/\alpha\delta(1-\beta_L)$. A cost-minimizing firm chooses the wage so that
     this constraint binds. In addition to the usual function of
     unemployment as a worker discipline device the present model
     adds a further externality across firms: entry fees charged

by other firms in the future help to discipline the workers of any given firm in the present (allowing reduced wages).

11. There is also an ex post labor participation constraint $V_L \geq 0$. But when $V_L \geq x$ and $w \geq v$, $V_L \geq 0$ follows automatically. Since $w \geq v$ holds from Proposition 1, the constraint $V_L \geq 0$ is redundant and can be ignored.

12. To make firing threats credible, assume that agents of each type behave as follows: (i) if L has previously shirked and was not fired, L shirks again in the current period; (ii) if L has ever shirked then K dismisses L in the current period. These strategies are subgame perfect, so that dismissal is a credible response to shirking. A more subtle difficulty is that of renegotiation. Any pattern of equilibrium behavior between a firm and a replacement worker could be obtained as well through renegotiation between the firm and its shirking incumbent (this allows the firm to avoid any costs of worker replacement). But if potential shirkers expect this, firing is non-credible. This reasoning rules out Pareto-dominated equilibria in employment, which seems overly strong. I will disregard renegotiation issues in what follows.

13. As in note 11 above, it can be shown that $V_K + x \geq 0$ and $q \geq w$ together imply $V_K \geq 0$. Since Proposition 1 establishes $q \geq w$, the constraint $V_K \geq 0$ is redundant and can be ignored.

14. MacLeod and Malcomson (1989, 1993) show that labor rents are positive if employers can fill jobs immediately and there is no cost to setting up new matches. Proposition 3 in section 4 drops the first condition by allowing $\beta_K < 1$. Dow (1993b) extends this conclusion to small but positive match-specific set-up costs. However, market-clearing entry fees can occur for the KMF if these set-up costs are large enough.

15. For a model where shirking in LMFs is punished by an income loss, see Dong and Dow (1993a); for a model where shirking is punished by retaliatory effort reductions on the part of other team members, see Dong and Dow (1993b).

16. In LMFs with membership markets, firms increase labor inputs by selling new membership deeds and decrease labor inputs by repurchasing some deeds held by existing members (Dow, 1992; Fehr, 1993). Since the desired size of the firm is constant here, these transactions are irrelevant. In particular, the entry fees of members who leave through normal attrition are not refunded since permanent reductions in firm size are not contemplated. Similar results could be derived from a model where non-shirkers sell their membership rights directly to replacement workers upon departure, so long as shirkers are prevented from engaging in transactions of this type.

17. The probability that a job occupied in period t will also be

occupied in period t+1 is $\alpha + (1-\alpha)\beta_K$. The probability that a job vacant in period t will be filled in period t+1 is β_K. Let π be the steady state probability that any given job is filled. We then obtain $\pi = \pi[\alpha + (1-\alpha)\beta_K] + (1-\pi)\beta_K$. This yields $\pi = \beta_K/[1-\alpha(1-\beta_K)]$ as stated in the text.

18. Dong and Dow (1991) show that adequate effort incentives can be maintained through mutual monitoring even in large worker teams, provided that returns to scale are non-decreasing.

19. Since $x \geq 0$ is imposed in section 3.4 below, the constraint $M \geq 0$ is redundant.

20. This conclusion is special in two respects: it assumes fixed coefficients, so that shifts in factor proportions resulting from fluctuations in membership size are unimportant; and it ignores investment issues (on the latter, see Dow, 1993a).

21. Entry by new firms could also increase β_L and/or decrease β_K by increasing the ratio of available jobs to workers. This does not affect the conclusions reached in the text.

22. Shirkers in the LMF model effectively forfeit a bond to the other members of the firm, since they lose the present value of continued membership and the remaining workers share the entry fee paid by the shirker's replacement. If membership fees clear the market, this added revenue for the other LMF members equals the present value lost by the shirker. This

scheme preserves work incentives because the entry fee paid by the replacement worker is spread among a large workforce, ensuring that the shirker obtains essentially a zero refund on the bond when expelled.

23. When workers receive rents in capitalist firms (whether for bargaining or efficiency wage reasons), labor participation constraints do not bind. It follows that compensating wage differentials do not induce the firm's owners to internalize non-contractible costs borne by workers. This point is made in the context of a formal bargaining model by Dow (1993c).

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	KMF Economy	LMF Economy
$\underline{IC}_L$:	$x^L_{min} = \dfrac{v - \alpha\delta(1-\beta_L)w}{\alpha\delta\beta_L}$	$= \dfrac{v - \alpha\delta(1-\beta_L)q}{\alpha\delta[\beta_L+\delta(1-\alpha)(1-\beta_L)]}$
$\underline{PC}_L$:	$x^L_{max} = \dfrac{w - v}{1 - \alpha\delta}$	$= \dfrac{q - v}{1 - \delta}$
$\underline{IC}_K$:	$x^K_{max} = \dfrac{(q-w)(1-\beta_K)}{\beta_K}$	----- *
$\underline{PC}_K$:	$x^K_{min} = \dfrac{-(q - w)}{1 - \alpha\delta}$	$= 0$

UPPER AND LOWER BOUNDS ON ENTRY FEES

TABLE 1

*IC_K always holds for the LMF economy when PC_L and PC_K are both satisfied (see section 3.3).
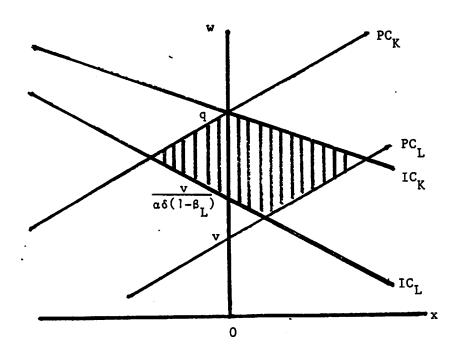
Figure 1

Viable KMF Contracts

$q = \dfrac{v}{\alpha\delta(1-\beta_L)}$

w

PC$_K$

E

PC$_L$

v

IC$_L$

IC$_K$

x

0

Figure 2

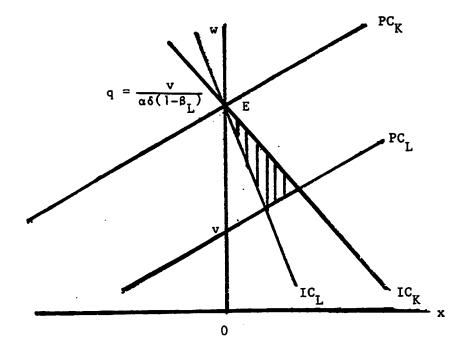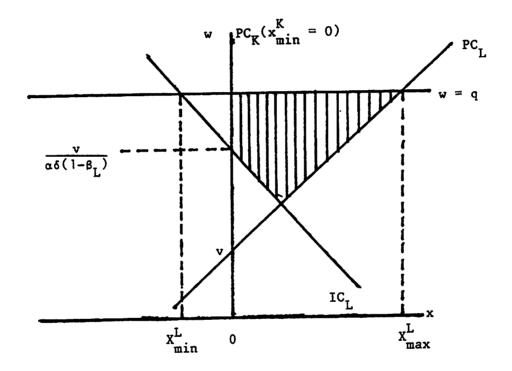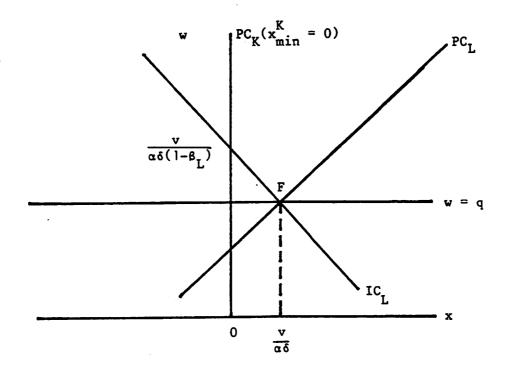Viable KMF Contracts: A Degenerate Case

Figure 3

Viable LMF Contracts

Figure 4

Viable LMF Contracts: A Degenerate Case