Financing difficulties in the Labor-Managed Firm

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List of Abbreviations

CR – Control rights
KMF – Capital-managed firm
LMF – Labor-managed firm
LMF* – Labor-managed firm with exclusive loan financing
PC – Producer Cooperative
RAO – Rights of Asset Ownership
RRC – Rights of Residual Claimancy
RA – Rights of Alienation
SDLMF – Sertel/Dow style labor-managed firm
WMF – Worker-managed firm

Introduction

In this study we will be dealing exclusively with what in the literature are called self-managed, worker-managed, or labor-managed firms. These names are used interchangeably but a more nuanced examination reveals that these concepts are in fact distinct. By self-managed firm I follow Bonin and Putterman (1987) in defining such a firm as "a productive enterprise the ultimate decision-making rights of which are held by member-workers, on the basis of equality of those rights regardless of job, skill grade, or capital contribution" (pg. 2). Worker-managed firms and labor-managed firms can be regarded as further subdivisions of the self-managed category. Worker-managed firms (WMFs) are self-managed firms where capital income is assigned to active participants in the firms rather than to capital ownership while labor-managed firms are self-managed firms which pay a scarcity-reflecting remuneration for the use of capital to its owners whoever they may be (Vanek 1975). Dow (2003) uses the term labor-managed firm (LMF) to refer to firms where control rights are assigned to the suppliers of labor so his definition is analogous to Bonin and Putterman's definition of self-management. To avoid confusion, I will use the abbreviation LMF* to refer to the Vanek-style self-managed firms which are financed exclusively out of 'external' loans and LMF to refer to self-managed firms of the Dow/Bonin and Putterman classification. Finally there is those class of LMFs where the worker-members have an ownership stake in the firm's capital assets, which we will refer to as producer cooperatives or (PCs). In this text we will be primarily dealing with the general category of LMFs, although a detailed analysis of the specific forms of self-management, WMFs, LMFs*, and PCs, will be developed later on.

One question which I will seek to answer in this present study is: why labor-managed firms account for such an insignificant portion of firms in modern market economies? Why are modern market economies dominated by capital-managed firms or KMFs, firms where ultimate control is allocated by virtue of and in proportion to capital supply? Without a qualitative asymmetry between capital and labor certain "equivalence theorems", in the frame of neoclassical economics, can be established which show that "the resource allocations supportable in an economy consisting entirely of KMFs coincide with the allocations supportable in an economy consisting entirely of LMFs" (Dow 2003, pg. 118). In this study we will therefore also examine the neoclassical (Ward-Domar-Vanek) model of the LMF to explore what these models can tell

us about the allocative efficiency of LMFs when compared to KMFs. As Dow (2003) argues, the inalienability of labor versus the alienability of capital is the principal source of the differing behavior which LMFs and KMFs exhibit . One purpose of this present study is to examine where the causal chains flow from labor inalienability to LMF rarity. Ultimately I will argue that limited worker wealth combined with credit rationing are the key obstacle to the formation of LMFs. However, differential birth is just one side of the equation determining the frequency of an entity in a population. We must also examine whether the paucity of LMFs can be explained with reference to their ability to survive in a competitive market. Jossa and Cuomo (1997) provide theoretical evidence that various kinds of LMFs will suffer from underinvestment.

In the end I will examine whether a combination of tradeable LMF membership rights and quasi-equity finance, in the form of 'risk participation bonds' (McCain 1977) or 'variable income debentures' (Vanek 1977), and overcome the underinvestment issues which plague existing LMFs. An implication of this proposal is the possibility of delinking control rights and residual claimancy from asset ownership, a possibility which would argue against the commodity conception of the firm as a conceptually *bundled* group of ownership rights. To investigate these implications it will be necessary to first understand the competing theories of the firm that underlie much of the literature on worker participation, specifically the theory of the firm-as-commodity and the theory of the firm-as-coalition/association (Putterman 1988).

    The issues I want to address in the following text include, given the commodity theory of the firm underlying the majority of neoclassical and neo-institutional economics, can costly financing and limited worker wealth account Because human capital is inalienable workers cannot offer their own future labor income as collateral that would be forfeited to banks in case of default (Hart and Moore 1994). (6) Lack of worker wealth combined with the inability of workers to make credible commitments to capital makes financing and hence creating LMFs much more difficult therefore LMFs are much less likely to be created in the first place which would account for their relative scarcity. It is important to note that KMFs can in theory face the same difficulties in making credible commitments to capital that LMFs face. The difference is that capital suppliers are wealthier than workers so they (1) have to rely less on incomplete capital markets to finance their firms and (2) when they do go to capital markets for financing their higher level of wealth allows for financing on less costly and more favorable terms. Capital

suppliers and the KMFs which they form, while facing less of the problem of making credible commitments to capital, are subject to the problem of making credible commitments to the workers whose labor time they lease. But just because labor time is a service that is leased and not a stock to be bought there is an increased incentive to protect their reputation in the eyes of workers as KMFs will frequently have to dip back into the labor market to replace labor services lost through turnover (Dow 2003, pg. 249). for the low emergence rate of LMFs in modern capitalist economics. I will follow Dow (2003) in identifying the qualitative asymmetry between capital and labor in the fact the labor is inalienable while capital is alienable. What this means is that labor cannot be bought as a stock but only rented as a service while capital can be both bought as a stock and rented as a service. I differ from Dow in tracing the causal chain from capital-labor asymmetry to LMF scarcity as follows: (1) Workers tend to be poor and face liquidity constraints thus they need to rely on leasing, debt financing, or equity financing if they are to buy their own firm (buying a firm in the firm-as-commodity sense which includes asset ownership), (2) Capital is alienable and labor is not so capital can be bought while labor services can only leased, (3) Because capital is alienable workers have a harder time make credible commitments to repay investors since the threat of non-renewal by investors has little force if assets are durable, retained earnings are healthy, or the firm is on the verge of bankruptcy. Since capital is often a durable stock LMFs can avoid frequently returning to capital markets and hence have no need to protect their repayment reputations. (4) Credible commitments to capital are also hampered by the fact that limited worker wealth precludes the possibility of workers investing some of their own wealth in projects to signal to financiers their likelihood of succeeding. (5) Because human capital is inalienable workers cannot offer their own future labor income as collateral that would be forfeited to banks in case of default (Hart and Moore 1994). (6) Lack of worker wealth combined with the inability of workers to make credible commitments to capital makes financing and hence creating LMFs much more difficult therefore LMFs are much less likely to be created in the first place which would account for their relative scarcity. It is important to note that KMFs can in theory face the same difficulties in making credible commitments to capital that LMFs face. The difference is that capital suppliers are wealthier than workers so they (1) have to rely less on incomplete capital markets to finance their firms and (2) when they do go to capital markets for financing their higher level of wealth allows for financing on less costly and more favorable terms. Capital suppliers and the KMFs which they form, while

facing less of the problem of making credible commitments to capital, are subject to the problem of making credible commitments to the workers whose labor time they lease. But just because labor time is a service that is leased and not a stock to be bought there is an increased incentive to protect their reputation in the eyes of workers as KMFs will frequently have to dip back into the labor market to replace labor services lost through turnover (Dow 2003, pg. 249).

If leasing of assets by LMFs is ruled out by service flow monitoring and holdup problems and debt financing by moral hazard issues in credit markets which can either lead to a rise in interest rates or outright credit rationing (the riskier the project the more the lender as to gain and the more the borrower has to lose) (Stiglitz and Weiss, 1981), what about the possibility of raising funds for LMFs through issuing *non-voting* equity shares to outside capital suppliers? As Putterman and Dow argue, however, "…equity capital is likely to be made available only on unfavorable terms, if at all, unless workers can credibly signal that their interests converge with those of outside investors (to overcome moral hazard), and that their investment projects are of high quality (to overcome adverse selection)" (2000, pg. 326). The final question which I would like to answer is given that something like a commodity theory of the firm persists, and given the difficult of workers financing LMFs due to lack of wealth and credit rationing, can an equity like instrument as conceived by (Vanek 1977, and McCain 1977) solve the problem of equity financing by squaring the interests of worker-controllers with non-controlling financiers? Such an instrument has been called a "risk participation bond" by McCain (1977) and Gui (1985) and a variable income debenture (VID) by Vanek (1977). The idea behind the equity-like instrument is to offer its owners a share, alongside workers, in enterprise revenue net of payments to non-labor costs including interest to debt holders which increases when the firm's income rises and decreases when the firm's income falls. By allowing creditors to share in the higher profits from riskier projects, debtors are turned into equity like owners of the firm's variable income hence aligning the incentives of both workers and equity-like owners towards income maximization (Bonin and Putterman 1987, pg. 65). Workers will put forth their highest effort and "risk participation bond" owners will supply more equity if both parties can expect higher returns. Jossa and Cuomo (1997) are skeptical of such a proposal as they argue it will involve making capital suppliers residual claimants in addition to labor suppliers thus undermining the principle of workers' control. Gui (1985) highlights the inefficiency of such a proposal if asymmetric

information regarding the level of gross income is introduced as workers can manipulate their payments to bondholders by increasing the probability of bankruptcy after the financing contract has been negotiated. If such a proposal is workable it will imply that control rights (CR), rights to asset ownership (RRAO), and rights to residual claimancy (RRC) can be unbundled, undermining the aforementioned theoretical arguments in favor of ownership rights being conceptually linked.

In order to test whether the hypothesis that 'limited worker wealth and costly financing are responsible for the rarity of LMFs', is consistent with the empirical data it may be useful to follow the advice given by Dow and Putterman (2000, pg.333):

> "For these reasons we think the best way forward to devise an appropriate strategy for analyzing the empirical record. One possible approach would be to exploit existing variation in the incidence of worker control across firms and industries, as a basis for inferring the contributions of the factors discussed in Sections 3–5. The idea would be to identify measures or proxies for such factors as monitoring difficulty, variability of labor returns, capital intensity, worker liquidity constraints, and workforce heterogeneity, and then to study the degree to which the prevalence of worker control is explained by these measures. For instance, if we had data on the proportion of employment accounted for by worker-controlled firms in each of N industries, and data on the aforementioned measures for each industry, we could estimate a multiple regression that would indicate which factors are significant for the prevalence of worker control, whether the signs of coefficients are consistent with the hypotheses, and the rough quantitative contribution of each significant factor to the extent of worker or financier control."

Chapter 1 - Conceptual foundations

Before embarking on a detailed economic analysis of the labor-managed firm we must first lay down some conceptual foundations, namely what we mean by a 'firm' and what bearing the various theories of the firm have on the question of LMF rarity. Putterman (1988) outlines the four dominant conceptions of the firm in the literature: the firm as a production function, the firm as a commodity, the firm as a coalition, and the firm as an association. These differing conceptions of the firm have differing implications in explaining the rarity of LMFs. Ultimately the commodity approach (Sertel 1982, Dow 1996, Dow 2003) whereby the role in the control group of the firm is treated as a commodity rather than the firm itself will be the favored conception of the firm in advancing a viable form of worker's self-management. Consideration will also be given to a more recent theory of the firm proposed by Hodgson and Gindis among others, the so called "real-entities" theory of the firm.

1.1 Mainstream theories of the firm

Most formal economic analyses of LMFs have been highly neoclassical in nature: Ward (1958), Domar (1966), Vanek (1970), Bonin and Putterman (1987), and Ireland and Law (1982). The firm here is essentially treated as a production function . Models assume full worker control with all capital being rented at a fixed market-clearing rental rate. The only decision left for the controllers of the firm to make is to select the profit-per-worker (or net income per worker) maximizing quantity of the variable input labor. The neoclassical theory of the firm assumes a production function operating under conditions of perfect information, unbounded rationality, and complete markets. In the LMF the short-run production function can be written as $Q = f(L, K)$ where capital (K) is fixed. In the single variable input-single output case the objective function of the LMF can be written as $y = \frac{pX - r\overline{K}}{L}$ where r is the parametric price of capital. The objective function (y) of the LMF is net income per worker or total revenue (pX) minus all other non-labor costs ($r\overline{K}$) divided by the total number of workers (L). In the simple case it is assumed that both labor and capital provide homogenous factor inputs and each member works the same

fixed hours (Ireland and Law 1982, pg. 15). The first order condition for y is obtained by differentiating with respect to L and setting the equation equal to zero:

$$\frac{\partial y}{\partial L} = \frac{1}{L^2}\left(Lp\frac{\partial X}{\partial L} - pX + r\bar{K}\right) = 0$$

Rearranging terms we obtain:

$$p\frac{\partial X}{\partial L} = \frac{pX - r\bar{K}}{L} = y$$

This suggests that the LMF produces up to the point where the marginal value product of labor is equal to the net income per worker. The result is strikingly similar to the first order condition of the profit-maximizing KMF where the marginal value product of labor is equal to the market wage. The obvious difference of course is that for the KMF the wage is determined on the market and is thus an exogenous variable while for the CMF the average net income is a choice variable since L has to be selected for my the owners of the labor-managed firm. As Putterman (1988) makes clear according to the neoclassical theory of the firm, the owners of the firm can be identified with *the firm* when the owners of the firm are the set of individuals who both select the production program and hold rights to appropriate any profits. It is important to note that according to the neoclassical theory of the firm it is not necessary that the owners of the firm also own the capital (tangible and intangible) utilized by the firm. Furthermore since anyone can "own" the firm by paying the required inputs at any given time and since profit-maximization in the short run is identical in the long run given perfect information, there is no continuity in the firms existence and hence no need to "sell it" to anyone else.

New institutional economic (NIE) models of the firm introduce two additional assumptions: (1) information is costly to obtain and transmit and (2) human beings exhibit bounded rationality and hence cognitive ability becomes a good which must be economized. The majority of arguments used in the literature on LMFs presuppose what can be called following Putterman

(1988) as the "commodity theory of the firm". The neoclassical firm highlights only one component of firm ownership, namely <u>control rights</u>. Following Dow (2003) control rights (CR) can be defined as the right to: "directly or indirectly allocate the resources of input suppliers located inside the firm, distribute rewards or penalties among them, and perhaps terminate their relationship with the firm" (pg. 8). Control rights stem from the fact that contracts between input suppliers are incomplete according to NIE, and hence someone must be given the right to make decisions (choice of product line, production methods, wages, and employment levels for instance) not previously determined by contracts (Williamson 1985, Grossman and Hart 1986). The commodity theory of the firm proposed by the NIE regards the firm as a bundle of rights which can be bought and sold. The bundle of rights constituting the firm consists of: (1) the right of ownership of a set of tangible and intangible assets (RAO), (2) control rights as defined above (CR), and (3) the rights to the income left over after all input suppliers have been paid, or residual claimancy (RRC). Finally, ownership of the firm according to the commodity view also includes (4) the right to transfer the bundle (1)-(3) to another party or parties on mutually agreeable terms, or the right of alienation (RA) (Putterman 1993, pg. 246). The move from the firm as a production function to the firm as the bundle of rights (1)-(4) goes something like this. As explained above, ownership of the neoclassical firm entails only the right to choose the production program (CR) and the right to the net revenue (RC). Two arguments are used in the NIE to extend the definition of the firm to include ownership of tangible and intangible assets (AO) as well. The first argument is termed the 'service flow monitoring problem', advanced by Alchian and Demsetz 1972 while the second argument goes by the name of the 'holdup' or 'quasi-rent expropriation' argument, advanced by Klein, Crawford, and Alchian 1978 and Williamson 1985. These arguments are used to make the conceptual link between CR + RRC and RAO a theoretical necessity. Once it is established that it is more efficient if the holders of CRR + RRC are <u>also</u> the holders of RAO the next move that is made is to link CR, RRC, and RAO to RA so that the bundle of ownership rights constituting the firm is complete. What is termed the 'horizon problem' refers to the fact that if it is efficient that firms own certain long lived capital assets and intangible assets longer than the time which the owners of the firm are associated with the firm, then the contractual rights of control over the firm's assets should be saleable and transferable. Because CRs are necessarily linked with the rest of the rights constituting firm

ownership, CRs can only be transferable and saleable if the other rights (1), (3), and (4) are transferable and saleable this implies that the firm should be saleable and transferable.

1.2 Alternate theories of the firm

The firm as coalition/association view regards the firm as a coalition of agents who are either members of the 'ultimate control group' or subject to its authorities (Putterman 1988). Alternatively stated, the "firm as coalition" view defines the firm as the set of agents, including those belonging to the 'ultimate control group', supplying inputs to a common production process. Dow defines the ultimate control group as the smallest subset of agents holding formal authority that cannot be revoked by some alternative set of agents (2002). However, the coalitional view of the firm has a harder time making sense of the idea of firm ownership. If the firm is to be regarded as equivalent to a group of people and people cannot be owned then evidently the firm itself cannot be owned. Dow who appears to endorse a coalitional view by identifying the firm with its members goes on to say that all that is necessary for the firm to be owned is that the role of ultimate controller be treated as a commodity (2003, pg. 109). But such a view does not appear so far from the commodity theory of the firm discussed above. The only difference appears to lie in the fact that Dow is committed to the view that the role of controller need only confer control rights (CR), which can in theory be unbundled from RAO and RRC. To quote Dow, "…to the extent that the supply of capital, residual claims, and control rights are bundled empirically, this is not a matter of logical necessity but rather an empirical fact that must be explained" (2003, pg. 107-8). But as Putterman argues, any market for membership rights in either a CMF or LMF cannot unbundle CR from RAO and RRC. As Putterman explains, "…real life markets for such memberships would usually be thin, while workers buying in would realistically have to purchase a capital stake as well as a right to work and share in profits…" (1988, pg. 258). Since Dow (2003) admits that leasing physical assets would be unfeasible given the service flow monitoring and holdup/asset specificity) arguments referenced above, it is unclear how theoretically control rights can be unbundled from asset ownership and residual claimancy as he repeatedly claims.

It is also worth considering the "real entity" theory of the firm proposed by Gindis (2009, 2015). The thrust of Gindis's argument is that the firm is not an entity reducible to simpler components such as contracts or transactions, but instead forms a non-reducible dynamic whole which can be likened to a "competent team" or a "knowledge-creating entity". If one adopts this realist ontology then it would be misleading to refer to the firm as a legal fiction, a nexus of contracts, a collection of asset owners, or a production function. Instead it is more fruitful to view the firm as a "*dynamic system of interactions, interdependencies, and complementarities*" (Biondi, Canziani, and Kirat 2007, pg. 6). Gindis (2009) argues that certain "existence tests" can be devised to see if an entity is in fact "real" (it picks out something in the objective world), namely tests of identity, unity, persistence, and causal power. A firm is identifiable because it can be distinguished from something else on the basis of key characteristics, it forms a unity since it is not reducible to its individual members, it is persistent because it does not cease to exist if its component parts are all replaced, and it has causal powers for the individual knowledge and capabilities of the firm's members are affected by the firm's collective knowledge and capabilities in a process of 'reconstitutive downward causation" (Gindis 2009, Hodgson 2004). Furthermore the attribution of legal personhood does not change the real entity status of the firm according to defenders of this theory. To quote Machen (1911, pg. 258) "although corporation personality is a fiction, the entity which is personified is no fiction". According to Gindis the firm as real entity is held together by various forms of 'glue' including: "…'institutional glue' created by legal entity status, constitutive rules, contracts and norms; 'organizational glue' manifested by structures, processes, functions and roles; 'motivational glue' that ensures loyalty and adherence to common goals through a variety of means; 'cognitive glue' accounting for identification, shared beliefs and representations; and 'capabilities glue' that relates to the complementarity between human assets such as knowledge and non-human assets, to productive routines…" (2009, pg. 28). While the 'real entity' theory of the firm is convincing it is not obvious whether such a theory of the firm cannot in fact coexist with competing theories of the firm, such as a commodity theory of the firm for example. Dow (2003) seems to suggest as much when he clarifies that it is not the firm which is treated as a commodity since the firm "…is larger than its shareholders…it includes all of the agents who are members of the ultimate control group or subject to its authority" but rather the role of controller in the firm which is made into a commodity (pg. 109).

1.3 Theories of the firm and worker self-management

It is now time to relate the competing theories of the firm to the factors that might account for the relative scarcity of LMFs. I will focus exclusively on the theory of the firm as production function, on the various instantiations of the theory of the firm as commodity , and on the coalitional theory of the firm. The commodity theory of the firm is assumed both by critics and sympathizers of LMFs. Critics of LMFs such as Alchian and Demsetz (1972) and Holmstrom (1982) provide arguments to show first why CRs must be bundled with RRC and with additional assumptions why CR and RRC must be bundled with RAO. Alchian and Demsetz (1972) argue that if output is easily observable in team production but individual contribution to the joint product is not then someone must undertake costly monitoring of workers' effort contributions. To incentivize the monitor, the right to control the effort level of the labor inputs must be assigned to the residual claimant. The greater the effort elicited the greater the joint product and hence the greater the reward to the holder of the residual claims (the revenue remaining after all the individual inputs have been paid their marginal products).[1] However residual claimancy cannot be assigned to the workers since then monitoring itself becomes a public good so residual claimancy has to be assigned to someone outside the production team. CR is thus linked to RRC for efficiency reasons. Holmstrom's (1982) argument for linking CR to RRC accepts the unobservability of joint output problem but differs in its obviating the need for costly monitoring. Holmstrom achieves this by making individual compensation depend on joint output in a sharply discontinuous manner. Team members are compensated only if the joint output is at or higher than an agreed upon threshold. If joint output does not meet the agreed upon target, compensation declines dramatically; this is accomplished by contracting with an external agent beforehand to withhold a portion of the joint product if the threshold is not reached. Both arguments only establish why CR should be linked with RRC and specifically that someone outside the production team should be given these two rights. To link CR and RRC to RAO and RA and complete the commodity theory of the firm, where to own the firm one must buy a stake in it, the aforementioned service flow monitoring and hold up arguments are

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[1] Joint products are products whose sum is greater than the sum of separable outputs of each cooperating resources (Alchian and Demsetz 1972, pg. 779).

employed. The service flow monitoring argument states that it will be more cost efficient if the firm (the holders of CR and RRC) also own their own assets since the agency costs of insuring that the assets are not abused will be reflected in the higher rental prices of leased assets. The holdup problem introduced by Williamson (1985) refers to the fact that highly specific assets with a large sunk cost component involve quasi-rents[2] which the contracting parties will attempt to expropriate from each other. If party A invests in a highly specialized asset (K) for party B it will produce a quasi-rent since its profit from dealing with party B is much higher than its profit from dealing with the next best alternative C (the more specific the asset the higher the price that can be charged since competition among suppliers is low). However, once party A commits to the investment (incurring a sunk cost) then party B can attempt to expropriate A's quasi-rent by renegotiating its payments for (K). As long as the price B pays to A is higher than the price C pays to A then B can seize some of the quasi rent A has with respect to asset (K). Because of this quasi-rent problem no firm will want to lease specialized assets to party B and hence it will be more cost efficient if B also owns its own specialized assets. A final argument in favor of bundling CR and RRC with RAO goes follows. It was already established that bundling CR with RRC is the most efficient solution to monitoring work effort. However since workers use capital assets in the production process, the agent that is monitoring the workers' effort will also be monitoring the use of the capital asset hence again it will be most efficient if the holder of CR and RRC is also the holder of the RAO.

Such commodity theory arguments appeal to monitoring and work incentive issues to argue why capital suppliers should control the production process. Before focusing on the group of explanations which deal with investment, wealth, and risk diversification which forms the main body of the research question, I will briefly say something about the group of theories which seek to explain the rarity of LMFs due to issues with collective choice and decision making. These theories for the most part conceive of the firm as a coalition of competing interest groups engaged in a non-cooperative game. Advocates of LMFs employ a coalitional theory of the firm to argue for example that LMFs can be expected to raise productivity through a reduction in monitoring-to-effort ratio (via mutual monitoring), an increase in the flow of technology-relevant information, and through encouraging cooperative behavior with respect to the adoption

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[2] Quasi-rents are the difference between the current stream of income and the next best alternative

of new technology (Putterman 1988, pg. 259). The crux of the collective choice arguments, notably those of Hansmann (1988, 1996) stress the fact that workers will tend to have heterogeneous interests (wages, job security, working conditions, time preference, risk attitudes, etc.) while capital suppliers will be more likely to agree unanimously on objectives (profit maximization or present value). Heterogeneous preferences are only one part of the problem, the other part being that in the absence of unanimity majority rule may generate unstable outcomes through the usual problem of voting cycles (for any possible decision there may be some other decision preferred by a majority of voters) (Dow and Putterman 2000, pg. 331).

Chapter 2 - The Allocative efficiency of the Labor-Managed Firm

2.1 Short-run equilibrium behavior of the LMF

The first neoclassical model of the LMF introduced by Benjamin Ward (1958) showed that a labor-managed firm which produces only a single output and uses only one variable input, labor, will respond 'perversely' to price changes. Specifically, Ward showed that LMFs exhibit backward bending supply curves so as prices rise LMFs hire less labor and consequently produce less output than their capitalist twins. On the other hand when prices fall, LMFs respond by hiring less labor than their capitalist twins. The difference in behavior between the LMF and the KMF is attributable to their contrasting objective functions, profit-maximization for the KMF and profit (or income) per member-maximization for the LMF. The reason for the different maximands derives from the fact that in the KMF the size of the firm's pure economic profit does not depend on the number of owners while in the LMF, since the entrepreneurial role is assigned to a productive factor (labor), the amount of profit *does* depend on the number of owners. I follow Dow here in distinguishing between pure economic profit (surplus) from payments made to capital suppliers (dividends, interest, rental payments, or returns on capital) (2003, pg. 110). Pure economic profit or the residual is whatever income is left over after all contractual payments have been met, which includes dividends, debt payments, employee salaries, and taxes, or in other words the income remaining after capital and labor suppliers have been paid. While in the KMF the role of controller is assigned to a supplier of an alienable stock, capital, in an LMF the role of controller is assigned to the suppliers of an *in*alienable service, labor. Since output varies with the number of labor suppliers so will the pure economic profit and hence economic profit is always maximized relative to the total number of worker-owners. In contrast in the KMF increasing the number of capital suppliers or shareholders does not affect the level of output and hence profit[3]; increasing the stock of capital affects output and profit not the number of capital-owners who serve as members of the ultimate control group.

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[3] Technically if we follow Dow in defining profit as pure economic profit or surplus then the number of capital suppliers would affect profit through its effect on dividend payments as the cost of capital. Because the size of the shareholder group has no influence on output level however, the KMF's objective function as absolute profit maximization remains unchanged.

Returning to the perverse behavior of labor-managed firms according to neoclassical theory it was established that LMFs would respond to price increases by decreasing output. The reason for this lies in the fact that since the marginal product of labor is always exceeded by the average product of labor due to the assumption of diminishing marginal returns to labor, a price rise increases earnings (profit per member) more than it increases the marginal revenue product of labor. Thus the term on the right side of the equals sign of equation (1) (average income) will be greater than the term on the left side (marginal revenue product of labor) and hence supply labor will have to be reduced if the two sides of the profit maximizing first order condition are to be equivalent.

(1)

$$p\frac{\partial X}{\partial L} = \frac{pX - r\overline{K}}{L} = y$$

Another way of looking at the same fact is through the following two equations where G denotes revenue per head and F cost per head. The profit maximizing LMF adds labor until marginal average revenue is exactly equal to marginal average cost or in other words until an additional member adds as much to average revenue as he adds to average cost. If we set equations (2) and (3) equal to one another we have equation (4).

(2)

$$\frac{\partial G}{\partial L} = \frac{Lp\frac{\partial X}{\partial L} - pX}{L^2} = \frac{1}{L\left(p\frac{\partial X}{\partial L} - p\frac{X}{L}\right)}$$

(3)

$$\frac{\partial F}{\partial L} = \frac{-rK}{L^2}$$

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(4)

$$\frac{1}{L\left(p\frac{\partial X}{\partial L} - p\frac{X}{L}\right)} = \frac{-rK}{L^2}$$

Since price changes have no effect on the right hand side of equation (4) the only way to keep marginal average cost equal to marginal average revenue is to make the left hand side smaller in absolute value terms by reducing the difference between revenue marginal product and revenue average product (the first and second terms inside the brackets) which is accomplished by reducing output through a reduction in labor. Now consider a price drop. If prices were to drop an LMF would respond in an opposite way to KMFs by increasing membership and consequently output. The reason for this 'perversity' is due to the fact that a fall in prices according to equation (1) would decrease earnings more than the marginal revenue product of labor so labor supply would have to be increased to ensure that the new decreased earnings are equal to the marginal revenue product of labor which will become smaller as more labor is hired. If we look at equation (4) a price decrease means that the marginal loss (the marginal increase in average cost) is now larger than the marginal gain (the marginal increase in average revenue) and thus labor has to be increased in order to spread these greater losses among more people until the marginal average cost of capital is exactly equal to the marginal average revenue that the now increased output brings.

The 'perverse' response of LMFs to price changes implies a violation of maximum productive efficiency. Putterman (1990) defines productive efficiency as a state in which it is not possible to increase the output of any good without reducing that of at least one other good

(pg. 71). Productive efficiency is the application of Pareto-optimality to the sphere of production and implies that the allocation of inputs among all industries is efficient in the sense above. Specifically maximum productive efficiency implies that the value marginal product of labor ($p\frac{\partial X}{\partial L}$) is equalized among all industries. To see why the LMF economy violates productive efficiency consider the case of two firms, one producing motorbikes and the other bicycles. If the price for bicycles were to rise while the price of motorbikes fell then the single input-single output model would predict that bicycle producers will hire less workers while motorbike producers would take on more workers. The value marginal product of labor will be higher for bicycle than motorbike workers but bicycle firms will refuse to hire more workers from motorbike firms as this would mean less profit for those remaining in bicycle firms. Consequently in an LMF economy labor would be inefficiently allocated and labor would not produce goods of as much value as possible. Since the lost motorbikes are less valued than the gained bicycles more bicycles can be produced by shifting labor from the motorbike to bicycle industry with no loss to total value.

As potentially damning as the perverse behavior of LMFs may appear to the verdict on their productive efficiency, Domar (1966) and Vanek (1970) have shown how the perverse behavior of LMFs will be attenuated once one moves away from the single input-single output model. Specifically, if firms produce several outputs or have several variable inputs then product supply curves will either be less negatively sloped or positively sloped. As Putterman (1990) explains the classic single input-single output model ignores the fact that the willingness of nonmembers to join the firm depends on the expected pay-out they hope to receive so that ultimately an upward sloping labor supply curve may render the output supply curve upward sloping as well. Ireland and Law (1982) level a further criticism against the simple single input-single output Ward model of the LMF in that such a model ignores the rights of dismissed workers in assuming free dismissal of workers who become redundant when prices rise. Following Steinherr and Thisse (1979), they argue that only two membership reduction rules can be considered fair to all members of the LMF, the first is a 'random selection' rule whereby every member has an equal probability of being dismissed and the second is a 'full compensation' rule such that the members who remain compensate those who leave to the point that members are indifferent between leaving and staying. Ireland and Law (1982) show that if

the 'random selection' rule is followed then all members will elect for the status quo and no workers would be made redundant since each member's expected income (the amount of income he or she receives in the two states of leaving or remaining, weighted by their respective probabilities of occurring) would be reduced as the value of the new marginal product would be greater than the outside wage (where W = income per member in the initial period) . Similarly the 'full compensation' rule, whereby departing members receive compensation V – W, where V is the income per member after the reduction and W is again the outside wage, workers would again vote not to reduce membership levels in response to a product price increase. James Meade (1972) in contrast showed that an 'Inegalitarian Cooperative' would respond to price changes in much the same way as a capitalist profit-maximizing firm. In Meade's 'Inegalitarian Cooperative' new members are paid dividends higher than the value marginal product of labor in their original firm but lower than the value marginal product of labor of the original members in the new firm. Consequently, Meade's cooperative will respond to a price rise by hiring new members until their dividend or wage rate is equal to the new higher valued marginal product of labor. Because new members are recruited until the outside wage (equal to the next best alternative), rather than average income per member, is equal to the new higher marginal product of labor the 'Inegalitarian Cooperative' will like its profit-maximizing KMF twin respond to a price rise by increasing membership and hence output level.

Meade's 'Inegalitarian Cooperative' already hinted at the fundamental flaw underlying all Wardian or 'Illyrian' models of the LMF which take the objective function of the LMF as being average income rather than profit maximization. As Dow explains "…the flaw in the Illyrian model is that it suppresses the labor market by assuming that the LMF ignores the gap between what insiders and outsiders are paid" (2003, pg. 146). As long as the LMF is operating within a missing or incomplete labor market it is hardly surprising that they respond perversely to price changes. This point is made forcefully by Zamagni and Zamagni (2010) who argue that while capitalist firms can 'adjust' to attain their profit-maximizing objective by operating in both capital and labor markets, LMFs are denied both such that the perverse results are already built in to the model's initial hypotheses (pg. 70). Meade's (1972) inegalitarian solution is only one of several ways to complete the missing labor market. John Bonin (1981) argues that temporary work arrangements, whereby workers temporarily move from LMFs experiencing lower demand

to LMFs experiencing higher demand to work for a market clearing external wage (y^0), may yield full equivalence of the short run supply curves in an LMF economy (LME) and an KMF economy (KME). In situation of temporary work arrangements a price increase for LMF(X) will lead to an increase in its marginal product of labor and temporary workers will be hired until (y^0) is equal to the MP(L) of LMF(X) and consequently the MP(L) is equal in LMF(X) and LMF(Y). The original members of the LMF(X) now distribute amongst themselves the new higher average net income while the original members of LMF(Y) experience a loss since their average net income (or dividend) is less than the external (y^0) which is equalized to the MP(L) in the new equilibrium. Meade's 'Inegalitarian Cooperative' and Bonin's temporary workers solutions, although insuring the allocative efficiency of an LME, sacrifice a significant degree of equity for efficiency considerations.

An alternative to unequal distribution of net income between insiders and outsiders was formulated by Sertel (1982), Dow (1986, 1996), and Fehr (1993) in the form of a market for tradeable 'membership rights'. Sertel (1982) and Dow (1986) were the first to show that under competitive conditions a market for membership rights is a perfect substitute for both a labor and stock market for the labor-managed firm. The key departure of the Dow model of the LMF from the original Ward-Domar-Vanek model is in terms of the firm's objective function. A market for membership rights induces LMFs to maximize total profit rather than average net income because it forces LMF insiders to internalize what outsiders are willing to pay for membership thus making the external wage the true cost of labor (Dow 2003, pg. 150). The new objective function of an LMF with tradeable membership rights becomes average net income *plus* membership revenue. Since membership revenue does *not* depend on the size of the original LMF insider group this second component ensures that the new objective function becomes total profit maximization rather than average income (profit) maximization. To put it another way, while before increasing the LMF membership meant increasing the number of people among which the new profit had to be distributed, with the introduction of a market for membership rights an increase in the LMF membership now brings an increase in profits (average net income + membership revenue) for the LMF insiders. A higher net income or profit compensates LMF insiders for the new mouths they have to feed so ultimately total net income/profit becomes the LMF's new objective function. Suppose an LMF outsider current receives the capitalist wage

(w)[4] and LMF insiders receive average net income (y₀). Then an outsider would be willing to pay up to $(y_1 - w)$ for a new membership deed, where y_1 is the average net income a new member receives after joining and thus $(y_1 - w)$ is the net gain per unit of labor from joining the LMF (Dow 2003, pg. 149). Upon expansion then the original LMF members not only receive the new higher net income per worker (y_1) that the new members contribute, but they also divide amongst themselves $(y_1 - w)\Delta L/L_0$ which is the total membership revenue divided by the total membership before expansion. As long as this sum is greater than the prior net income (y_0), expansion will be profitable. In contrast to Meade's inegalitarian solution, the Dow solution treats worker-members equally. After joining all worker-members share equally in the new net income produced by the firm, while the membership fee can be seen as a compensation to current members for past capital investments. More importantly, with the introduction of a market for membership rights, both the backward-bending supply curve and the inefficient allocation of labor disappear as the external/shadow wage (w) becomes the true cost of labor and the LMF is in equilibrium only when the MP(L) equals (w). Since all LMFs treat (w) as the common cost of labor, the value MP(L) is equalized among all firms and maximum productive efficiency is achieved. Sertel (1982) established many of the same results as Dow (1986, 1996) by showing how a market for partnership deeds…"establishes transaction prices for membership in all LMFs based on the discounted present value of their expected future returns" (Bonin and Putterman 1987, pg. 29). Sertel frames his model in terms of worker utility and disutility to show that an LMF with a membership market will be in equilibrium when "the demand price for partnership deeds, $D(m) = \bar{u}(m) - \underline{u},$ is equal to the supply price, $S(m) = -m\frac{d\bar{u}}{dm}$ where $(\bar{u})$ is the utility function of a worker in an LMF, $(\underline{u})$ the utility function of a worker in a KMF, and (m) the number of members in the firm. Expanding and simplifying D(m) and S(m) through algebraic manipulations yields the equilibrium condition $\pi\bar{F}_L x - E(\bar{x}) = \underline{u}$ where π is the price of output, $\bar{F}_L$ the marginal product of labor in the LMF, x are units of effort, and $E(\bar{x})$ a real-valued function presenting the disutility of effort. This equilibrium condition states that an LMF will take on a new member until the marginal product of labor of the LMF member is equal to the external utility function of a worker in a KMF, or in other words when MP(L) = w, the equivalent equilibrium condition of the profit maximizing capitalist firm.

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[4] If an economy consists only of LMFs then the market-clearing wage becomes a shadow wage reflecting the next best dividend per worker

2.2 Long-run equilibrium behavior of the LMF

So far we have only considered the short run comparative static behavior of the labor managed firm but it is worth briefly examining the behavior of LMFs in the medium and long-run as well. In the medium-run in which all factor are variable but the number of firms is fixed (entry or exit are not free) Ward's perverse supply curve can reappear. If the production function is homothetic (the marginal rate of technical substitution is the same along any ray from the origin) then the LMF will have a perfectly inelastic supply curve (Ireland and Law 1982, pg. 29). If the production function is not homothetic then the slope of the supply curve will depend on the way in which the marginal rate of technical substitution varies with the scale of production. If the ratio of the marginal product of capital to the marginal product of labor increases with scale (the MRTS$_{LK}$ becomes larger and the slope of the isoquant steeper as the MP(K) grows relative to the MP(L)) then the supply curve will slope upwards. This is consistent with Vanek's (1970) implication of a high MP(L) and a low MP(K) as two factors, among others, which induce a the backward-bending labor supply curve. In the long-run, depending on what assumptions are made regarding free entry and exit, two scenarios can arise. In the long-run case without free entry and exit the LMF can only achieve long-run equilibrium if it produces in the constant returns portion of the long run average cost curve. The result stems from the fact that the LMF, in adopting the maximand of average income per worker, receives no surplus profit after all factors have been paid the value of their marginal products. Under first-order conditions capital is hired until the MP(K) ($p\frac{\partial X}{\partial K}$) is equal to the rent cost (r) while labor is hired until the MP(L) ($p\frac{\partial X}{\partial L}$) is equal to net income or profits per head ($y = \frac{pX - r\overline{K}}{L}$). If all profits have been distributed as factor payments to labor then the distribution of output fully exhausts the firm's production. But Euler's theorem states that this condition, whereby $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = z(x, y)$, only if the production function is homogenous of degree 1 or in other words exhibits constant returns to scale. Thus, in the long-run without free entry or exit the labor-managed firm always operates at the level of production at which long-run average costs would be minimized if the enterprise were a profit-maximizing capitalist firm (Estrin, Laidler, Dietrich 2008). From textbook theory we know that

this long-run average cost minimizing point, whereby the LMF exhibits constant returns to scale, is equivalent to the minimum efficient scale (MES) of production. In the long-run an LMF will *only* produce at this MES point and hence its supply curve becomes perfectly inelastic. Of course, depending on whether the capitalist twin makes a profit, breaks even, or makes a loss, the LMF in long-equilibrium will either make more, the same, or less profit than its capitalist twin. But even in this long-run case we see that the LMF always increases output by a smaller amount in response to given price changes that do their capitalist counterparts for a capitalist firm can always choose to produce in the decreasing returns to scale region of the (LAC) curve if a price increase will lead to higher profits but a LMF will instead continue to produce at the (MES) point and distribute the higher "profits" as factor payments to the worker-owners. If we amend the long-run case to introduce free entry and exit then LMFs and KMFs behave identically, both exhibiting perfectly elastic, horizontal supply curves. Like in a KMF economy, higher average earnings in certain LMF industries will signal new firms to move in while industries exhibiting low average earnings will signal firms to leave. The entry and exit of firms to/from their industries leads to prices declining and prices increasing respectively. If entry and exit is truly costless then such a process will ultimately big prices down to the break-even point of the minimum efficient scale of production (MES). At such a point LMFs produce the same output and employ the same amount of labor as their KMF counterparts who are making zero profits. Furthermore, as Putterman (1990) explains, "…if existing firms move in and out of product markets, or firms are formed or disbanded whenever returns from a given type of labor are unequal across industries, then a change in demand in any one industry will lead to a reallocation of labor and capital among industries until these returns are again equalized, at which point factor allocation will be fully efficient (pg. 167). Dreze (1976, 1989) formally proves such an equivalence result establishing that in the long-run, with costless entry and exit, an economy of labor-managed firms is as productively efficient as an economy of capitalist firms. Such a result, confirms Paul Samuelson's famous statement that it makes no difference if capital hires labor or labor hires capital since an economy in which workers lease machinery and one in which capitalists hire workers produces identical results in terms of efficiency (Zamagni and Zamagni 2010, pg. 71).

<u>Chapter 3 - Financing the Labor-Managed Firm</u>

3.1 Introduction to LMF financing

Up until this point, the various neoclassical models we have examined have all treated capital as a hired factor with a parametric rental price (r). As discussed in the beginning, however, the assumption that firms lease all their assets is highly implausible as the inability of lessors to provide a credible guarantee against uncontrolled depreciation towards lenders will make leasing prohibitively expensive. Specifically, the 'service flow monitoring argument' and the 'quasi-rent expropriation' explained earlier imply that "the price of rental would accordingly reflect some combination of costly monitoring charges and of a premium for presumed negligence in the use of goods" in addition to the risk of potential quasi-rent expropriation (Putterman 1988, pg. 249). For these very reasons it was argued that it is more cost effective if a firm owns its assets than if it leases them, thus the labor-managed firm like its capitalist counterpart must find a way to finance its capital requirements. Deborah Milenkovitch (1984) offers five possible ways in which self-managed firms can finance their capital assets: (1) internal financing by the collective from retained earnings in which claims on assets are unvested (by vesting we mean the process of accruing *non-forfeitable* rights on income streams), (2) individually supplied financing through financial intermediaries, (3) individually supplied financing directly in the enterprise with vested claims on income streams, (4) external financing with an obligation to pay off the loan, and (5) external financing by perpetual debt (pg. 85). Method (1) states that a self-managed firm finances its capital assets exclusively through retained earnings and that, in addition to having no claims upon the assets of the firm, upon leaving workers lose any claims on the firm's net income. In summarizing the various financing options open to self-managed firms it may have been noticed that I have retreated from the LMF label used throughout the text. There is a reason for this which was hinted at in the very beginning of the paper. Following Vanek (1975) and Jossa and Cuomo (1997) a *self-managed* firm refers to any firm where the exclusive control and management of productive activities lies with the full active membership. Within the category of self-managed firm Vanek introduced an important distinction between *labor-managed* and *worker-managed* firms. A worker-managed firm (WMF)

is exclusively self-financed, that is to say, it only relies on method (1), retained earnings, to finance its capital assets. Models of WMFs are most prevalent in the vast literature on worker self-management in the former Yugoslavia in which worker-managed firms with social/state ownership of capital were the dominant form of industrial organization (see Vanek 1975, Furubotn and Pejovich 1970, Estrin 1983, and Horvat 1976 among others). Most importantly, in a WMF with exclusive internal-financing the income on any capital is assigned to the workers and not to the state who are its effective owners. In a *labor-managed* firm, on the other hand, capital incomes go entirely to owners of capital, regardless of who the owners happen to be. In addition Vanek (1975, 1977) stipulates that to be called an LMF such a firm must be exclusively financed by borrowing, that is to say it must rely on external financing methods (4) and (5). Throughout this text I have used the term 'LMF' in the more liberal sense of a firm where the ultimate control group is the set of labor suppliers, which I borrow from Dow (2003). Hereafter I will use the term LMF* to refer to Vanek's definition of a labor-managed firm in order to avoid any confusion. The final class of self-managed firms which are of interest for the following discussions on capital financing are firms in which the capital assets are either collectively or individually owned by all/some of the firm's members (Vanek 1975, pg. 16). Such firms are referred to in the literature as 'producer cooperatives' (PCs) and rely on methods (2) and (3) for financing their capital assets. However, it should be noted that methods (2) and (3) allow both for internal financing through retained earnings and recourse to external credit; as long as the partner of the self-managed firm has "the right of payment of a quota (calculated on the basis of the relationship between the partner's initial contribution and the current net capital value of the firm) of net capital of the firm" then such a firm can be called a Western-style producer cooperative (Bruno and Jossa 1997, pg. 164).

Worker-managed firms (WMFs) are now largely of historical interest since the Socialist Federal Republic of Yugoslavia dissolved in 1992. Throughout the remainder of this text we will thus be focusing our attention on LMFs* and PCs although references to WMFs will still be made since their respective investment issues are illuminating for many of the similar financial issues faced by the former . Before delving in the heart of the financial issues faced by LMFs* and PCs it is worth clearing up some of the confusion surrounding the differing forms of asset ownership and their compatibility with a commodification of membership positions (the role of being a shareholder in a KMF or the role of being a member of an LMF). Asset ownership can

either take the form of individual ownership of non-human assets or shared/collective ownership of non-human assets. Control rights can, of course, either be assigned according to labor or capital supply. The following table from Dow maps out different forms of governance structures based on different combinations of asset ownership and control rights (2003, pg. 111):

Table 5.2 *A classification of governance structures: Bundled input supply*

| | | Asset ownership | |
		Individual ownership of non-human assets	Shared ownership of non-human assets
Control rights	**Control by capital**	Machine-owners' cooperative to which machine owners supply labor services (KMF)	Joint-stock company to which machine-owners supply labor; votes on the basis of capital supplied (KMF)
	Control by labor	Workers' cooperative to which workers supply personally owned machines (LMF)	Workers' cooperative with jointly-owned machines; votes on the basis of labor supplied (LMF)

Here is it clear that control by labor is consistent with both individual *and* collective asset ownership. More specifically, the existence of tradeable LMF membership rights, which is the proposal introduced by Sertel (1982) and Dow (1986, 1996), is consistent with both individual *and* collective asset ownership. The case of individual ownership of non-human assets which we will be considering, however, is not the one of workers supplying individually owned machines but rather the one found in the Spanish Mondragon Corporation, for example, whereby each worker has an individual stake in the physical or financial assets of the firm through a system of internal capital accounts (Ellerman 1986). As Jossa and Cuomo (1997) make clear such a system of internal capital accounts as proposed by Ellerman attributes individual property rights to the current members of the LMF in the form of individual equity (pg. 261). In the Mondragon case each worker is assigned an interest-bearing capital account to which are credited both the

membership fee (the initial contribution) and any retained earnings (up to a maximum of 70 percent) after deducting wages, interest, and depreciation from net income (Dow 2003, pg. 60). Upon retirement workers in Mondragon recoup the full value of their capital account, which includes the principal (the initial membership fee), dividends paid out of the firm's retained earnings, and any interest payments not paid out in cash. A similar arrangement is the ESOP or 'Employee stock ownership plan' whereby a firm creates a trust serving as a "defined-contribution employee benefit plan", which acquires stock in the firm on behalf of the employees to whose individual accounts' both stocks and corresponding dividends are allocated (Dow 2003, pg. 76). ESOPs, however, are agnostic regarding control rights, however, thus they can just as well take the organizational form of a KMF as an LMF. The reason for this brief diversion on differing forms of individual asset ownership in LMFs, is that I want to stress the point made by Dow that "…all four combinations are logically possible—collective asset ownership with or without commodification of membership, and likewise for individual asset ownership" (2003, pg. 114). This point bears repeating since there is much confusion as to the meaning of collective asset ownership in the literature on LMFs. Ben-Ner (1988) for example uses "collective ownership" for a system where workers lack tradeable claims on the LMF while Putterman (1990) assumes that "collective ownership [implies] workers forfeiting all personal claims upon the value of any assets created out of retained enterprise earnings" . As we have explained above these claims are mistaken. Sertel (1982) and Dow (1986, 1996) have shown that even when the assets of the LMF are collectively owned by the legal entity of the firm, a transferable membership right or labor share enables a worker to fully appropriate the present of future investment returns by selling his membership position. If the position of partner in an LMF can be sold departing workers "leave behind [the jointly owned] capital bought with their savings but recoup it with the sale to the new partner" (Jossa and Cuomo 1997, pg. 245).

3.2 Financing difficulties as an obstacle to LMF emergence

In the previous section it was established that in a world of complete and perfectly competitive markets KMFs and LMFs would be symmetrical in their static and dynamic behavior. Such 'equivalence theorems' show that an economy of labor-managed firms will be as allocatively efficient as an economy of capital-managed firms (Dreze 1976, 1989, Dow 1996).

The natural question that arises then is: if LMFs are as efficient as KMFs why do they occupy only a marginal place in Western market economies? Although there is no consensus answer to this perplexing question, the last four decades of research on the economics of LMFs has more or less converged on financing difficulties as the key barrier to the spread of LMFs in Western market economies. For example, Jacques Dreze asserts that "funding difficulties are the main reason why labor-managed firms are not spreading within capitalist economies" (1993, pg. 261). Specifically, the financing problems of LMFs enter at two points: before the LMF is created and once the LMF is already in existence. The first point of entry for LMF financing difficulties involves a combination of low worker wealth with credit rationing in bond markets and non-voting equity markets which hamper the rate at which workers will pool resources to form LMFs (Dow and Putterman 2006). The second point of entry for financing difficulties plaguing LMFs is once such firms have already come into existence. The principal financing difficulty affecting incumbent LMFs is the much discussed 'underinvestment' phenomenon which leads first to depressing the private value per unit of capital of the LMF and hence the growth rate of the LMF relative to the KMF and secondly to the increased likelihood that worker-members of existing LMFs will sell their firms to capitalist investors (Dow 1993). In evolutionary terminology the first point of entry for funding difficulties is the lower rate of differential birth of LMFs as such firms have major difficulties getting off the ground. The second point of entry is the higher rate of differential death of LMFs relative to KMFs as underinvestment issues threaten slower-growing LMFs from being outcompeted by KMFs in competitive markets, resulting either in bankruptcy or degeneration into an investor controlled firm.

In order to make sense of the increased funding difficulties that LMFs face relative to KMFs during the formation stage it is necessary to invoke what Dow (2003) calls a "symmetry principle" which traces symmetrical behavior of LMFs and KMFs back to qualitative symmetries (in both a physical and institutional sense) of labor and capital inputs (pg. 118). The obvious corollary of such a "symmetry principle" is that any *asymmetrical* behavior between LMFs and KMFs must be ultimately derived from some qualitative asymmetry between capital and labor. The asymmetrical behavior of LMFs is evident from the fact that they are rare relative to KMFs and the fact that LMFs are seldom found in industries with large economies of scale, high capital intensity, or highly specialized physical assets. The fundamental asymmetry between capital and labor inputs can be termed the 'alienability' characteristic. The alienability of capital

implies that the ownership of non-human assets can be shifted from one person to another while endowments of labor-time and skill cannot (ibid). Williamson (1985) likens this asymmetry to the difference between stocks and flows; while capital can provide its whole self to the firm as a stock labor can only supply a service flow. The fundamental asymmetry between labor and capital inputs is the source of the causal channel through which one potential cause (on the differential birth side) of LMF rarity can begin to be explained. The causal explanation of LMF rarity begins with a contingent fact which nonetheless is of enormous significance. The contingent fact is that on workers tend be suffer from limited wealth and liquidity constrains so the lack the resources needed to finance jointly owned assets. Using back-of-the-envelope calculations data from 1988 Bowles and Gintis (1996) estimate that the average net worth of the least wealthy 80 per cent of American workers (half of which was tied up in homes and cars) was about $64,000 while the capital stock per employee was about $95,000. Thus the typical net worth of a worker is about half the value of the capita stock they typically work with. For this reason workers will have to rely on leasing, debt financing, or equity financing if they are to purchase the physical assets which will constitute the firm. As was established above capital is an alienable stock while labor is an inalienable service flow. Stocks can be leased *and* owned while service flows can only be leased. Leasing of capital assets as a cost-effective option for firms was ruled out in the beginning as costly information (information is costly to obtain and transmit) and asset specificity lead to costly monitoring of service flows and the threat of quasi-rent expropriation respectively (Alchian and Demsetz 1972 and Klein, Crawford, and Alchian 1978). Thus workers interested in creating a labor-managed firm will have to rely either on bond (loan capital) financing or equity (risk capital financing) to finance the firm's capital assets. In this scenario then an upfront investment of capital must be provided in exchange for future interest payments in the bond financing case or future dividend payments in the equity financing case. But once the stock of alienable capital has been committed, the LMF may be able to rely solely on internal financing from retained earnings for working capital and maintenance thus eliminating the need for the LMF to dip back into equity and bond markets (Dow 2003, pg. 237). Members of the LMF will thus face a problem of making "credible commitments" to capital in order to ensure investors that the LMF will not take advantage of an upfront capital investment by paying themselves higher wages, depreciating assets, or pursuing risky projects (ibid). The threat of non-renewal by investors has little force if assets are durable, retained earnings are
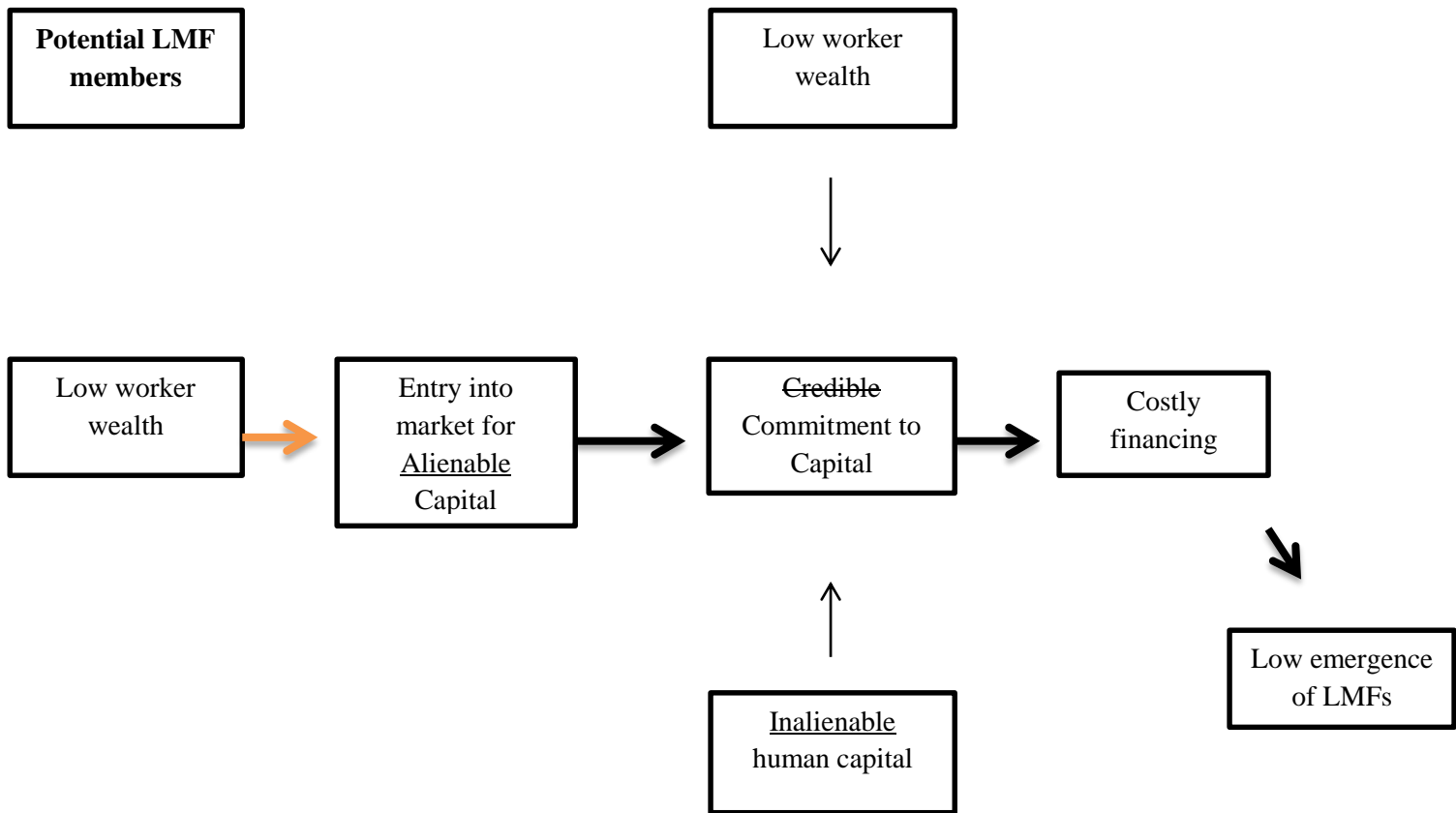
healthy, or the firm is on the verge of bankruptcy. Such situations characterized by a divergence of incentives between principal (lenders) and agent (worker-borrowers) are termed 'moral hazard' problems, scenarios where the agent takes more risk since the principal bears the costs of these risks. Moral hazard problems involve *ex post* asymmetric information. Only after the contract has been created to informational asymmetries enter into the picture as the principal can neither control or costless verify the level of risk which the agent may undertake. Gui (1985) confirms the above moral hazard dilemma in the bond market arena as agent/worker liquidation (bankruptcy) depends on the realization of a stochastic variable, gross income from production (value-added inclusive of capital costs) which is only observable to the worker-members. Workers (agents) can thus liquidate projects to avoid debt repayment which the lenders (principals) have no way of anticipating in situations of asymmetric information. Moral hazard dilemmas where informational asymmetries are ex post should be contrasted with so called adverse selection problems where informational asymmetries are *ex ante*, appearing even before the loan contract between principal and agent is signed. For example, if some borrowers have better skills or projects than others but lenders cannot distinguish between different quality projects ahead of time then borrowers will find it difficult to convince lenders that the probability of loan repayment is sufficiently high, leading to prohibitive interest rates and credit rationing once again. Symmetrically, adverse selection problems may also affect groups of workers who when confronted by a wealthy investor who offers to transfer his assets through a debt contract, cannot confirm the quality of the investor's project beforehand (Dow 2003, pg. 209).

To make matters worse because workers are poor they lack the funds necessary to make so called "trust investments" in their own projects which would signal to lenders or equity investors the likelihood the project succeeding. Furthermore because human capital is inalienable workers cannot offer their own future labor income as collateral that would be forfeited to banks in case of default (Hart and Moore 1994). Even if the Sertel-Dow market for membership rights is introduced, due to prohibitions on indentured servitude and the illiquidity of individual claims on the LMF's capital assets, it will be difficult to secure a loan using the membership right as collateral (Dow 1993, pg. 192). The overall outcome of the LMF's inability to make credible commitments to capital are high interest rates or outright credit rationing in the case of bond financing or a higher cost of capital (selling stock at a cheaper price) reflected in higher returns demanded by equity financiers (Stiglitz and Weiss 1981). Bowles and Gintis (1993) correctly

stress the contested nature of exchange in bond markets as the promise by the borrower to repay the lender is enforceable only if the borrower is solvent at the time repayment is due, and the borrower's promise to repay is not amenable to third-party enforcement (pg. 32). The incentive incompatibility between creditors and borrowers is heightened by the fact that since workers receive employment rents, they profit from the firm's continued operation even when the future profits are expected to be negative whereas lenders will prefer that the LMF declare bankruptcy in such a situation (Gintis 1989). Equity financing in the case of the LMF can only be of the non-voting equity type as granting owners of capital (even if they are workers) votes on the basis of the amount of capital supplied contradicts the fundamental tenet of worker self-management: one member one vote. Lack of worker wealth thus combines with the inability to make credible commitments to capital to make external financing for LMFs a bleak and costly option.

As Hodgson (1996) indicates such an obstacle as costly access to external financing could ensure that labor-managed firms are less numerous than hierarchical firms, even if in the best case scenario they suffer no efficiency disadvantages, because they are less likely to emerge in the first place. If the financing troubles which LMFs will face are as gloomy as concluded above then "…hierarchical firms may grow in size or number to swamp the non-hierarchical businesses, whatever the relative efficiencies" (ibid, pg. 103). It is important to stress that KMFs can in theory face the same difficulties in making credible commitments to capital that LMFs face. As Dow (2003) points out "…there are no data comparing the cost of external capital for KMFs and LMFs so it is impossible to determine directly whether LMFs are disadvantaged in the credit market relative to similar KMFs" (pg. 192). The fundamental difference, however, is that capital suppliers are wealthier than workers so they do not have to rely as much on incomplete capital markets to finance their firms and when they do go to capital markets for financing their higher level of wealth allows for financing on less costly and more favorable terms. Capital suppliers and the KMFs which they form, while facing less of the problem of making credible commitments to capital, are subject to the symmetrical problem of making credible commitments to the workers whose labor service flow they lease. But just because labor time is a service that is leased and not a stock to be bought there is an increased incentive to protect their reputation in the eyes of workers as KMFs will frequently have to dip back into the labor market to replace labor services lost through worker turnover.
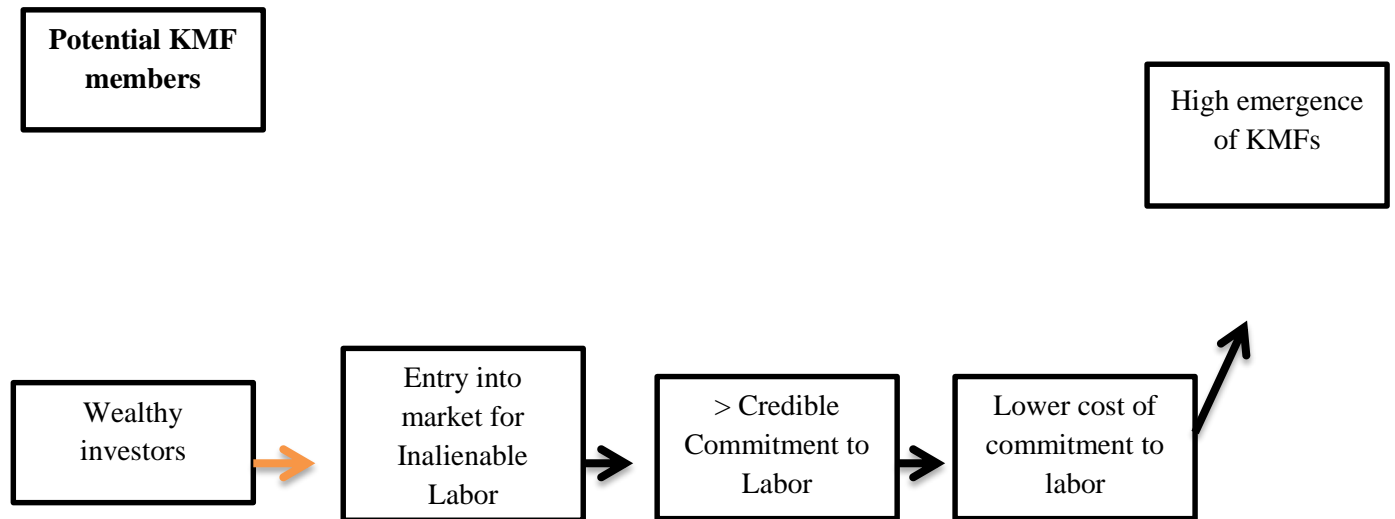
To summarize the overall flow of the channel from labor-capital asymmetry to a lower emergence rate for LMFs the causal chain can be conceived of as thus:

Potential LMF members		Low worker wealth

Entry into market for Alienable Capital → ~~Credible~~ Commitment to Capital → Costly financing

Low worker wealth → Entry into market for Alienable Capital

Inalienable human capital → Commitment to Capital

Low emergence of LMFs

From the above flow chart it can be seen that the major causal factor (indicated by the bold arrow) which lead to the difficulty of making credible commitments to capital are the fact that capital is alienable. The other two factors, low worker wealth and the fact that inalienable human capital cannot serve as collateral, are best seen as auxiliary causes of low credibility commitments to capital. The orange color of the arrow leading from low worker wealth to entry of worker-members into capital markets is intended to show that the initial situation of low worker wealth is merely the trigger which begins but does not cause the flow of the causal channel from capital-labor asymmetry through lack of credible commitments to costly financing

and low emergence. To repeat bold arrows indicate the flow of the *causal* channel while the orange arrow is only the trigger.

The symmetrical causal channel for the KMF can be summarized by the following flow chart.

```
┌──────────────────┐                                      ┌──────────────────┐
│  Potential KMF   │                                      │  High emergence  │
│     members      │                                      │     of KMFs      │
└──────────────────┘                                      └──────────────────┘

┌──────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Wealthy  │ → │  Entry into  │ → │ > Credible   │ → │ Lower cost of│ →
│investors │   │ market for   │   │ Commitment to│   │ commitment to│
│          │   │ Inalienable  │   │    Labor     │   │    labor     │
│          │   │    Labor     │   │              │   │              │
└──────────┘   └──────────────┘   └──────────────┘   └──────────────┘
```

In contrast to the scenario facing potential LMF members, a high level of wealth for owners of substantial capital triggers their entry into the market for inalienable labor-power to which they can make a more credible commitment to (for the reputational reasons outlined above), leading to lower transaction costs in contracting labor, and ultimately a higher emergence rate for the KMF form. The qualitative asymmetry between labor and capital as pertains to the credibility of commitments to labor and capital can be put another way. While labor, since it is inalienable, can always pick up and leave if it is not satisfied by capital's promises, capital, as an alienable stock, does not have the same freedom to pick up and leave once it has been given to labor. As regards the differing costs of reputations for labor and capital respectively, while capital has to return frequently to the labor market since labor is always free to pick up and leave, once capital has been given over to labor, labor does not have to return to the capital market again as long capital remains firmly in its hands!

3.3 Underinvestment in the WMF. LMF*, and PC

Up until now we have been discussing the first point of entry for the financing difficulties faced by LMFs as a general category. In the following section we will be looking at the second point of entry for LMF financing difficulties; specifically, the issues of underinvestment which arise once self-managed firms have already come into existence. To continue with the evolutionary analogy, underinvestment issues in incumbent LMFs deals with the differential death (survival value) of such firms rather than their relative fecundity or probability of emergence. The central underinvestment issues which are attributed to self-managed firms in LMF financing literature are: the 'Furubotn-Pejovich effect' or horizon problem , the 'Vanek effect', and the risk-sharing effect. Briefly, the Furubotn-Pejovich effect (first discussed by Pejovich (1969), Furubotn and Pejovich (1970), Furubotn (1971, 1976)) refers to the tendency of WMFs to underinvest when the time horizon within which worker-members expect to remain with the firm is shorter than the time period over which they will see the full returns on investments made from retained earnings. The reason for this 'horizon problem' is rooted in the fact that once partners of WMFs leave their firms they forfeit any rights to both the principal of their investments, the value of any assets created out of retained earnings, *and* any returns, reflected in the higher future dividends per worker resulting from the initial investment (Jossa 2014). The second financing problem encountered in the LMF literature is the so called 'Vanek effect' or the 'self-extinction' force (Vanek 1977). The 'Vanek effect' occurs when LMFs are financed exclusively from retained earnings (or internal financing) leading to the following distorting 'forces': (1) firms operate in the increasing returns to scale zone of production (output is too low) as the marginal product of labor lies above the level of the typical worker's marginal rate of time preference, (2) at any given level of capital the firm will attempt to reduce membership, (3) the gradual disinvestment and capital consumption undertaken in order to achieve the desired capital/output ratio, and (4) adjustments to the capital/labor ratio are always carried out by varying capital and never by increasing membership (George 1990, pg. 12). Vanek hypothesized that an LMF financed through retained earnings will become extinct over time because of the four forces listed above. The final category of financing perversities plaguing self-managed firms (LMFs) are classed as "risk-sharing effects", and refer to the problem of optimally allocating risk between workers and investors when LMFs are exclusively funded out

of loan capital (external financing). The fundamental problem of optimal risk-sharing involves the purported conflict between risks and incentives within the Vanek LMF*. Full-debt financing protects workers from bearing the lower tail of enterprise risk through default (thus avoiding bond repayments) while allowing them to capture the upper tail of any extraordinary gains (McCain 1977). But if the worker's income is insured against such firm-specific risks via transferring the risk to lenders then they will have less of an incentive to repair and maintain the capital assets financed through loans in order to extract as much current income from its use as possible (Jensen and Meckling 1979). On the other hand if workers as residual claimants are made the equity-owners of their capital assets then they will have an incentive to optimally use and maintain the assets. But if the majority of assets are financed out of the workers' equity then then the worker shareholders could potentially lose all of their invested wealth as after liquidating the firm's assets, creditors and bondholders are paid before equity investors who might only scrap up a tiny residual in the realm of pennies on the dollar. Such a risk is amplified in the case of worker-owners who cannot diversify their portfolios by holding several membership rights in several firms.

Having analyzed how the WMF is plagued by both the Furubotn-Pejovich effect and the Vanek effect, it is now time to consider the investment behavior of that particular LMF, LMF* as we have called it, that is financed exclusively through bonds/loans or what Vanek (1975, 1977) calls external financing. Like the WMF but unlike the Western style PCs, partners of the LMF* lack individual property rights to firm's capital goods or assets, as the assets are *collectively* owned to use the terminology introduced above. Although LMFs* are prohibited from internal financing, in the sense of financing from retained earnings, there is nothing prohibiting such firms from loaning capital from its own members. Partners who choose to invest their private savings in debentures (an unsecured bond) of the firm, are granted the same rights as any holder of a debt security: the right to enjoy interest, to recoup the loaned capital on maturity, and to be able to sell the bonds at any moment on financial markets. Because an externally financed LMF* can sell bonds to its own internal constituents, Jossa (2014) rightly concludes that the internal vs. external financing distinction is the wrong line of demarcation to draw. Rather, he proposes that the distinction between a LMF* and a WMF should be drawn on the basis of LMFs which distinguish between labor income and capital income and those that do not. Labor income is

taken to mean the average net income that a worker receives in virtue of his being a member of the firm while capital income is the return on capital accruing to holders of equity (dividends), bonds (interest rate), or leasing agreements (capital rental rate). A WMF, which is financed through retained earnings, makes no such distinction between capital and labor income as the income which partners receive derives both from their status as workers in the firm (with the corresponding right to the net income) and as contributors of capital, who accept reductions in dividends in order to finance fresh investments; dividends paid out from future retained earnings will thus reflect the new increased value of the firm's assets in addition to the worker's regular right to a share of the firm's profits. Returning to the financing issues faced by self-managed firm type LMF*, because the LMF* is exclusively financed from loan capital (whether the holders of the debentures are themselves partners or not), the partner's contribution to capital investment out of retained earnings is zero and hence there can be no Furubotn-Pejovich effect (Jossa and Cuomo 1997). Jossa (2014) argues that the LMF*, although not exhibiting the F-P effect, may have a tendency to exclude efficient investments, which a profit-maximizing (PMF) twin would undertake, because lacking the ability to recover any part of capital LMF* members will only take into account the future income that will flow from the investment and not any variation in the firm's net worth.

As is well known, in a PMF a precondition for undertaking an investment project is that the internal rate of return (IRR), the discount/interest rate at which the net present value (NPV) of all cash flows is equal to zero, is greater or equal to the minimum acceptable rate of return (MARR), the minimum rate that the firm expects to earn when investing in the project (or the firm's weighted average cost of capital (WACC)). Equilibrium is reached when the IRR is equal to the MARR or:

(1)

$$RL_t \sum_{t=1}^{T} (1+r)^{-t} = C_0$$

where RL is the annual gross income from the investment, r is the interest rate, t is any year, T the terminal year of the project, and C_0 is the purchase price of the machine or cost of capital. Jossa and Cuomo (1997) state the equilibrium condition of the marginal investment of one monetary unit as following:

(2)

$$\sum_{t=1}^{T} r_t(1+i)^{-t} - 1 = 0$$

where the left-hand side of the equation represents as above the NPV of the future investment returns and the right-hand side is the cost of the investment equal to one monetary unit. In an LMF* where the worker-members do not bear the reductions in the capital value of the assets and whose only cost is to reimburse the bondholders with a quota of capital increased by the matured interest (principal plus interest), face a different investment constraint than both the PMF and WMF. However, even though the underinvestment effect facing an LMF* is different than the F-P effect which plagues the WMF, both result from the potentially truncated time horizon of the partner. In the case of the LMF* the limited time horizon of partners leads to a *distortionary* effect on investment decisions which can result not only in underinvestment but a kind of "overinvestment" (Jossa 2014). A point of clarification is in order here. Jossa claims that the LMF* will experience a form of overinvestment if a project that is deemed inefficient in the long run but efficient during the time horizon of the partner is undertaken. However, it suffices to say that such projects even though they yield temporary efficient returns, will lead to a decrease in the total net worth of the firm in the long-run and hence remain an instance of underinvestment when seen in their totality. To see why an LMF* is said to make inefficient investments consider the investment constraints facing members of the LMF*. According to Jossa and Cuomo (1997) partners of the LMF* whose time horizons are shorter than the duration of the investment will have an incentive to make the marginal investment as long as:

(3)

$$\sum_{t=1}^{n} (r_t - d_t - i_t)(1+i)^{-t} = 0$$

where n is numbers of years the majority partner expects to remain with the firm, r_t the gross return on investment, d_t the annual rate of depreciation of investment, and i_t the market interest rate. Equation (3) states that the investment will only be made when the cost of investment represented by the depreciation and interest on loaned capital is equal to the returns on the investment. If n is shorter than the duration (in years) of the investment, T, then the partners of the LMF* have an incentive to make inefficient investments. That is to say, because the partners of the LMF* are only concerned with equalizing the flow of costs to the flow of returns in the years 1 to n, they will neglect the marginal investment constraint in the period from $n + 1$ to T. Because of the truncated time horizon, the members of LMF* will take on projects which on the whole are inefficient (the flow of costs is greater than the flow of returns), but within the years 1 to n are efficient. In contrast, WMF members (like members of PMFs) will never undertake inefficient investments as they have a vested interest in recovering the entire cost of capital, which they contributed through retained earnings not paid out in dividends (self-financing). The WMF will thus only undertake the marginal investment if equation (4) is satisfied:

(4)

$$\sum_{t=1}^{n} r_t(1 + i)^{-t} - 1 = 0$$

If the time period which the worker-members expect to remain with the firm (n) is shorter than the period in which the investment will provide returns (T) then the WMF experiences the F-P effect, with partners suffering a loss "…equal to the difference between the reduction of the dividends and the returns on the investment already obtained and withdrawn" (Jossa and Cuomo 1997, pg. 213). Formally a WMF experiencing the F-P effect will make a loss P on the marginal investment where:

(5)

$$P = \sum_{t=1}^{n} r_t(1 + i)^{-t} - 1 < 0$$

Thus a WMF member will use the marginal investment rule (4) instead of (3) which is employed by the profit-maximizing firm (PMF). Given n is less than T the internal rate of return of the WMF will be smaller than the PMF and hence WMFs exhibit the well-known tendency of underinvestment which has been widely discussed in the literature (Stephen 1984, Vanek 1975, Bonin and Putterman 1984). Jossa (2014) is correct to point out that the 'Furubotn-Pejovich' underinvestment effect is used rather loosely in the literature. He points out that the F-P may refer to two distinct underinvestment forces operating in the WMF: (1) partners forfeit their rights to a share of returns on the investment upon leaving the firm but are not denied reimbursement for their past capital contributions made through dividend reductions when the investment project is completed and (2) in addition to forfeiting their rights to the firm's net income the worker collective as a whole is prohibited from reimbursing partners through depreciation expenses due to 'capital maintenance requirement' (CMR) requiring WMFs to replace worn-out equipment and hence at a minimum to maintain the total value of capital assets at all times (Jossa 2014). To be clear, in a WMF workers do not the *right* of refund of their capital share at the time of their withdrawal given that they have no corresponding claims on the net worth of the firm upon leaving. They do however have an *incentive* to recover the past dividend deductions made for reasons of self-financing, during their tenure with the firm through cashing in on the returns to the investment. A CMR ensures that not only is the right of refund forfeited but any possibility a partner had of recouping his share of the past self-financed investment.

Returning to the LMF*, it was concluded that such firms have a tendency to make inefficient investment decisions, arising from a distorted investment rule (3) where the time horizon (n) of the partner replaces the lifespan of the investment (T) in the upper limit of summation. The truncated time horizon of the LMF* member is a necessary but not a sufficient condition for the occurrence of inefficient investments. The sufficient condition for inefficient investments, which was alluded to above, is that LMF* members have an incentive to delay depreciation of externally financed capital goods. More specifically, since members of the LMF* do not have a right to the capital assets of the firm upon retirement they will not take into account the full cost of the investment (reductions in the capital value of assets). Nothing changes when LMF* partners are the ones who acquire bonds and become the firm's creditors, as the fact remains that no has a right to the net worth of the firm upon departure. Every partner

in the LMF* thus has an incentive to squeeze as much profit out of the firm's net worth as long as they remain with the firm without any regard to the firm's net worth once they retire.

Depreciation of course refers to the process of allocating the costs of capital goods over their useful life and can either be done of the basis of matching the depreciation expense (the wearing out of the asset) to its contribution to production, or distributing the depreciation expense evenly across the lifespan of the capital good (straight-line depreciation), or attributing the entire cost to one year. Unlike the LMF*, members of the PMF and the WMF have an incentive to amortize (depreciate) the entire cost of the investment during the investment's lifetime. Consequently, for the PMF in equation (2) and the WMF in equation (4) $1 = d_t T$ or in other words the total depreciation expense of the capital asset whose life is T years is equal to the initial monetary cost of the investment 1. For an LMF* the investment rule described by equation (3) can be rearranged as:

(6)

$$\sum_{t=1}^{n} r_t (1+i)^{-t} = \sum_{t=1}^{n} (d_t + i_t)(1+i)^{-t}$$

yielding the equivalence between the gross return on the investment and the cost of the loaned capital whose two components are depreciation d_t and interest i_t. When $n < T$, however, the members of the LMF* will have an incentive to delay amortization (fail to attribute depreciation expenses in accordance with asset use) in order to collect non-realized (future) profits yielding the inequality between the attributed costs and interest payments and the full monetary cost of the investment:

(7)

$$\sum_{t=1}^{n} (d_t + i_t)(1+i)^{-t} < 1$$

where $n < T$

Thus, unlike the WMF and PMF, the LMF* will undertake an investment even if the net return is less than its total cost so long as the net return of the investment during the n horizon is greater than the flow of costs in the same time period:

(8)

$$\sum_{t=1}^{n} r_t(1+i)^{-t} \geq \sum_{t=1}^{n} (d_t + i_t)(1+i)^{-t}$$

Jossa and Cuomo (1997, pg. 227) show that equation (3) can be transformed into a 'profit equation' which only looks at the flow of costs and returns in one year:

(9)

$$rpK - dpK - ipK = D$$

where rpK is the gross return on depreciation, dpK the contribution of the capital asset to the productive process, and ipK the interest on the loan capital. Jossa and Cuomo (1997) show that if mpK, the share of the value of loan capital pK which is reimbursed to the bondholders on a yearly basis, is less than dpK, or in other words if the attributed cost of capital (the depreciation expense) is less than the average return of capital, then LMF* members in time period t can distribute among themselves the higher dividend D' which represents the non-realized profits due to LMF* members in time period $t + 1$. Self-interested partners of the LMF* can reimburse bondholders at a lower rate than the rate at which capital goods are worn out and thus leave future LMF* members with the burden of a flow of investment costs (a higher mpK) which is larger than the flow of capital services resulting in lower average dividends for the would-be members. Jossa and Cuomo (1997)'s assertion that LMFs* have an incentive to undertake inefficient investment projects, which can result in underinvestment (including short-term "overinvestment"), is similar to the worry raised by Klein, Crawford, and Alchian (1978) that

LMFs who lease their capital assets will have an incentive to wear them out as fast as possible (reducing depreciation expenses) in order to maximize present earnings.

Having looked at the investment shortcomings which in theory plague the WMF and LMF* but no the PMF, it worth looking at a third form which an LMF can take: the Western-style producer cooperatives (PCs). Following Putterman (1990), Ellerman (1992), and Jossa and Cuomo (1987) I will define a producer cooperative as an LMF where the net worth of the firm is contained in individually-owned, internal savings accounts or' internal capital accounts' and individual bonds (like in the LMF*) are paid scarcity-reflecting interest rates. To use Dow's distinction, PCs are characterized by *individual* rather than collective asset ownership and may or may not issue *individually* owned membership rights (shares). Internal capital accounts (bearing the market interest rate) are credited with: any initial capital contributions made by the partners upon joining the PC, the quota of annual profits (either distributed equally or in accordance with the member's labor contribution), and any retained earnings which were not distributed as dividends but used to finance investment projects. The account is debited when withdrawals of agreed dividends are made by partners. Upon termination the individual capital accounts are closed and paid out to departing members in perpetual bonds which they member can either hold to collect interest or sell in a market for debt securities, either way recouping the full value of past contributions made to self-financing (Ellerman 1986, pg. 64). PCs will clearly not suffer from the F-P effect as all of the firm's retained earnings which were converted into venture capital (deducted from the partners' dividends) are reimbursed to the individual partners upon departure. Unlike the WMF, in the PC the right of reimbursement of contributed capital is never touched so there is no incentive for the partner to recuperate the invested capital before leaving the firm. A reduction in the value of the partners' capital accounts can only occur during their tenure with the firm if the enterprise experiences a downturn in business leading to a decrease in the total net income. Although not experiencing the F-P effect, the PC unfortunately suffers from the same tendency to make inefficient investments as the LMF* does when a partner's time horizon is less than the duration of the investment project ($n < T$) and, paradoxically, just because partner's have a right to the reimbursement of past capital contributions (Jossa and Cuomo 1997, pg. 231). Because partners know they will be reimbursed for their capital contributions unconditionally , they have the same temptation as partners in the LMF* to delay amortization of capital and hence expropriate the profits from future would-be partners leading

to a decrease of the firm's net worth in future periods. The potential for adopting inefficient projects leading to underinvestment in the long run is always lurking in the minds of the PC members as it is with members of the LMF*.

3.4 Saleable LMF Membership Rights: The Sertel-Dow proposal

So if producer cooperatives with internal capital accounts and labor-managed firms with 100 per cent bond financing both face the prospect of inefficient investments is there a way out of this financing quagmire? Dow pinpoints the crux of the problem when he makes clear that the problem with internal capital accounts is that members cannot capitalize on the present value of *future* investment returns (2003, pg. 155). Just as a market for membership rights was employed as a solution (albeit one among several) to the labor supply perversities discussed in the earlier chapter so Dow (1996, 2003) and Sertel (1982) propose tradeable membership rights as a solution to the underinvestment problems of the WMF, LMF*, and PC. A (perfect) market for membership rights mimics the stock market employed by joint-stock KMFs as every decision made by the firm reflects on the value of the members' shares, effectively making the time horizon of the partner equal to infinity. The Sertel-Dow labor-managed firm (SDLMF) thus follows the same investment rule as the PMF:

$$\sum_{t=1}^{T=\infty} r_t(1+i)^{-t} = 1$$

which implies the further rule that the entire value of capital be amortized over the course of its lifetime, so that:

$$d_t T = 1$$

This is the same constraint which both the LMF* and PC violate due to their myopic investment decisions. Earlier, it was mentioned that according to Dow individual membership rights are

compatible with both collectively owned capital, owned by the firm *qua* legal entity, as well as individually owned capital, either in the form of individually owned machines or as in the case of the PC individually owned capital accounts. Saleable membership rights although not logically incompatible with internal capital accounts, make such accounts redundant as the present value of future net income already includes the value of the firm's net income upon the partner's departure. Furthermore, tradeable membership rights are compatible with any of the various forms of financing, specifically bonds, non-voting equity shares, retained earnings, or (what will become relevant later on) quasi-equity shares. While the WMF could only finance investment projects out of retained earnings and the LMF* by selling bonds, the entire buffet of financing methods is available to the SDLMF. The PC has the same flexibility in choosing its financing instruments as the SDLMF but it is still hampered by the inability to capitalize returns on investments that extend beyond its partner's tenure with the firm.

In searching for a possible solution to the inefficient problem facing the LMF* and PC, outlined by Jossa and Cuomo (1997), it is worth investigating further the potential for tradeable membership shares to alleviate the aforementioned problems. Jossa and Cuomo (1997) and Jossa (2014) of course disagree with Vanek (1977) who sees no potential for the LMF* to take on inefficient investments. Because Vanek (1977)'s conclusions are based on the highly idealized assumption that "…capita has infinite durability, and thus there are no problems of depreciation…", we will use the less restrictive LMF* model outlined by Jossa and Cuomo as our reference point. Moreover, since the LMF* and the PC exhibit identical investment behavior it will suffice to compare the 100 per cent bond financed LMF* with the SDLMF. Lastly, even if the relative merits of tradeable membership rights outweigh their shortcomings, it must still be established which of the various financing instruments outlined above allocate risk between worker and investor in the most optimal way. The "risk-sharing effect", which is the third class of financing issues faced by the LMF, is paramount in determining the cost of finance, reflected in the size of the risk premium demanded by investors and, if tradeable membership rights, are issued on the price such shares can fetch on the market. As is well known, a higher debt-to-equity ratio (D/E) results in a lower share price and hence an increased cost of financing for a firm who must entice investors with lower earnings per share (E.P.S) (Banks 2007).

The first set of criticisms of LMF membership markets comes from Jossa and Cuomo (1997) and has more to do the potential of such markets to undermine the fabric of the LMF as a

'cooperative' enterprise. According to Meade (1972) in order to qualify as a cooperative enterprise two rules must be followed: (1) new members will only be taken on board if (a) the new member voluntarily wishes to join and (b) all (or possibly a majority of) the older members accept the new member; (2) incumbent members can only leave the firm if (a) the member wants to leave voluntarily and (b) all/a majority of incumbent members agree to his departure (pg. 414). Jossa and Cuomo's main worry is that a *free* market in membership rights would violate (1b) and (2b) as the collectivity would forfeit the right to decide who they can let in and out of the firm. But such an argument borders on strawman territory for Sertel (1982) recognizes that if a membership market is to be workable, then partnership deeds can only be transferred within regions of productive substitutability so a plumber will replace an electrician (pg. 14). To counteract Sertel's problem Dow recommends that instead of membership rights being sold directly to prospective replacements they are sold first to the firm so that insiders as a collective can internalize quality effects when selecting a replacement (2003, pg. 160). Thus there is no reason to think that a market for membership rights violates Meade's rules for a cooperative organization.

The second set of criticisms of a market for membership rights comes from Dow himself and have to do with the feasibility of implementing such a LMF share market in the real world. The limitations of a market of LMF control stems from the very same inalienability of labor which was said to account for the difficulty workers experience in procuring financing to create their own LMFs. Since membership shares in the LMF are tied to the inalienable labor power of a worker, it is impossible to transfer a membership right to another worker without also replacing the labor service of the initial departing member. The market for LMF control will thus be subject to the same frictions as the labor market in a capitalist economy including: the fact that most workers can only hold one job at a time due to travel costs, workers tend to change jobs infrequently due to the costs of search, turnover, and relocation, and the fact that labor services are heterogeneous with different jobs requiring different sets of skills (Dow 2003, pg. 158). The upshot of these labor market imperfections is that a market for membership rights, unlike a stock market, will only become active and bring efficiency gains if there is a job opening while simultaneously someone else is looking for a job, and secondly that several membership markets will arise for every occupation which requires a qualitatively different set of skills. Imperfect markets for membership rights have a danger of becoming too numerous and when they do exist

will be thin and non-market clearing. Dow (1993) links the imperfection of membership markets to underinvestment of LMFs since a failure of incoming members to pay an entry fee equal to the full private value of membership will lead to an *undervaluation* of future investment returns for incumbent LMFs (pg. 191). The primary factors which prevent membership fees from being bid up to market-clearing levels include the combination of low worker wealth with credit rationing (which we pinned down earlier as the channel through which the creation of LMFs is impeded), the lack of government unemployment insurance to protect risk-averse workers, with undiversified portfolios (workers can only usually hold one membership right unlike the unlimited number of shares available to stock market investors) from periods of economic downturn, and the adverse selection problem which arises when asymmetric information prevents outsiders from ascertaining the true expected future value of the firm which insiders know but have no incentive to disclose. Furthermore, as Ben-Ner (1988) points out, an LMF can easily degrade into a KMF if the supply price for membership rights is less than the demand price tempting incumbent LMF owners to hire workers for a fixed wage. The keys to correcting an imperfect membership market are as multifarious as the reasons preventing the market from clearing in the first place and whether imperfect membership markets will prove fatal to the growth, through underinvestment, of the LMF depends on how competitive the market for LMF control can be made. If we take credit and insurance market imperfections as the primary factors keeping membership share prices below the market clearing rate, then any of the following policies could serve as possible solutions: direct extension of government credit to workers, or government guarantees to private lenders who finance worker membership fees, government income support for workers adversely affected by unforeseen shocks in the industry level, full disclosure of the risk level of incumbent LMFs through external monitoring, and the reliance on informal compensation packages when members depart like those found in Meade's (1972) Inegalitarian Cooperative (Dow 1993, pg. 194). The impact of financing on the establishment of a market clearing rate for membership shares operates on both the supply side and demand side of the equation. On the supply side, the equilibrium membership price reflects the value of jointly owned assets (the price of membership being the difference between the present value of the LMF's projected net worth and the market reservation wage) with a higher equity to debt ratio driving prices up. On the demand side, limited worker wealth in combination with credit rationing will cause prospective workers to undervalue the membership shares of the LMFs they

wish to join. The main takeaway for our present investigation is that while a *perfect* market for membership rights as proposed by Dow and Sertel will solve the *underinvestment* problem present in LMFs* and PCs*, the establish of a competitive membership market, which is brought as close to theoretical market clearance as possible, depends on the resolution of our final financing problem: which method, non-voter equity, bonds, or quasi-equity shares, leads to the most optimal risk sharing agreement between risk-averse workers and risk-neutral creditors, and hence the most cost-effective solution to financing for the LMF.

3.5 The Commodity theory of the firm and the solution to LMF financing issues

It is now time to tie everything together. In the beginning of our discussion we noted that different conceptions of the firm will give different prognoses concerning the viability of the LMF. Collation/association theories of the firm are largely supportive of worker self-management, emphasizing the reduction in the monitoring-to-effort ratio through mutual monitoring (Bowles and Gintis 1993), the possibility of attaching control rights to the function role of laborer (Ellerman 1975), the inseparability of economic democracy from political democracy (Dahl 1985, Pateman 1970), and the natural rights violation of selling one's labor time for a wage, absolving oneself from the legal responsibility for the whole product (output + liabilities) (Ellerman 1985). In this investigation we took the commodity conception of the firm as our working theory of the firm since it is the theory of the firm implicit in the leading approaches to economic organization (Williamson 1975, 1985, Jensen and Meckling 1976, Fama 1980, Alchian and Demsetz 1972). To recap the commodity theory of the firm treats the firm as a *bundle* of ownership rights which include the following: rights of asset ownership (RAO), rights of residual claimancy (RRC), control rights (CR), and the right to transfer the previous three rights to someone else (RA). These ownership rights can be divided into three components which can be said to characterize ownership of the firm: decision making power (CR), risk-bearing (RRC), and supply of financial capital (RAO) (Putterman 1993). According to Putterman (1988) the commodity conception of the firm implies that the firm is a "..bundle of rights with a marketable value linked to an expected profit stream…" (246). But is this bundling of ownership

rights a conceptual necessity? The link between CR and RRC is the easiest one to make (in fact it is already present in neoclassical conceptions of the firm) and boils down to the fact that the more control is given to the risk-bearers over the risks taken, the less will be the cost of risk-bearing or on the flip side only the risk-bearers as residual claimants will have an incentive to internalize all the social benefits of the firm's productive decisions. The next crucial link to make is between RRC and RAO (and by transitivity between RAO and CR) or between the supply of financial resources and risk-bearing. Up until now we have equated the supply of financial capital with the ownership of capital goods but this requires an explanation as financial capital can easily take the form of debt or leasing contracts rather than equity stakes. So there is a further hidden link here, between RAO and the supply of financial capital. Putterman (1993) provides the following reasons why financial capital will largely take the form of equity financing and hence a stake in the collectively owned capital goods of the firm. Although equity owners are the last to be repaid when firms enter bankruptcy (hence the equation of equity with 'risk capital') and bondholders have the security of a fixed interest rate, equity owners reap all the extraordinary gains from a firm's success while only sharing with bondholders the losses incurred in the case of a default. A moral hazard problem arises when equity holders urge managers to pursue high risk high reward projects while bondholders want to minimize risk, leading creditors to demand higher interest rates the higher the debt-to-equity ratio since the probability of bankruptcy and loss is proportional to the firm's debt level (McCain 1977). Firms who choose 100 percent debt financing will thus find this option prohibitively expensive, a variable which increases the lower the proportion of the firm's assets redeployable (firm specific assets cannot as easily be used as collateral for loans) and the higher the cost of monitoring risk behavior. For these reasons the bearers of risk, or the residual claimants, will usually be the suppliers of finance, and, given that the risk-bearers already own the firm in virtue of the standard neoclassical combination of CR and RRC, they supply finance in the form of pooling funds to purchase *collectively* owned capital goods over which they each of an ownership stake, hence the equation of financial resources with asset ownership. As regards the arguments against leasing the firm's assets these were already referred to in our earlier discussion of the 'service-flow monitoring' argument and the 'quasi-rent expropriation' argument. The commodity theory of the firm, supplemented by the above auxiliary arguments, will hence view the bundling of ownership rights as a theoretical necessity.

The implications for a viable labor-managed sector of the economy are enormous. If the ownership rights constituting the firm cannot be unbundled then even such commodity theories of the LMF as Sertel and Dow's tradeable membership rights would imply that liquidity constrained workers would have to become the suppliers of the firm's equity finance. Given that the holding of a membership right effectively ties the worker to only one firm, the lack of portfolio diversification which would result from a worker's investing a significant portion of his wealth in one firm's equity capital would make equity financing as prohibitively expensive for prospective members as 100 percent debt financing. But as Putterman (1988) points out there is a far deeper problem for LMFs if the bundling claim is correct. If control rights cannot be separated from the supply of equity capital, then the implication is that even if workers, as owners of financial assets, become (part-) owners of their firms and thereby attaining control rights over them, these control rights are attached to the status of asset ownership and have nothing do to with the functional role of working for a firm (Putterman 1988, pg. 263). If we accept this conclusion, then the implication of accepting the *bundled* commodity theory of the firm is that labor-managed firms are in fact a conceptual impossibility and the only kind of firm which can in fact exist, at least on a large scale, are firms controlled by the suppliers of capital or capital-managed firms. We now arrive to our final line of inquiry, specifically: is it possible to believe in the viability of a labor-managed firm while simultaneously holding to a commodity theory of the firm?

3.6 Solving the LMF underinvestment problem

To this question I answer in the affirmative for I believe that one way of creating an LMF is to delink the ownership rights which commodity firm theorists assume are bundled at the conceptual level. To qualify as a commodity it is not necessary that the firm include all four of the aforementioned ownership rights. As Dow (2003) argues the commodification of control rights, with the attached rights of residual claimancy, are a sufficient condition for a firm to qualify as a commodity thus it is no longer true that in order to own a firm one must buy a capital stake (RAO) in the enterprise. The million dollar question is: how is this delinking of ownership rights in an LMF to be achieved in practice? We can now draw the connection between the implications of accepting the commodity conception of the firm and the resolution of the underinvestment issues affecting the LMF. The method of financing employed by the LMF has a direct bearing on the possibility of unbundling the ownership rights which constitute the firm. Referring back to our earlier discussion of underinvestment issues in various kinds of self-managed enterprises, the LMF* immediately stands out as a way to separate control rights from asset ownership. Unfortunately, as the discussion in the previous paragraph shows, full debt financing is not a cost effective solution for an LMF or most organizations for that matter. In addition, LMFs* will still suffer from the inefficient investment problem theorized above. On the other hand, Jossa and Cuomo (1997) believe that the LMF* can be a viable organizational form if certain modifications are made to their internal structure. To reassure creditors and make debt financing an affordable option for workers, Jossa and Cuomo propose two modifications to the structure of the LMF*. First, upon leaving the firm each member of the LMF* retains his share of the debts contracted by the firm during the period he was a partner or, as in the case of Meade's (1972) Inegalitarian Cooperative, departing members compensate the members who remain in the firm. According to Meade (1972, pg. 418) if:

$$E_0 > p\frac{\partial X}{\partial L} > al$$

where $E_0 = $ average earnings outside of the firm and $al = $ the return per 'share' in the firm. The above inequality implies that as long as E_0 is greater than the value marginal product of labor

then there will be a net gain $(E_0 - p\frac{\partial X}{\partial L})$, representing the surplus the departing worker gains relative to the value he produces, which is divided equally among the departing and remaining partners. $(\frac{E_0 - p\frac{\partial X}{\partial L}}{2})$ can be seen as compensation payment for the larger loss $(al - p\frac{\partial X}{\partial L})$ which would result from the worker's departure (since $p\frac{\partial X}{\partial L} > al$, a departing worker would cause the marginal product to rise for incumbent partners but the average dividend to fall). Jossa and Cuomo opt for this first alternative since they conclude that Meade's proposal would be too difficult to implement. This first modification to the LMF* is intended to correct the inefficient investment incentive by forcing departing members to internalize the social costs of their short-sighted investment decisions through the attachment of post-departure debt obligations. Jossa and Cuomo (1997) and Jossa (2014) also propose a second modification to the structure of the LMF*, namely that the state should become 'the owner' of the capital goods in order to reassure creditors by serving as the ultimate guarantors of any debts outstanding after the firm has been liquidated. The question of who owns the firm's capital goods becomes particularly perplexing in light of the peculiar financing structure of the LMF* for the capital goods cannot be attributed to the workers, since in an LMF* they only have a claim on the firm's net income which they forfeit on departure, and neither can ownership of the capital goods be attributed to the financiers, for they at most have rights to interest payments and to recoup loaned capital on maturity. If instead the collective ownership of the capital goods is assigned to the firm *qua* legal entity, then it is unclear what will happen to the firm's property, plant, and equipment if the workers should choose to abandon the firm or declare bankruptcy. Jossa and Cuomo (1997) borrow Grossman and Hart's (1986) and Hart and Moore's (1990) identification of the firm with its capital assets and of the owner of the firm with the owner of the firm's capital assets to draw the conclusion that if the state is the owner of the LMF*'s capital goods then it is also the owner of the LMF*. Jossa and Cuomo's solution to the unbundling of ownership rights is a creative one. What they have done in effect is to empty the concept of 'ownership' of the firm of much of its content. The firm is identified with the RAO, with the corollary that whoever owns the assets (the state in their case) 'owns' the firm, while CR and RRC are awarded to the LMF* partners as *usus fructus* (usage) rights.

What to make of the Jossa and Cuomo solution? First of all it is unclear whether attaching debt obligations to departing members can avoid the delayed asset depreciation

problem of the LMF* since from the outside it may extremely costly if not impossible for the state to correctly evaluate the extent of the reduction in the value of the state-owned capital goods. Depending on how effective the state is in imposing a minimum quota of obligatory depreciation, bondholders cannot rule out the risky scenario where the worker-members' decision to file for bankruptcy leaves them with a significant loss if the level of contractual debt is larger than the salvage value of the firm's physical assets (Gui 1985). A fully bond financed LMF, even if asset ownership is nationalized, may not fully avoid the moral hazard problem facing creditors who require *ex post* credible commitments from debtors. It is worth briefly returning to the producer cooperative (PC), a firm whose defining characteristic is its transfer of the firm's net worth into individually owned internal capital accounts. Although earlier we concluded that PCs were theorized to suffer from the same underinvestment issues facing the LMF*, the PC seems better equipped to procure affordable debt financing since the possibility of internal financing out of the firm's retained earnings can act as a signal to creditors of the debtors' confidence in the investment project's probability of success. Furthermore if in a PC workers can be said to have a stake in the firm's collective capital, then the asset abuse problems facing the LMF* should in practice be minimized. Upon closer inspection however the PC does not differ much from the LMF* in terms of internal structure. In fact as Dow (2003) points out, in practice individual capital accounts are more like loans because the principal is repaid at its book value, not its market value, upon departure and in addition the rates of return on these accounts are pre-determined much like the interest rates on bonds (pg. 48). At first glance it may appear that the PC accepts the view of the firm as a *bundle* of property rights which can be bought as a commodity by purchasing a capital stake in the firm's collective assets. But if we accept Dow's observation then a PC can ultimately be seen as a kind of LMF* where, to use Ellerman (1986)'s analogy, partners deposit money in a bank's savings account who then lend the money back to the LMF* as a loan before permanently moving the savings account directly into the firm (pg. 63). The "net worth" PC partners have a purported stake to his nothing more than a mixture of directly loaned personal money and indirectly loaned dividend deduction masking as internal financing out of the firm's retained earnings. If a PC is nothing more than an a disguised LMF* then it is little surprise that they suffer from the same inefficient investment decisions and potentially the problem of guaranteeing to partners whose capital contributions are all different that the majority of the firm's members will not pursue what they may deem as

excessively risky projects where larger 'creditors' have more to lose than their fellow worker-partners.

Having discarded the LMF* and PC as ineffective forms of establishing worker self-management, it seems that a perfect market for Sertel-Dow membership rights may be the only plausible way to solve the underinvestment issues that plague LMFs already in operation. In addition the S-D solution can harmonize a commodity conception of the firm with worker's self-management by turning control rights (and RRC) into a commodity which is acquired through the functional role of being a worker rather than being attached to the ownership stake of an LMF's collectively owned assets. However, the S-D membership market is a necessary but not sufficient condition for the unbundling of the firm *qua* ownership rights just because membership markets function imperfectly for the reasons discussed earlier. In order for the S-D membership market to be made as "perfect" as possible and serve as a practical vehicle for the unbundling of ownership rights a new class of financial instruments has to be introduced; a financial instrument which can potentially align the interests of firm controllers and financiers without having to combine them in one and the same agent. Such a financial instrument is referred to in the literature as non-voting equity or quasi-equity bonds and various forms of such instruments have been proposed in last decades (see Nutzinger Vanek 1977, McCain 1977, Jay 1980, Major 1996, Waldmann and Smith 1999, Dreze 1993). The common feature of all such quasi-equity proposals is that holders of such instruments are paid a proportion of the firm's residual income instead of a fixed interest rate and hence they participate in the extraordinary gains from successful projects as much as the losses from a potential default. Since the holders of quasi-equity instruments are not given any voting rights in the firm, the principle of conferring control rights solely to labor suppliers is protected. Dreze (1993) spells out the logic of such proposals in the context of what was referred to earlier as the problem of optimal risk-sharing. According to Dreze, non-voting equity or quasi-equity ideally can be seen as a kind of 'funding agreement' whereby "the business risks are born by equity capital, with a stipulation of which risks are, or are not admissible" (1993, pg. 259). Paradoxically however, Dreze concludes that if worker's are to be fully insured against 'firm-specific' risks (risks eliminable through diversification) and share in 'market risks' on a less proportional basis (due to worker risk averseness), the efficient funding agreement would give workers a fixed income (a residual share which happens to be a fixed amount) with the balance of value-added accruing to capital (ibid,

pg. 260). However, in the view of the present author, an agreement where equity is supplied by outside investors conditional on limits being imposed regarding the firm's decision making ability, is one small step away from endorsing co-determination which would not qualify as a pure LMF according to our working definition. A promising approach is that of McCain (1977) who introduces an equity-like 'risk-participation bond' where the return to investors is tied to the average compensation per employee. If B = the number of bonds outstanding each paying a dividend of $d = my$ (where m is a proportion a of average income y) then the income per member can be defined as:

$$y = \frac{pQ - myB}{N}$$

where solving for y yields

$$y\left(1 + \frac{mB}{N}\right) = \frac{pQ}{N}$$

or

$$y = \frac{pQ}{N + mB}$$

From the above it can be deduced that any time workers seek to maximize (y) the return to bondholders (d) is also maximized as a larger (y) now yields a larger (d) in equation $(d = ym)$ where (m) is an exogenously fixed proportion. According to the model the interests of risk-bearers and suppliers of finance are brought in harmony by effectively sharing the risk between worker-members and external financiers. Gui (1985), however, shows that in situations of asymmetric information, workers "can influence payments to bondholders by increasing the probability of liquidation after the contract is negotiated" (Bonin and Putterman 1987, pg. 78). In such a scenario workers could withhold potentially low gross income levels from investors and upon liquidation leave bondholders holding the bag if gross income is well below the level of

contractual debt owed. The eternal problem of labor having to make credible commitments to capital will thus have a tendency to creep in again.

We now come to the end of the line in our present investigation of LMF financing difficulties, which seem all but insurmountable. In groping in the dark for a possible solution to the LMF's mammoth financing issues a modest proposal can be put forth which combines various elements examined in the present study. A possible purely speculative solution is to combine state ownership of the firm ala Jossa and Cuomo (1997), in order to provide guarantees to holders of 'risk-participation bonds' in the case of an unforeseen default. In order to attain the maximum possibility of efficient investment decisions, LMFs would adopt Sertel-Dow membership rights with the added clause that contractual debts cannot be forfeited upon departure. An additional way to guarantee quasi-equity owners, proposed by Schlicht and von Weizsacker (1977) is to allow quasi-equity owners access to the firm's books in conjunction with external auditing of the firm's operations. Major (1996) and Waldmann and Smith (1999) additionally suggest including the value of fringe benefits in the residual used as a basis to calculate the bond yields and linking the participation bond yields to the industry wide index, respectively, to avoid any self-interested remuneration by worker-members. If 'risk-participation' bonds are brought as close to possible to their theoretical squaring of workers' and investors' interests (given the above modifications), and would thus constitute a cost-effective external financing option for LMF members, then a S-D membership market can be brought closer to a market clearing level since membership shares would be made more affordable by the LMF's (using 100 per cent non-voting quasi-equity financing) higher debt-to-equity ratio. Additional institutional 'support structures', as Vanek (1975) calls them, could include a 'wage-earners investment' which can buy risk-participation bonds out of the funds derived from society's wage deductions, and be designed through legislation to encourage the growth of the self-managed sector of the economy. Alternately, Jossa (2014) advocates the creation of a 'second-level cooperative' whose members are individual cooperatives, and would combat the risk diversification problem facing worker-owners by allowing individual cooperatives to buy risk-participation bonds in each other's' enterprises. The above modest proposal is purely speculative but it hints at an important conclusion. If the delinking of control rights from asset ownership, or alternatively the delinking of control rights from the supply of finance, is to be converted from a mere theoretical to a practical reality, then creative and innovative thinking on

the part of proponents of worker-self management is absolutely necessary. For if we accept the conclusions of the commodity theory of the firm as a *bundle* of ownership rights, then any firm which cannot unbundle the aforementioned rights can never be called a *labor*-managed firm, and if LMFs were to try unbundling the package of rights in utter ignorance of the many complex incentive conflicts arising between workers and investors, they would be doomed to the perpetual margins of modern economics and into the dustbins of history.

Concluding Remarks

The present study has concerned itself what in the literature are called labor-managed firms or LMFs. Following Bonin and Putterman such a firm can be defined "…as a productive enterprise the ultimate decision-making rights over which are held by member-workers, on the basis of equality of those rights regardless of job, skill grade, or capital contribution" (1987, pg. 2). Our investigation was divided into three main parts. The first part dealt with the conceptual foundations underlying the debate on labor managed firms. Specifically I focused on the theory of the firm-as-commodity and the theory of the firm-as-coalition and showed how arguments offered in favor of the firm-as-commodity imply a bundling of control rights, residual claimancy, asset ownership, and the right to sell all three. In the second section we analyzed the neoclassical (Ward-Domar-Vanek) models of the LMF demonstrating the various predictions the models made with respect to the allocative efficiency of an economy of LMFs. In the final section of this investigation, we went over the various financing issues affecting LMFs. Financing difficulties, in the form of costly access to external financing, were said to exist at the LMF formation stage and during the course of an LMFs lifespan in the form of underinvestment. These two respective financing problems, one entering at the firm's birth and the other during a firm's active life, are consistent with those general class of hypotheses which seek to account for the rarity of LMFs on the basis on the capital constrains facing workers who are poor and risk averse. I will argue that the this general class of capital constrain arguments provide the causal link from the qualitative asymmetry between capital and labor (capital is alienable while labor is inalienable) to the low emergence rate of LMFs. In the last section of this proposal I analyzed whether equity-like 'risk participation bonds' (McCain 1977) offering variable income obligations to bond holders can directly solve the start-up financing problems facing prospective worker-owners and indirectly solve, when combined with a market for membership rights, the underinvestment issues facing incumbent LMFs. If such a proposal were workable in practice it has the potential to undermine many of the arguments conceptually linking control rights to residual claimancy and asset ownership and hence offer a new conception of what the firm-as-commodity entails.

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