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Temporal horizon and capital maintenance requirement in labour managed firms. The role of equity, loan financing and divisible reserves.

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Abstract.

The accumulation of capital in labour managed firms has been widely studied so far in the specialised literature. Analytical results do seem to clearly highlight a tendency to under-investment in this kind of production organisation. However, institutional aspects have not been thoroughly studied, and a more comprehensive and coherent elaboration may help finding good institutional solutions able to solve the problems highlighted in the first instance by Furubotn, Pejovich and Vanek. The present study just elaborates on the institutional background underpinning the problem of under-investment. Special relevance will be given to the role of property rights, the presence of equity in LMFs, individual appropriation of the net residual calculated at the end of the accounting period, and loan finance by worker members of LMFs.

Key Words: under-investment, property rights, equity, indivisible reserves, divisible reserves .

JEL classification: D23, G32, J54.

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0. Introduction.

The problem of the accumulation of capital in labour managed firms (LMFs hereafter) has been widely studied in the specialised literature. The most part of scholars tend to recognise the existence of a tendency to under-investment in LMFs. However, not all authors agree on the point and some prefer to see its substantial irrelevance. At the empirical level it is extremely difficult to isolate the effects of institutional variables underpinning the existence of under-investment. These institutional variables are usually identified in the property rights setting characterising a certain economic system. In fact, other variables, such as the tax system, can have effects inducing relevant distortion on the basic mechanisms triggered by property rights.

As far as the present study is concerned, our objective is to clearly expound the problem of under investment in LMFs as it was initially highlighted by Furubotn and Pejovich and by Vanek already in 1970. We will also review the main contributions relevant to the issues that will be taken up in the second and third part of the chapter. Starting from the explanation of the reasons that justify the suspect of misallocation of capital funds in LMFs, we will then concentrate our attention mainly on institutional factors. The reason is that, though the problem has been thoroughly studied in the literature from an analytical point of view, no systematic treatment was found concerning the institutional factors at the origin of under-investment in LMF. The most part of studies use to refer to the property rights setting existing in the former Republic of Yugoslavia. However, that system of property rights was largely taken for granted and only its impact on the economic behaviour of productive organisations was considered. The alternatives to the Yugoslav system respecting the basic features of workers' control received marginal attention and no systematic elaboration. Indeed, a comprehensive study of the institutional background characterising LMFs is likely to be of crucial importance since this kind of production organisation should have relevant structural differences with respect to capitalist firms (CMFs hereafter).

The recent flourishing of studies linked to the so-called *property right school* represents a good occasion to reconstruct the problematic introduced by Furubotn, Pejovich and Vanek from an institutional point of view. The central focus of this work just concerns the institutional analysis of the accumulation of capital in LMFs starting from the definition of the ownership of a firm given by Hansmann. We will see that Hansmann's definition allows a more flexible interpretation of the way in which LMFs accumulate capital than the Yugoslav law was used to concede. We will attempt to draw the most important consequences ensuing from the definition and to search for solutions to the many problems that such kind of production organisations find on the road to an efficient allocation of self financed investment funds. All the issues risen will have as their implicit objective the solution of the problem highlighted by Furubotn, Pejovich and Vanek. Vanek's proposals will be taken into consideration, criticised on various points and reconsidered as a good point of departure for further elaboration. In the last part of the work we will give a more analytical form to our argument, highlighting why our institutional proposals can constitute a viable solution to the analytical dead end reached by past studies.

Section 2 is dedicated to the problems stemming out of the existence of a temporal horizon and of the possible imposition of a capital maintenance requirement in LMFs as they are presented in the existing literature. The possibility of a market for membership rights is taken into consideration and judged unsuited as a valid solution. Section 3 deals with an institutional elaboration of the problem highlighted in section 2, starting from the definition of the firm's ownership given by Hansmann. We expound and comment the passages found in the literature which concern the individual appropriation of the net residual. Our aim is to study the possible use of individual shares of the net residual as the financial basis for equity and investments in LMFs. The solutions proposed concern the transformation of individual shares in loans supplied by members. They may be required to contribute to the accumulation of full risk capital in their firm. Various problems linked to the inclusion of individual shares of the net residual in the equity of the

firm are treated. The capital maintenance requirement is considered separately in relation to the same solutions. Section 4 comes back to the analytical problems treated in section 2 and delineates the effects of a more varied institutional structure on the accumulation of capital in LMFs, in the search for a Pareto optimal allocation of investment funds. Since the utilisation of indivisible reserves is allowed, the risk of the existence of self-extinction forces caused by their presence is examined and assessed. The literature shows preoccupation about such forces causing the disappearance of LMFs. Section 5 concludes the chapter with some brief policy recommendations.

2. Temporal horizon and capital maintenance in socialist labour managed firms.

Starting from the contributions by Vanek (1970, 1975) and one paper by Furubotn and Pejovich (1970), the theoretical literature concerning labour managed firms¹ has devoted considerable attention to the problem of the accumulation of capital in this kind of firm. All these works point their attention to the existence of a truncated temporal horizon for worker members in LMFs as a source of inefficient allocation of self financed investment funds. Though some authors (Horvat, 1986a) have preferred not to recognise the relevance of the horizon problem in LMFs, the most part of the literature insists on its importance. Some authors (mainly Furubotn and Pejovich) consider the horizon problem as a fatal and insurmountable one. Their works tend to demonstrate that a socialist LMF will reach a Pareto optimal allocation only in exceptional cases, whilst inefficient allocation of self-financed investment funds will be the normal outcome. The exceptionality of efficient solutions coupled with the uncertainty which characterises investment decisions in market settings and the permanence of worker members in LMFs would represent one of the most relevant explanations of why LMFs are such a rare production organisation in market economies.

2.1. Stating the problem.

Furubotn and Pejovich take into consideration a model of LMF that can be defined socialist insofar as capital assets are intended to be publicly owned, i.e. worker members are not allowed to privately appropriate the net residuals reinvested in the firm. They can only benefit from distributed returns on investments in the form of labour income. In other words, the system can be defined as a kind of *usufruct* of socially owned capital assets conceded by the state to worker members of cooperative production organisations. Though this model of labour managed firm is the one usually taken into consideration by the specialised literature, it must be noted that it by no means represents the only possible institutional model for LMFs. The reason why it is the most widespread in the

¹ In order not to complicate the exposition too much, we will not introduce Vanek's distinction between WMFs and LMFs. The vast majority of the literature uses the label "labour managed firms" to indicate a form of workers' cooperative that self-finances at least partly its investments. For example, Furubotn, Pejovich, Bonin, Zafiris and many others admit self-financing in labour managed firms. Jossa and Cuomo, following Vanek's definition, always distinguish sharply between the two models. Here, it will be sufficient to remind that while the WMF model admits, or better requires, self-finance, the pure LMF in Vanek's definition is completely externally financed. It means that all the net residual is distributed in the form of current labour income and all investment are financed out of loans supplied by both external financial supporters and worker members themselves. We will concentrate most of all on the literature that admits both self-finance and loan finance. Finally, since in the last section we propose a mixed model that requires LMFs to use both kinds of financial sources at least in the general case, confusion would risk to ensue the introduction of Vanek's distinction.

literature may be that it was the official and the only allowed system of capital ownership in the former Republic of Yugoslavia. Many scholars working on the theory of labour management were trained on the study of that social system. In western countries the situation is more varied, and it is not rare to find cases of workers' co-operatives where worker members own individually a relevant part of the firm's capital, though the institutional form of private appropriation varies from case to case. At any rate, in western countries too we can find some features of capital accumulation that strongly resemble the Yugoslav system. For example, a relevant part of the firm's net income is often reinvested in *indivisible (i.e. collective) reserves*. Usually there are limitations to the possibility of reducing the value of the existing capital stock (in Yugoslavia all firms were required to keep constant the book value of their capital stock). Whilst in the Yugoslav case the law clearly stated that capital assets were socially owned and hence workers' collective ownership over firms was ruled out a priori, in the western case the situation is more fuzzy. On the one hand, state ownership cannot be fully endorsed and justified since workers' co-operatives are meant to be independent firms outside state control. On the other hand, workers' members collective ownership over the firm presents other kinds of problems, insofar as rules requiring co-operatives not to decrease their capital stock may imply an at least partial transfer of its net value from one generation of workers to the following ones. This can be one of the main reasons why co-operatives are not considered to be owned by the collective of workers who run them as a going concern. For example, the Italian law on co-operatives seems to rule out the possibility of collective ownership (Genco, 1999, pp. 60-67) though the issue is not settled and continuously debated.

More precisely, the *socialist labour managed firm*, whose most relevant supporters is Horvat (1984, 1986a, 1986b) is a model tailored on the former Yugoslav economic system. Here, all the physical capital was socially owned and worker members of co-operative firms had the usufruct of physical assets. Firms were financed by means of two main channels:

- state bank loans;
- self-finance through reinvested net residuals.

Firms were required to maintain constant the book value of their capital assets. This is exactly the institutional form of self-management taken into consideration in their various publications by Furubotn and Pejovich (Furubotn and Pejovich, 1970, Pejovich, 1974, Furubotn, 1976, 1978, 1980a, 1980b.).

They and some other scholars (Milanovic, 1983) consider the horizon problem a fatal flaw for any kind of self-managed system, insofar as it would constitute an insurmountable obstacle to an efficient allocation of financial capital and investment. Some authors tried to show that the problem pointed out by the two Yugoslav economists is not as severe as it may seem at first sight (Stephen, 1980, Zafiris, 1982, Bonin, 1985, Horvat, 1986a, 1986b, Jossa - Cuomo, 1997, Jossa, 1999) or it is not necessarily a fatal obstacle. Other scholars attempted to devise alternative financial instruments (McCain, 1977, Vanek, 1970, 1977, Conte - Smith - Ye, 1992, Waldmann - Smith, 1999, Albanese, 2000, Mazzoli - Negrini, 2000) or institutional arrangements (Vanek, 1975, 1996, Bernan - Bernan, 1978, Meade, 1980, Dow, 1986, 1993a, 1996) which could constitute viable solutions to the horizon problem.

Furubotn and Pejovich (1970, pp. 443-454) take into consideration an economy in which worker members in co-operatives² can use their savings to make two kinds of investment. The first is an *investment in non-owned assets* made out of profits of the co-operative run by the members themselves. The second is an *investment in owned assets* which workers can finance out of

² As a matter of simplicity I will use the terms (worker) cooperative and LMF (labour managed firm) interchangeably, though the first term is more commonly found in the empirical literature, whilst the second is more widespread in the theoretical literature. Since Furubotn and Pejovich often refer to the specific case of Yugoslav worker cooperatives, the reference to the empirical terminology seems to be justified.

distributed labour income (wages) and save on individual accounts registered at state banks. The fundamental difference between the two types of investment is that the first is not redeemable and does not yield any individual return for each member, whilst the second can be recouped without stringent constraints and yields fixed (positive) returns. Any investment in non owned assets could not be consumed but was to be maintained in perpetuity³. The peculiar property rights setting imposed by the law in Yugoslavia define quite precisely the structure of incentives facing members of co-operatives willing to invest. Workers are induced to compare the convenience to invest in the two types of asset and equalise the returns on the last dollar invested in each type.

As a matter of simplicity, the authors assume that all workers have the same preferences concerning investment projects and that they all expect to remain in the firm for the same amount of time. It is possible to calculate the returns necessary on each type of investment to render workers indifferent between the two. If the time horizon is one year and if bank account yield an yearly interest rate of 5%, then the internal rate of return (IRR below) on a one dollar investment in non owned assets necessary for equivalence will be 105%. This comparison implies that for a one-year investment in non-owned asset to be selected, the co-operative will require a return more than double the initial expenditure. If the temporal horizon is longer than one year, the situation does not improve considerably. The necessary IRR for investments planned on 2, 5, 10, 20, 30, 40 years will be, respectively, 54%, 23%, 13%, 8%, 6.5%, 5.8%. Investments in the two types of assets with a similar rate of return will be nearly equivalent only if workers expect to remain in the co-operative for a very long period. However, if we drop the assumption of identical temporal horizon for all workers and take into consideration uncertainty about the expected permanence in the firm, a horizon superior to 20 years will be rare. The reason is that if worker members decide democratically about investment, the relevant temporal horizon will correspond to the median member's one and not to the youngest'. When age distribution across membership is evenly distributed the temporal horizon cannot be superior to 20 years and may be much shorter if some degree of labour turnover is present in the economy.

It is easy to check the numerical results using the formula:

$$PV_{LMF} = a_{LMF} \sum_{t=1}^T \frac{1}{(1+i)^t} = 1 \quad (1)$$

where PV_{LMF} is the present value of the self-financed investment, a_{LMF} is the return yield by the investment in one period of time, T^4 is the temporal horizon that, if not assumed to be the same

³ The official motivation for this requirement was the willingness to increase overtime the socially owned stock of capital, intended to be at the disposition of the whole people of Yugoslavia. However, it is important to inquire if, in the absence of the capital maintenance requirement, the systems would have been able to increase its capital stock overtime anyway. Unprofitable and not expanding firms may have been induced to consume their capital stock, endangering future employment. Since the Yugoslav system was a mixture of decentralised market exchange and centralised control of aggregate production, central authorities were wary of all round market relationships. Consumption of capital was considered to be particularly dangerous because it would have implied potential unemployment and switching of workers from unprofitable firms to more profitable ones. Such kind of turbulence would have strongly reduced the central authorities' capability to control and direct aggregate production.

⁴ T is an intrinsically uncertain variable. It could be considered dependent on various other variable endogenous at the level individual preferences and the economic environment at large. For example, the alternative job opportunities available for worker members at a given moment in time tend to shorten T , and this fact is likely to increase time horizon problems for LMFs working in a turbulent and dynamic economic environment. It may not be a case that LMFs are particularly rare in systems characterised by tough competition and labour marker flexibility, such as the Anglo-Saxon ones. On the other hand, investments in human capital specific to a certain firm will tend to widen T since a worker that has accumulated firm specific human capital will have difficulties in finding comparable job opportunities in other firms. Finally, many other unpredictable events can well have an impact on T rendering it all the more uncertain. We don't aim at studying the problem of the accumulation of capital with an endogenous T . Hence, we choose to consider the above cited variables as endogenous to the system at large, but beyond the control of single

for all associates, will correspond to the temporal horizon of the median members, i is the rate of time preference which will be equal to the interest rate paid by bank deposit (owned assets in our case)⁵. In the case of a 1 dollar investment, a is equal to the IRR gross of depreciation. If the investment is to be undertaken, its present value needs to equal its initial value (1 in our example).

The same results are obtained by calculating the result of the preceding sum, which yields:

$$a_{LMF} = \frac{i}{1 - (1 + i)^{-T}} \quad (2)$$

Formula (2) clearly shows that a_{LMF} is always greater than i and approaches i as the members' temporal horizon increases and tends to infinity (which obviously cannot be the case).

To Furubotn and Pejovich, in the presence of the set of constitutional property rights present in Yugoslavia, co-operatives will self-finance investments only if returns are well above the market interest rate paid on bank deposits. Investments in productive assets will be positive, but the system will allocate investment funds in an inefficient way. In other words, the system will not reach the Pareto optimal allocation that is obtained when the last dollar invested in productive assets yields a return equal to the market interest rate (in our case 5%). In this respect LMFs will be Pareto dominated by capitalist firms (CMFs below) because share ownership in CMFs guarantee the acquisition of returns arising out of self-financed investments virtually *ad infinitum*, i.e. without any temporal horizon up until the duration of the firm itself. CMFs will select all the investment projects which yield a return superior or equal (where equality is obtained for the marginal investment) to the market interest rate. This result will be obtained in the absence of disturbing factors. The economic duration of investments can be limited because of wearing out of physical assets. In this case, CMFs will self finance investments only when their rate of return gross of depreciation is higher than i , just to recoup the initial sum invested. Scarcity of available self-financed funds will increase required returns as well. The reason is that worker members will trade off present and future consumption increasing investments only in the presence of higher returns. Finally, required returns will be higher than i when self-financed investments in the firm are riskier than other investments available on financial markets (e.g. state bonds). As a simplifying benchmark for comparison, we will consider equality between the rate of return on investments self-financed by CMFs and the market interest rate.

When markets for residual claims of CMFs are imperfect (mainly in the case of non regulated market, but nothing guarantees perfection in the case of stock exchanges), share prices may take imperfections into account and apply a discount rate to the real value of shares. The assumption of infinite temporal horizon and perfect shares markets is obviously a simplifying one, but heuristically useful. For example, transaction costs can strongly reduce the smoothness of exchanges, but the institutional differences between CMFs and LMFs remain relevant.

Furthermore, in CMFs we do not find the barriers constituted by the personal links which ties together worker members and residual claims in LMFs. In the latter type of production organisation residual claims are likely not to be marketable for two main reasons:

- i) if a member sold her residual claims during the period she works in the firm, she would not have an interest any more to produce a surplus;
- ii) since her stay in the firm is necessarily limited and she can quit at any time, it may be impossible to assign a meaningful value to her residual claims.

worker members and LMFs. Because of these reasons, T will be assumed to be a parameter of the problem, exogenous to the problem at hand.

⁵ Again, the two rates do not need to be equal above all in cases where financial market present imperfection (Yugoslav financial markets, where the rate of interest on bank loans was decided administratively, could not be considered perfect markets). The equality will be obtained only at equilibrium and it is never guaranteed.

These limitations to marketability of residual rights in LMFs are caused by the personal features of the relationships which link members and the firm they work in. The same limitations are not present in CMFs where shares are not necessarily linked to the personal features of shareholders.

Marketability of residual claims in LMFs could be reintroduced if a market for membership rights were constituted. It would tie residual claims not to the person of a singular member, but to the membership position itself. It could indeed eliminate the problem constituted by the existence of a temporal horizon for worker members in LMFs and by the personal relationship of worker members with their firm (Dow, 1996). An incoming member would buy the membership rights of an exiting one at the present value of future returns on the membership position. This possibility will be considered and criticised in section 3.2.3. Here it is important to underline that if a market for membership rights is not constituted, the presence of a temporal horizon for worker members in LMFs becomes relevant, just because residual claims are not marketable.

Furubotn and Pejovich's conclusion is that CMFs will extract all the possible rents arising out of the firm's operation and will have an incentive to obtain these results by using their own funds. LMFs will instead tend to select only the projects with the highest returns down to the rate of indifference between investments in owned and non owned assets a_{LMF} (which we can also name *hurdle rate*). Total returns on productive assets in LMFs will be inferior to the socially optimal returns obtainable by CMFs. We cannot conclude that the results reached by Furubotn and Pejovich have general validity, since they are tied to a very specific institutional setting. However, they can represent useful heuristic starting points for further research. Indeed, a rich literature stemmed out of their model.

The limited convenience for LMFs to reinvest their own profits could be balanced by the access to external financial support in the form of bank loans or bonds. However, the comparative disadvantage with respect to CMFs can never be eliminated insofar as limited self-financing means a reduced capability to build equity and, therefore to guarantee loans with a collateral (Vanek, 1970, pp. 317). LMFs will face a double disadvantage on financial markets: the first deriving from their unwillingness to reinvest their net revenues in the firm up to the Pareto optimal frontier and the second arising out of their limited capability to guarantee loans.

The empirical evidence is quite supportive of these theoretical conclusions since Yugoslav firms showed a strong propensity to recur to loan financing, that was usually easily supplied by state banks (Horvat 1986a, pp. 25-26, Milanovic, 1983, p. 333). Also in western countries for example in Italy, there is evidence of the tendency of co-operatives to have a higher debt-equity ratio than capitalist firms (Berman - Berman, 1989).

A general tendency to under-capitalisation would constitute a signal of the inability to fully replace equity with bank loans or bonds. Berman and Berman (1989) find evidence of a lower capital intensity of the Plywood cooperatives of US Pacific Northwest with respect to comparable capitalist firms. Furthermore, cooperatives usually self-select themselves in low capital intensity sectors (Ben-Ner, 1988). Not the same results are valid for the Mondragon cooperatives in the Basque regions (Thomas - Logan, 1982). There are various difficulties facing empirical testing of theoretical results. For example, the tax system can cause strong distortions. If current labour income is taxed, but reinvested profits are not, optimal choice of investment will shift in favour of future consumption and the Furubotn - Pejovich effect may result to be hidden even when present (Horvat, *ibid.*, pp. 25-26). If central authorities control the credit market and fix administratively the interest rate on loans below the free market rate, firms will tend to overuse the credit market, the more so in the presence of limited liability and soft budget constraints (Kornai, 1986, Buck - Wright, 1990). In this case, firms may come out to be over-capitalised at the expenses of current income even when they do not have sufficient incentives to invest the optimal amount of realised profits. Though the issue of external loan financing is a relevant one, it is not our objective to thoroughly analyse it here. We will keep on concentrating on the way LMFs use or should use their

realised profits in order to fund investment projects. The reason why the problem of self-financing and investment of internal funds needs to be treated before the one of external financing is that an LMF that is completely externally financed is not conceivable, since it would lack the necessary amount of equity. Various problems can be imagined to arise: the dilemma of the collateral (Vanek, 1970, 1975), the agency problem (Jensen and Meckling 1976, 1979), and the law of increasing risk that would require an increasing remuneration for external loans as the debt-equity ratio increases (Drèze, 1976, Schlicht - Von Weizsacker, 1977, Fanning - McCarty, 1983, pp. 137-139, Gui, 1985). The analysis of external finance needs to be added after the problems concerning self-finance have been settled. Here it will be sufficient to say that the two forms of finance are likely to be substitutable only to a limited extent. In general they can be thought to be complementary and not substitute. A firm, both LMF and CMF, will be able to obtain external finance only if it accumulates equity and collateral.

Among the papers that elaborate on the problem of under-capitalisation in LMFs from a theoretical point of view, the one by Zafiris (1982) and Bonin (1985) are worth mentioning. The book by Jossa and Cuomo (1997) and Jossa (1999) give a valid review of the literature and present a comprehensive and detailed exposition of the theoretical aspects.

2.2. The temporal horizon for members of LMFs and its impact on investment decisions.

Zafiris and Bonin presents contributions which elaborates both on the horizon problem and the capital maintenance requirement.

The capitalist firm will invest 1 dollar in a certain project if:

$$PV_{CMF} = a_{CMF} \sum_{n=1}^N \frac{1}{(1+i)^n} = 1 \quad (3)$$

N is the duration of the investment project that in CMFs can be taken to be perpetual as a simplifying assumption. The only difference with respect to (1) is that this time N does not represent the temporal horizon of shareholders. In fact, even if they have one, they still have the possibility to sell their shares when they do not have any more the intention to remain associates of the firm. As we saw, this possibility is likely to be precluded to members of LMFs.

If $N < T$ the formulas concerning LMFs (2) and CMFs (3) will be equivalent. In this case both kind of firms will require a rate of return $a_{LMF} = a_{CMF}$ in order to pursue a certain project. It is only when $T < N$ that the two formulas are not equivalent any more. LMFs will take into consideration a shorter horizon, that is T . In CMFs we do not have such an horizon, and the relevant time interval is still N . Whilst T is necessarily limited, N does not have a precise upper bound and, in principle, can be considered infinite or extending up to the whole future life of the firm. CMFs will reach the Pareto efficient frontier where $a_{CMF} = i$ in the absence of depreciation, scarcity of investment funds and risk differentials. In other words, a CMF will invest up the point at which the internal rate of return on investment is equal to the market interest rate, where i is also interpreted as the rate of time preference between present and future consumption. The same result is not guaranteed in the case of LMFs.

We can now take into consideration the present value of 1 dollar invested in bank deposit:

$$PV_{BA} = i \sum_{t=1}^T (1+i)^{-t} + (1+i)^{-T} = 1 \quad (4)$$

The sum is equal to 1 whatever the value of T and i . Indeed, (4) is an identity, not a equilibrium condition. The present value of one dollar deposited in a bank account, yielding an interest of i for T periods of time and withdrawn at time T is 1.

By equating (2) and (4) we can calculate the value of the difference between a_{LMF} and i .

$$d = a_{LMF} - i = \frac{(1+i)^{-T}}{\sum_{t=1}^T (1+i)^{-t}} = \frac{i}{(1+i)^T - 1} \quad (5)$$

The difference between a_{LMF} and i depends inversely on T and can be interpreted as the net rate of depreciation to be applied to an investment of one dollar over T periods necessary to completely recoup the sum outstanding.

In figure 3.1 we can see the different equilibria concerning a CMF and an LMF. Curve II and II' represent the demand for investment and is coincident with a curve representing the marginal efficiency of capital. Curves SS and S'S' represent the supply of saving, i.e. the required rate of return inducing private savings to be invested in a certain project. More specifically, the curve S'S' represent the rate of return necessary to induce a LMF to self-finance its investment projects (a_{LMF}). SS is instead the rate of return that renders a project convenient to a CMF, namely a_{CMF} . As we have shown, a_{CMF} is always inferior to a_{LMF} . The vertical difference between the two rates of return equals d . The rate of return indicated by i is the bank interest rate. The supply curve of self-financed investment funds of a LMF is flat at the level constituted by the rate $i+d$, in the absence of other disturbing causes. When the returns on investment is inferior to i both the LMF and the CMF does not invest because deposits on bank accounts will yield higher returns. When the return on investment is comprised between i and $i+d$, only the CMF will invest an amount of funds equal to O_f corresponding to point F. The horizontal line indicated by $i'=i+d$ represent the minimal rate of return that will induce a LMF to invest. On this line the LMF will be indifferent between self-finance and bank deposits. For values of a_{LMF} slightly superior to i' the LMF will self-finance an amount O_g of investment. When return increase over i' the equilibrium level of self-financed investments for the LMF is defined by the intersection between the i' BS' and the demand for investment curve II. The equilibrium is determined at point C and an amount O_c is financed. In the case of CMF, when the relevant curve of demand for investment is II, it finances an amount of investments O_e at point E. The flatter the supply curve of investment SS, the nearer to i the returns on investment financed by the CMF. If the supply of investment funds is perfectly elastic, the CMF reaches the equilibrium point E, where returns on investment equal to i . When the curves SS and S'S' bend upwards investment funds are scarce. This situation is likely to be the rule. In this case Both CMFs and LMFs will require higher returns in order to self-finance investments.

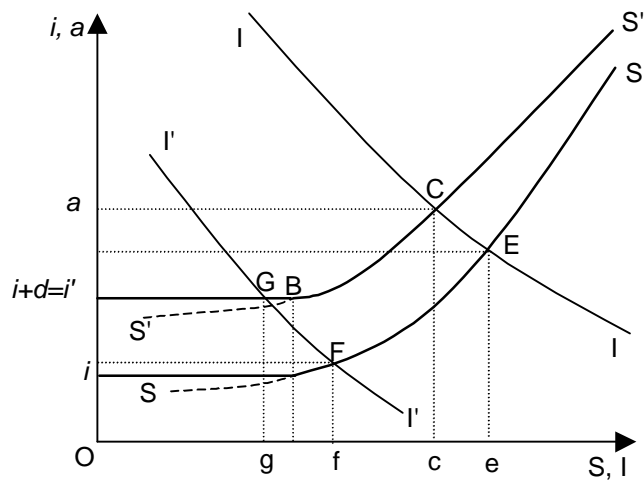


Diagram 1: the existence of a temporal horizon for worker members of LMF will induce a reduction in the supply of self-financed investment funds at any level of returns on capital. Members in LMF will require a higher rate of return (a) than shareholders in CMF in order to self-finance investments.

It is clear that the equilibrium reached by the CMF will be optimal, given the inclination of the SS curve. The LMF will tend to invest less the lower is the marginal efficiency of capital and the shorter the temporal horizon of the median member. However, an important role may be played by *uncertainty*, for example about the temporal horizon for associates. Uncertainty about the horizon may cause a further increase in the difference between a_{LMF} and i when members of LMFs are risk averse. Even if situations in which the amount of investments self-financed by the two kinds of firm are similar may be numerous, we cannot exclude a large number of cases in which CMFs enjoy an important advantage, due to the virtually infinite duration of the temporal horizon.

We can also expect that the advantage will be greater in all those sectors in which it is difficult to predict when returns on invested funds will be more conspicuous. When it is impossible to predict if returns on investments will come by before or after the duration of the expected stay of a member in a LMF and when the expected stay is itself uncertain the obstacle becomes more difficult to overcome. In fact, workers may consider other job opportunities at any time or may find a job in a LMF not corresponding to their expectations.

2.3. The market for membership rights.

One of the main proposals directed to the resolution of the problems just highlighted is the introduction of a *market for membership rights* (see Schlicht - von Weiszacker, 1977, Dow, 1986, 1993b, 1996a, 1996b for a defence of this possibility and Putterman, 1993, Nuti, 1996, Moretto – Rossini, 1999, for a more critical stance). If worker members in LMFs had the opportunity to freely trade their membership rights as residual claimants on the net revenue of the firm, they could sell those rights upon quitting the firm or upon retirement. The price would be the present value of future returns on the rights they are selling. This way the temporal horizon for members of LMFs would be extended to infinity and all the problems just highlighted would disappear.

Theoretical speculation (Putterman, 1993, Nuti, 1996, Rossini – Moretto, 1999) and empirical evidence (Smith, 1983) show that there can be serious problem concerning the very existence and the implementation of a market for membership rights in LMFs. Members of LMFs cannot freely trade their membership rights in the firm. The market for membership rights in LMFs is often excluded at the statutory level, insofar as membership rights are considered to be personal rights and inalienable for this reason (e.g. the in the group of Basque co-operatives in Mondragon). In other cases (e.g. the American co-operatives of Pacific Northwest at Plywood and in Italy) the market is allowed. At any rate, it always presents strong imperfection due to three main reasons:

- new members cannot be chosen at the discretion of exiting ones. Newcomers will need to be accepted by incumbent members. Search and matching costs will be relevant or prohibitive if specific personal profiles are expected. The personal nature of social relationships that characterise LMF has a determinant weight in this respect. Similar constraints can be found in CMFs as well, for example in the form of preference rules, mainly when dimension of the firm is limited. However, controlling shareholders in CMFs can more easily sell minority packages of shares, since their weight can be negligible. In LMFs the rule "one member, one vote" gives the same amount of power to each singular member of the firm that, being necessarily an insider, will have to interact with the other members. The importance of personal compatibility is reinforced with respect to CMFs;
- new comers buy a bundle of rights that is linked to the job sold by the exiting member. However, the value of the job is not independent on the performance of the incoming member. This means that the price paid by new members can be almost meaningless, since it should be based on the prediction of the performance of the new member, hence independent of the expected performance of the exiting member. The future performance of a new member, even if

we assume that the kind of job she will perform is known in advance, is still more difficult to predict than the performance of a member who already has a certain seniority in the firm;

- in capital intensive sectors, the present value of future returns for each singular bundle of membership rights increases sharply with respect to labour intensive sectors when the new member pays the full price of the job she is buying, capital equipment included. The price can be prohibitive if compared with the average wealth possessed by incoming members in LMFs. In those cases, aspiring members will need to be financed by loans. Financial institutions may be reluctant to anticipate important sums of money given uncertainty about both the performance of the firm as a whole and the future income stream of the specific member to be financed⁶.

To sum up the whole argument in sections 3.2.1 to 3.2.3, we have a situation of nearly absence of tradable claims over the net future income of the firm. When these claims exist, they can be exchanged with difficulty, reflect very imperfectly the present value of future returns on membership rights and can be conceivable only in labour intensive sectors. Uncertainty concerning the duration of investment, the timing of their returns, and the expected stay of worker members in the firm tend to shorten workers' temporal horizon in the presence of risk aversion. The conclusion can be that LMFs can be found to be numerous in labour intensive sectors and in sectors where there is not strong uncertainty about the entity and the timing of returns on investments. The empirical evidence seems to support these conclusions (Smith, 1992, 1994). All the listed elements can impact in a determinant way on workers' ex ante decisions about what kind of firm to join. It does not seem unreasonable to state that many persons could desire to join an LMF, but their actual decisions result to be different. The issues treated in this section can be considered important ones in explaining why so few LMFs are observed in reality, the high number of persons appreciating the model notwithstanding.

2.4. The capital maintenance requirement.

We can start our discussion of the capital maintenance requirement (CMR hereafter) from a quotation:

... a close connection can also be observed, at the empirical level, in the form of a negative correlation between the extent of appropriability rights and capital maintenance obligations in various economic regimes... (Zafiris, 1982, p. 64).

The empirical evidence is strong indeed. The Yugoslav law prohibited firms to reduce the book value of their capital and the existing stock of physical assets was entirely socially owned, hence not even a limited part of it was appropriated by worker members. In western countries rules may be slightly less rigid, but limitation to capital consumption are present as well. "In France, co-operative firms are generally prohibited from reducing capital to below a certain proportion of the highest value ever attained" (*ibid.*, p. 63). In Italy, co-operatives cannot distribute profits individually any time equity is reduced because of losses until the moment in which the highest amount of equity reached in the past is attained again.

⁶Uncertainty about the future performance of the firm can compress the value new comers will accept to pay for membership rights. The effect of uncertainty on the value of membership rights may have a strong impact on the price. However, a similar problem is present also as long as the price of shares of CMFs is concerned. Hence, this problem would not constitute a peculiar obstacle characterising the market for membership rights of LMFs.

Various authors (Furubotn and Pejovich, Bonin, Zafiris), see in the CMR a necessary constraint deriving from the lack of incentives to invest funds in LMFs, given the peculiar property rights characterising the Yugoslav system and various other co-operatives movements. The absence of that requirement could induce many firms to consume capital and, eventually, shut down operations. Stock of capital variability would also endanger the capability of central authorities to direct aggregate production in a system intended to be guided by indicative planning such as the Yugoslav one.

Authors more supportive of the Yugoslav system (mainly Horvat, 1984, 1986a, whilst Vanek assumes away the problem by imposing an infinitely lived capital, i.e. a depreciation rate equal to zero) see in the capital maintenance requirement the expression of a socialist normative principle. Accumulation of physical assets in socialist economies needed to continue indefinitely in order to increase the social welfare of future generations, hence reduction of the capital stock could not be granted. Given the relevance of the issue, it is important to nail down a precise analytical scheme concerning the capital maintenance requirement.

Following again the articles by Zafiris (1982) and Bonin (1985), we can recall the centrality of formulas (1), (2) and (5). The value of a_{LMF} can be interpreted as the annual rate of depreciation necessary to recoup the entire value of one dollar invested in the collective reserves of LMFs.

If we assume that:

- i) there is no capital maintenance requirement;
- ii) all workers in a LMF have the same temporal horizon;
- iii) the firm does not expand, hence the temporal horizon of the whole membership shrinks overtime.

an LMF that obtains a return of a_{LMF} on a one dollar investment will shut down operations exactly at the end of workers' temporal horizon. There would not be loss on funds invested. As we saw, such firm would not behave optimally when $T < N$ and because of the impossibility to market residual claims over future returns on membership positions.

If we drop the first assumption and introduce the CMR, we obtain an important change in the constraints faced by the working collective. The required returns on a one dollar self-financed investment would not be expressed by (1) and (2) any more. The required returns on investments would be:

$$PV_{LMF} = a_{LMF} \sum_{t=1}^T (1+i)^{-t} = 1 + (1+i)^{-T} \quad (6)$$

The present value of one self-financed dollar invested in the firm at time zero this time will need to equal 1 plus the present value of the cost of replacement at time T of the assets bought at time O. If we calculate the value of (6) we find:

$$a'_{LMF} = i \frac{1 + (1+i)^{-T}}{1 - (1+i)^{-T}} = i \frac{(1+i)^T + 1}{(1+i)^T - 1} \quad (7)$$

a'_{LMF} is the rate of return needed to depreciate the existing capital stock and to respect the CMR. If we know calculate the value of a'_{LMF} net of the rate of time preference i , we obtain:

$$a'_{LMF} - i = \frac{2i}{(1+i)^{-T} - 1} = 2d \quad (8)$$

The difference between the rate of return required on a one dollar self-financed investment and the rate of time preference in the presence of a CMR is double the value of d . We recall that d is the spread between the hurdle rate taken into consideration by LMF and the market interest rate that constitute the minimum rate of return that CMFs would accept for investments. It is evident that the burden imposed on LMFs by the capital maintenance requirement is a heavy one, when assumptions (ii) and (iii) are fulfilled. Figure 3.2 shows that the equilibrium point for a LMF shifts from point B to point C if we add the CMR. The disadvantage with respect to the CMF and the misallocation of investment funds increases.

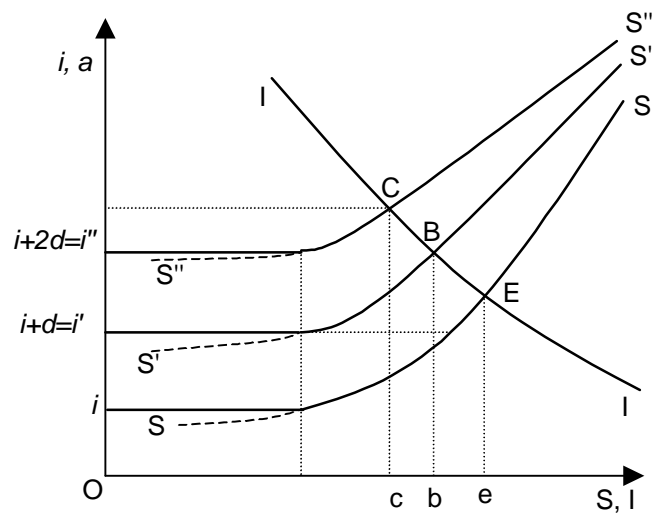


Diagram 2: marginal efficiency of capital and supply of self-financed investment funds for an LMF facing a stringent *capital maintenance requirement*. When the temporal horizon is that same for all members and the firm does not expand, members' temporal horizon will decrease over time and the capital maintenance requirement will cause a further reduction in reinvestment compared to the CMF case.

However, it should also be clear that this result depends crucially on assumptions (ii) and (iii), i.e. all worker members have the same temporal horizon and the firm does not expand. If we drop these assumptions and allow the firm to pursue new investment projects and expand membership overtime the outcome becomes more uncertain. An expanding firm will be able to increase its membership and its capital stock respecting the CMR even if the necessity to replace all assets is not explicitly taken into consideration. In the case of firms in expansion, not the capital maintenance requirement, but the temporal horizon may have worse consequences, if investments over the long run are advisable.

Uncertainty can play an important role in the case of the CMR as well. For example, worker members may find a certain investment project convenient even taking into consideration their temporal horizon and therefore the constraint given in (2). However, they may decide to renounce to pursue the investment project and expand membership because they do not have clear expectations about the firm's future capability to sustain an increased dimension. If they do pursue the project, they may find themselves in the future facing the necessity to keep constant an increased stock of capital assets. If this is the case, they will take into consideration constraint in (7) that is more restrictive. They will pursue a less expansionary and less efficient investment policy. Therefore, in the case of expanding firms too, the CMR can have negative effects on decisions about investment programs.

To sum up the argument in the whole section 3.2, the existence of the temporal horizon and the formal imposition of the capital maintenance requirement can represent a problem for LMFs. The temporal horizon will be a serious obstacle when long term investments are necessary and when there is uncertainty about the entity and the timing of returns on investments. In principle, there would be many instances in which a limited temporal horizon would not constitute a serious obstacle. If workers could easily predict the duration of their stay in the firm and if returns on investment had precise quantitative and temporal features, the most part of investment projects might fall in the useful range.⁷ However, since the most part of workers may be uncertain about their expected stay in the firm⁷ and since the most important variables concerning investments are uncertain as well, LMFs can often be selected against. A process of self selection is likely to ensue. LMFs will be chosen by individuals that put a value on industrial democracy and that expect to remain in the same firm for a period long enough.

As far as the capital maintenance requirement of the kind we found in Yugoslavia is concerned, it will be important in situations in which members of an LMF do not intend to pursue expansionary investments. If their temporal horizon shrinks overtime, they will have to pay double in order to leave the value of the capital assets unchanged when quitting the firm. The situation just highlighted may be an unusual one. However, in many instances the expansion of the firm may not be sufficient to justify the respect of the CMR. Furthermore, it is evident that the requirement will become particularly cumbersome when the firm undergoes losses. In such cases keeping constant the value of capital assets may become impossible in the absence of subsidies. Less rigid constraints, such as the ones present in French and Italian cooperatives seem to be better suited to face losses and capital consumption.

⁷ Even if a worker has an ex ante intention to remain in a certain firm for a long period of time, she may find ex post an unpleasant working environment or other problems. For example, she can be forced to quit the firm for unpredictable events. In such cases, investments done in the past will become a heavy burden. The worker may feel forced to remain in the firm in order to recoup money invested and contrary to the choice she would have made in the absence of the above cited constraints. Again, anticipating this kind of negative ex post realisation, she may well choose to discount her expected stay in the firm or not to join the firm altogether. Finally, once money has been invested, the impossibility to recoup it can give occasions to hold up workers in difficult situations since they will be reluctant to quit in the near future.

3. Proposals of institutional solutions.

3.1. The definition of ownership.

One of the most interesting aspects of Furubont and Pejovich's seminal contribution was the explicit reference at the institutions characterising the Yugoslav economic system. The kind of property rights imposed by law in that country had major effects on the allocation of capital and on economic performance. The literature concerning the specific analysis of that system is already very wide, there can also be the suspect that it is outdated nowadays. However, in recent years we have witnessed a renewed attention to issues concerning property rights in general and the property of the firm in particular, not restricted to a specific national system or type of production organisation. Grossman and Hart (1986), Hansmann (1988, 1996), Hart (1990), Hart and Moore (1990, 1996, 1998), produced various contributions in which they take explicitly into consideration property rights, which they identify as the main building block of economic activity. Property rights influence crucially ex ante incentives to invest in production, control of economic activities, ex post incentives to exert effort and ex post distribution of monetary proceeds. Many of their contributions enclose a comparison between capitalistic (often defined *outside ownership*) and co-operative ownership (Hansmann, 1988, 1996, Hart and Moore, 1990, 1996, 1998)⁸. They highlights the many advantages and problems linked to cooperative ownership. We will not review these works here. However, we will start from the definitions of ownership introduced by these authors in order to look for institutional solutions to the problems highlighted in the preceding section.

Hansmann dedicates an important part of his work to cooperatives and tries to explain the reasons of the relative paucity of their number relative to capitalist firms. He proposes a multi-stakeholder model where production organisations in general are characterised by two kind of cost: costs of market contracting and costs of ownership. Any specific organisation will chose the institutional form that minimises the sum of the two types of cost. The *costs of market contracting* are linked to market power, ex post market power (lock-in), and asymmetric information. The *costs of ownership* derives from monitoring, mechanisms of collective decision and risk bearing. The author discusses the relative advantages and disadvantages of co-operatives with respect to capitalist firm. He concludes that the main disadvantages explaining the low numerousness of co-operatives are heterogeneity of interests and high contracting costs for capital.

He (1988, p. 269) defines the ownership of a firm in the following way:

A firm's "owners" as the term is conventionally used ... are those persons who share two formal rights: the right to control the firm and the right to appropriate the firm's residual earnings. ... In theory, the right to control and to residual earnings could be held by different persons. In practice, however, they are generally joined, since those with control would otherwise have little incentive to use their control to maximise the residual earnings. To be sure, if all aspects of control could be contracted for ex-ante, then this problem would not arise. But control can usually be thought of as authority over precisely those aspects of firm policy that, because of high transaction costs or bounded rationality, cannot be specified ex-ante in a contract, but rather must be left to the discretion of those to whom the authority is granted.

In Hansmann's definition, ownership is to be attributed to the category of "*patrons*" which will minimise the sum of market contracting and ownership costs. The patrons of a firm are

⁸ Among the studies concerning property rights in co-operatives it is also important to recalls the works by David Ellerman (1982, 1984).

categories of individuals that have a continued relationship with it and an interest in its operation. It can be synonym of *stakeholders*.

If we compare the general definition of ownership given by Hansmann with the description that Furubotn and Pejovich give of the set of property rights existing in Yugoslavia, we can extrapolate interesting elements. First of all Hansmann requires residual rights of control and the right to the appropriation of the residual⁹ to be coupled together. The latter requirement was fulfilled, but not completely. Worker members in Yugoslav cooperatives could not privately appropriate the funds invested in the firm. They could only use the firm's capital equipment and obtain a current income from the assets present in the firm at a certain point in time (usufruct). As far as residual rights of control are concerned, they too were assigned to workers only imperfectly (Lydall, 1988). They did elect their representatives on the board of directors of the firm. However, some of the components of the board were appointed administratively or by unions and used to have a relevant degree of influence over the strategic decisions taken. It means that worker members' autonomous decisions were tempered by central indicative control.

As far as the ownership of physical assets is concerned, Hansmann's definition does not entail in any sense social ownership of the means of production in cooperatives. Social ownership of the means of production might be justified if it allowed the minimisation of the two categories of cost. However, it is quite hard to think of society at large as the owner of physical assets which would minimise costs of market contracting and costs of ownership for all categories of production organisation and in all sectors of production. The costs of asymmetric information, monitoring and collective decision making are likely to be particularly high in the case of social ownership, though the cost deriving from market power and risk bearing may be lower. Social ownership may be the best solution in some cases (e.g. natural monopolies). However, there will be other cases in which the category of patrons able to minimise the sum of the two categories of cost is worker members. In the latter case, Hansmann's model demand associated workers in cooperatives to be the owners of the firm. It is just the hypothesis taken into consideration in this work.

In our work it is crucial to underline that Hansmann's definition does not exclude in any sense the individual appropriation of the end-of-the-period net residual, which can be used to self-finance investments. It not even excludes the reduction of the stock of physical assets collectively owned by worker members of a cooperative, i.e. violations of the capital maintenance requirement. Hence, we can work under the hypothesis that the two constraints introduced in the previous section are removed. We can imagine cooperatives in which self-financed funds used for investments are appropriated by worker members at some point in time and cooperatives that do not need to respect the capital maintenance requirement. They would still be workers' cooperatives as long as worker members have residual rights of control and are entitled to receive the net proceeds of the firm. Members' residual control in LMFs is usually thought to be fulfilled by the rule "one member, one vote" and we have already briefly discussed this rule in the previous chapter. At any rate, the governance of LMFs is outside the scope of the present study.

Members' right to appropriate the residual in its purest version implies that the remuneration of capital is contracted in advance of the operation of the production process. The reason is that there cannot be two residual in a unique production organisation and, if the unique residual is appropriated by labour, it cannot be appropriated by capital. If labour as a factor of production is entitled the residual variable of the firm's revenue, then the residual has the economic nature of labour remuneration. The remuneration of capital is not a residual variable any more, as it happens in CMFs, hence it needs to be a cost subtracted from the residual and contracted ex ante. The cost of

⁹ In the remainder of the chapter, the terms "residual" and "net residual" will often be used. *Residual* will generally indicate what Meade (1980, pp. 89-93) names *total net labour earnings*, that is the value added of the firm less the cost of capital. *Net residual* will instead be the label for the value added less the cost of capital less current labour income (a variable that roughly corresponds to wages in CMFs). Current labour income is the salary worker members pay themselves during the accounting period. The net residual is what is left at the end of the period.

capital can be indexed to the economic results of the firm. The way in which the cost of capital is to be connected to the economic results of the firm (e.g. to the value added or to the value of the net residual) need to be contracted ex ante. It will be contracted between the economic actors who control the firm (in LMFs, workers) and third parties supplying finance to the firm. This way the cost of capital can have some features of a residual variable, but still the entity of its variable remuneration needs to be contracted with the controlling actors.

Various authors (Vanek, 1977, McCain, 1977, Smith – Wladmann 1999, Albanese, 2000) have proposed modifications of the basic scheme (fixed capital remuneration) which just go in the direction of linking the remuneration of capital to some variable indexing the value added of the firm. These proposals will be briefly discussed in section 4.3.3, even if they are not the main focus of the present study.

Our objective is to attempt the elaboration of at least one viable solution, in institutional terms, to the problems highlighted in section 2. We do not intend to find one "best" solution, but to elaborate one solution attaining the desired objective (Pareto optimal allocation of investment funds in LMFs, and respecting the other relevant constraints, mainly the ones imposed by Hansmann's definition of firm's ownership. Hence, in the case of LMFs, any solution proposed should not violate members' residual rights of control and their right to the appropriation of the residual. There will be an requirement of incentive compatibility as well.

The first and most important incentive compatibility implication is present in the definition of firm's ownership itself and clearly highlighted by Hansmann. Residual rights of control and the rights to the appropriation of the residual cannot be uncoupled because, in that case, the actors who control the firm would not have an incentive to maximise the residual for a different category of subjects.

The search for solutions to the Furubotn - Pejovich effect can itself be interpreted as the quest for incentive compatible arrangement. It will be necessary to devise patterns of self-finance for LMFs, which can potentially allow this kind of production organisation to reach the Pareto optimal allocation of investment funds.

3.2. Some references to the literature.

Before commencing our own treatment, we will expound the most relevant passages found in the literature concerning the possibility of members' individual appropriation of the net residual used to self finance investment programs. Not a lot of space has been dedicated to the problem so far. No general treatment is found and the reported remarks are often relegated in the footnotes.

Vanek (1975, p. 453) writes:

...we may realistically relax the assumption of a 100 per cent collective internal funding and permit some external funding or *individualized redeemable internal funding* (emphasis added). The general conclusion is that such an alteration of conditions will weaken the inefficiency explained in this section - largely in proportion to the degree of external funding - but will never eliminate it altogether.

Vanek's explication of this conclusion is that, given the unavoidable existence of inefficient allocation of capital when investments are self-financed and reinvested in collective funds, the addition of external financing will only reduce, but never eliminate the inefficiency. We will question this conclusion in the following section.

Bernan and Bernan (1978, pp. 702-703) introduce the issue too:

An individual worker contributing capital to a firm from prior individual savings or underpaid labour must be compensated by a corresponding *individually transferable interest in the firm* (emphasis added) or in his accumulated deferred income, as in the case of individual investment in other assets.

Here the possibility of individual financial support is clearly highlighted, but a precise institutional mechanism is not spelled out, and the authors do not explain how the individual contribution would solve the under-investment problem.

Ellerman (1984, p. 877) is more explicit about individual participation in the returns to self-financed investments in a LMF:

The net book value in a worker co-operative represents paid in membership fees, retained past labour income, and the accumulated interest on this capital. This capital value remains a property right apportioned among the members in a set of capital accounts. Each current worker-member would have an *internal capital account* (emphasis in the original) representing the equity capital value eventually due back to the member. ... A portion of the net income might also be retained but not credited to any member's account. This portion of the net book value not assigned to any individual member would be the *collective account* (emphasis in the original). The collective account represents capital that can be used by the co-operative but not paid out to the members. The sum of the balances in the members' individual capital accounts and the collective account would be the net book value.

Here the institutional mechanisms of individual financial participation are more clearly highlighted than in the preceding authors. Indeed, the relevant aspects of individual appropriation may be already present. At any rate, the author never explicitly refers to the Furubotn - Pejovich effect and to the capital maintenance requirement. In other words, he does not explain the relationship between individual appropriation, collective reserves and under-investment.

Hansmann (1988, p. 294) introduces the issue while criticising the analysis by Furubotn and Pejovich, which is considered too narrow because of its exclusive treatment of the Yugoslav system:

Their analysis is confused by their assumption that it is, for unstated reasons, commonly impossible to arrange for the cooperators to redeem their equity shares upon leaving or selling it to a new worker. In fact, schemes of the latter sort are not only feasible but frequently employed; in the Pacific coast plywood cooperatives, for example, departing workers sell their position in the firm to new workers at fair market value (Berman). ... Indeed, the absence of more generous redemption plans suggests that, even without them, the horizon problem may not in fact be particularly important in firms in which membership commonly extends over many years.

Hansmann criticise Furubotn and Pejovich for not taking into account cases in which worker members remain privately owners of part or all the capital invested in the cooperative. However, he cites the case of Pacific north-east Plywood cooperatives, but not the cooperatives in Mondragon, Basque countries, which is a model of partial private appropriation of the net residual. Though he is right in underlining that the exclusive focus on the Yugoslav system of property rights is too narrow, he does not seem to give a thoroughly satisfying answer to the problem risen by Furubotn and Pejovich. He states that the problem may not be so severe in the most part of workers cooperatives, since they are used to reinvest the most part of the net residual in collective reserves. However, this way he does not contribute to explain why cooperatives are so rare and relegated in labour intensive sectors. Furthermore, it is true that many cooperatives do not have mechanisms for individual appropriation, but this fact can be due to the inability to develop more sophisticated institutional solutions able to stand a given social environment. It can also be due to ideological

positions underpinning the decisions taken by associates. It does not need to show that the problem highlighted by Furubotn and Pejovich is not relevant. We saw in the previous section that there are instances in which the investment behaviour of cooperatives, which only allows collective capital, can be optimal or nearly so. At any rate, these are likely to be specific and not general cases. Cooperatives falling in these specific cases may survive and prosper for long periods of time, but in many other instances the cooperative solution for production organisations will simply not be available. Finally, the absence of very generous redemption plans can be a signal that mixed systems are the best solution. Again, it does not need to show that the temporal horizon is not to be seriously treated when deciding about investment plans.

Gui (1984) compares incentives stemming out of two possible property rights settings: the Illyrian (Yugoslav) one and the Baque (Mondragon) setting. He expounds with precision the mechanisms of individual appropriation existing in the Basque cooperatives. His conclusions are favourable to the possibility of individual appropriation of the net residual in LMFs even if he underlines that the existence of a variable capital can entail the danger of financial instability if the percentage of risk capital imputed to individual members is high. Though he highlights the most important features of the Basque and Italian cooperatives, he does not propose a general argument concerning the individual appropriation of the net residual, both at the analytical and at the institutional level. Indeed, this is the main objective of the present study.

Finally, Zevi (1984) too treats extensively the issue of individual appropriation of slices of the net residual in workers' cooperatives. He does so in the context of a project of reform of the Italian legislation, which was under discussion at the time the article was published. Though the project was not approved by the Italian parliament, it represents an interesting attempt to introduce divisible reserves in workers' cooperatives at the level of national legislation. Zevi clearly states that individual shares of the net residual should correspond to the value of the activity carried out within the cooperative and not to the amount of the capital quotas contributed by each member (*ibid.*, p. 304). His conclusion about the specific point is perfectly in line with our one. He also highlights various obstacles and risks on the road to the creation of divisible reserves: first of all capital instability if members are allowed to withdraw their quotas when quitting the firm. Consequently, more difficulties to find financial support by third parties, given the variability of the firm's capital. He also points out (*ibid.*, p. 308) that cooperative firms are found to be more numerous in countries where the legislation stresses first of all the relevance of cooperative firms intended as institutional units, whose working mechanisms go beyond the interests of singular members. This happens, for example, in Italy, where the mechanisms of capital accumulation have been up to now almost completely centred around indivisible, i.e. collective, reserves. Cooperative movement did not have success, sometimes to the point of extinction, in countries where the accent was put on the interests of individual members. Zevi's remarks should constitute a serious warning for projects attempting to introduce mechanisms of individual capital accumulation, keeping in mind that collective reserves are likely to cause under-investment. Zevi does not give precise indications about the correct institutional measures to be taken about divisible reserves, and we will try to make some step forward in that direction.

3.3. Problems with external finance.

Whilst Furubotn and Pejovich consider the misallocation of capital caused by the existence of the temporal horizon a fatal flaw for self-managed firms, various authors have tried to find remedies to the problem. The earliest attempt was made by Vanek already in 1970 and 1975. He recognises the inefficiency caused by reinvestment in collective reserves coupled with the limited temporal horizon for members in cooperatives and proposes a model of LMF that is completely financed by loans. In Vanek's model loans can be supplied by third parties and by worker members themselves.

The basic reason why loan financing would solve the problem caused by self-finance through collective reserves is that the principal of loans must be reimbursed at the end of their duration, unlike sums invested in collective reserves. Formula (4) represents the relationship describing savings in bank account. The problem of the temporal horizon is not present because an individual saver will put money in the bank at rate i and will recoup the principal. Hence the allocation is Pareto optimal.

Even if the problem of the temporal horizon is solved in the model of LMF defended by Vanek, its simplest version presents some serious problems highlighted in the literature.

The first one is indicated by Vanek himself (1970, p. 317) as *the dilemma of the collateral*. In western countries, so his argument goes, worker co-operatives are forced to self finance and to accumulate equity as a collateral because otherwise they would not be able to obtain credit from financial institutions. He proposed a national institution (the National Labour Management Agency, NLMA hereafter) that will be in charge of collecting the funds necessary for investments in LMF and to distribute these funds at the micro level to individual firms. This way LMFs would be completely externally financed, and they would not need collateral and equity since investment funds would be guaranteed by the NLMA. This solution seems to be far too simplistic. Even if an agency were created (and in some countries, such as Italy, it has been created), LMFs would be likely to continue to need collateral, possibly in the form of some kind of equity. First of all, it is difficult to imagine the Agency supplying all the necessary funds for investments to LMFs. Individual firms may need additional funds, and in order to obtain it, they would have to look for it on the private credit market. Secondly, without any form of collateral or equity, worker members would not have any financial stake at risk in the firm. They would not have an interest in preserving the capital equipment in a good state. They might prefer to consume it, and this is a reason why the capital maintenance requirement would be needed in such a system. The *agency problem* and the *law of increasing risk* (treated in the following paragraphs) would apply. Finally, it is not clear how these firms would absorb possible losses in the absence of some kind of equity. One of the most important functions of the equity is to protect creditors against the risk of losses. If the Agency itself were charged with the requirement to cover LMFs losses, the problem of soft budget constraint would ensue (Kornai, 1986, Buck - Wright, 1990). Vanek's proposal of the constitution of a NLMA as a unique financier for LMFs could be criticised on other ground. For example, the existence of a unique (or of a limited number of) credit institution could reduce firms' autonomy to freely search for funds and pursue their investment plans.

Other authors have criticised Vanek proposals concerning the financial structure of LMFs. Jensen and Meckling (1976, 1979) building on a previous article by Alchian and Demsetz (1972) underline forcefully what they believe to be the major flaw in a Yugoslav type of system. In their 1976 article they gave the definition of agency costs as the sum of monitoring expenditure by the principal, bonding expenditure by the agent residual loss. In the 1979 article they apply the definition to the specific case of a labour managed system where physical capital is socialised, such as the one proposed by Vanek (what they define "pure rental system"). At page 480, they argue:

The obvious agency costs of the rental arrangement are those associated with the reduced incentive for the user to maintain the asset properly, to guard it from theft, and the increased incentive to misuse it. If the user does not bear the cost of improper maintenance, etc., and if his behaviour cannot be costlessly monitored, he will have less incentive to care for it optimally. The magnitude of these costs along with the monitoring and bonding costs that would be incurred in a effort to control them explains why rental or leasing of most durable production goods is not observed.

Jensen and Meckling refer exclusively to a system where physical assets are rented or leased and they are not clear about the equivalence of a pure rental system with a system of LMFs that are completely externally loan financed. However, agency cost do appear to be a first serious obstacle

to full external finance. If worker member do not have a personal financial stake in the firm, or if the stake is too limited, they will not have a sufficient interest to protect and preserve physical assets. They could actually behave in a morally hazardous way and misuse the assets as long as costs are borne by third parties.

It is true that Vanek does not exclude the case of loans supplied by worker members. In this case workers would have a financial stake at risk in the firm. However, he is not clear about the necessity of such financial participation, and he is not even clear about the kind of financial responsibility workers should bear in that case. Should possible bankruptcy costs be borne first of all by loans supplied by workers, or should they be borne by all the loans supplied by members and third parties without distinctions?

A second author that has pointed his attention to difficulties created by external finance is Gui (1985, 1996). He argues that associated workers may tend to have a myopic attitude and neglect the future potential advantages deriving from the assets in their possession. This effect will be stronger in periods of bad business performance. In such cases worker members will find it particularly attractive to quit the firm if they have other job opportunities. He concludes:

The analysis conducted stresses the particular importance of equity capital in LMFs. This imposes a heavy load on wage earners whose wealth is generally small. ... worker-managers will be required to save and bear risk to a greater extent than subordinate workers. Their autonomy does have a cost. (1985., pp. 116-117)

To Gui, the idea of an LMF that is exclusively financed by debt is not defensible. His conclusion may point to a more general remark. Equity capital, or, in other words, a full risk financial stake held by the owners of the firm, may not be an exclusive feature of capitalist firms. For production organisations that operate on market settings, where returns on investments are necessarily variable and uncertain, equity is likely to be a necessary institution. It may well have arisen to protect the owners themselves against possible fluctuations of returns, but also to protect third parties who do not have control over the firm, and, therefore, should not bear the risks of wrong or morally hazardous decisions. Equity may come out to be a universal institution characterising firms operating on the market, be they CMFs or LMFs. If this is true, LMFs need to develop mechanisms suitable to accumulate equity, in the respect of their basic structural feature, that is, workers' control and workers' right to appropriate the net residual.

Gui's analysis opens the door the second problem linked to external finance, at least partly derived from the agency problem, even if not equivalent. It is the *law of increasing risk*. Gui underlines the fact that when worker members in LMFs do not have a full risk financial stake in the firm, they will have contrasting interests with respect to external financiers. They may not take enough care of the assets of the firm, but they may also choose too risky investment projects, reaping the high returns on invested funds if results are as good as expected, and quitting the firm by declaring bankruptcy when results are negative. This way worker members would be able to make financiers bear the risks of their decisions. To the extent that financiers anticipate this danger, they will charge higher interest rates in order to shield themselves against it. However, increased costs of capital will in turn increase the risk of default. On this basis Gui shows that there need to be an upper bound to the debt-equity ratio. In other words, LMFs will be able to recur to external financial support only in a limited way, and the quantity of debt they are able to subscribe is likely to be positively correlated with the amount of equity they are able to accumulate. This is just the law of increasing risk: as the debt equity ratio increases the cost of capital will increase more than proportionally imposing an upper bound on the ratio. If the law does hold, then exclusive external finance in the absence of equity is ruled out. Again, even in this respect LMFs do not seem to be any different from CMFs. The law of increasing risk is well known as far as capitalist firms are concerned and one of the main reasons why CMFs accumulate equity is just to avoid increasing costs of capital. McCain (1977, p. 357-358) expresses the law of increasing risk in very similar

terms to Gui. He adds an asymmetry between CMFs and LMFs. He states that capitalist corporations too face the law of increasing risk. However, they have an escape hatch that LMFs do not have. That is, they can issue shares, this way increasing their stock of equity and increasing the collateral with guaranty functions for external lenders. The issuing of shares has disadvantages as well because it dilutes returns per share and reduces control of majority shareholders. At any rate, share issuing can contrast the law of increasing risks at least within limits.

The author deny a similar possibility in the case of LMFs because, he states, worker members in cooperatives cannot issue tradable shares and would have an incentive to appropriate possible higher profits if they did. We will only note that worker members in LMFs do have escape hatches as well. First of all the fact that members of LMFs cannot issue shares does not imply that they cannot accumulate equity. LMFs can accumulate equity in the form of indivisible reserves or other titles such as divisible reserves that bear all the relevant risks. Furthermore, they can increase membership. The admission of new members presents risks like the issuing of new shares because it may reduce average income for each singular worker and because it may put at risk the control of the firm by the majority group of members (Furubotn, 1976, pp. 105-108). However, new associates can increase the accumulation of equity, this way contrasting the law of increasing risk. Ward's model (1958) shows that new members in LMFs will be admitted only up to the point at which the contribution of the marginal member does not decrease the average labour income for the whole membership. Of course, the admission of new comers can reduce the rate of growth of average labour income. At any rate, the risk of excessive dilution of returns is likely to be avoided.

A final critique against external finance for LMFs is the one defended primarily by Dréze (1976, 1993) and Meade (1980). It is the well known argument that LMFs cannot be financed exclusively by debt since this solution would charge workers with all the economic risk faced by the firm. Shareholders of CMFs can diversify their financial investments by investing in different firms and by trading titles that give the right to appropriate the net residual of the firm. This way they will be able to reduce the financial risk associated to their investments. Workers in LMFs cannot do the same because their human capital is necessarily linked to one specific firm. If their firm is exclusively loan financed, variation of the firm's revenues or of the cost of capital will constitute a serious danger for their labour income, the more so in capital intensive sectors. The issuing of shares of equity exclusively held by worker members would not be a good solution to the problem of the variability of returns since, this way, workers would find themselves risking both their human and financial capital in the same economic venture. This forced choice would violate the necessity to invest human and financial resources in economic activities with negatively correlated returns. Because of these reasons, workers would need to avoid undifferentiated investments and shield themselves against risk by issuing tradable shares, i.e. by creating a stock market. They will prefer to accept a nearly constant wage and to let shareholders bear the risks of variable returns and cost of capital. The fact that capital has control and is residual claimant in the most part of firms derives from its insuring function. Workers are not diversified and therefore risk averse, whilst shareholder can differentiate their investments in financial capital and can more easily assumed to be risk neutral for this reason.

Dréze and Meade's critique of the possibility of risk bearing for workers in LMFs is based on the assumption that owners of CMFs are always able to fully diversify their financial investments. A more realistic description of economic reality shows that in many business firms owners need to invest a large share of their wealth and human capital in the same economic venture. In this respect, they are in a position similar to the one of members in LMFs.

There seem to be more basic arguments that would justify the position of worker members in LMFs. Usually, the literature compares the behaviour of shareholders in CMFs and worker members in LMFs. We may instead prefer to compare the condition of members in LMFs and employees in CMFs. The reason is that we need to understand what position gives workers the greatest protection and possibility to fully reap the fruits of their activity. The fact that workers in

LMFs risk both their human and financial capital in the same venture may end up being not relevant if their overall condition is more satisfactory than the one of employees in capitalist firms. In other words, the ensuring functions of capital in CMFs may have also negative consequences that need to be carefully taken into consideration when deciding what the most suitable solution for workers is.

Workers in LMFs cannot diversify their human capital, but the same is true for employees in CMFs. Furthermore, members of LMFs need to participate financially in the same firm in which they work. However, to this end they will normally use the net residual they obtain at the end of the accounting year. In other words, apart from exceptional circumstances, they will not use their own personal wealth to finance the firm. Their position, in this respect, is again no different from the one of employees in CMFs. Indeed, they can be entitled with a part of the net residual, and this is not normally true in the case of employees. Member in LMFs usually pay themselves a current labour income with a smooth profile, that resembles in many respect a normal wage. They may be thought to self-ensure themselves against fluctuations of income. To this end, they can accumulate reserves that allow them to keep their business running and to maintain in hard times standards of living similar to good times. Finally, both theoretical reasoning (Jossa and Cuomo, 1997, 2000, Jossa, 1999) and empirical observation (Smith, 1984, Kremer, 1997, p. 35) seem to clearly show that LMFs tend to protect members' jobs more than CMFs do with their employees. Employees of CMFs are likely to undergo various other risks linked to their lack of control over the firm. Members of LMFs will face the same risks to a lesser extent given their right to elect representatives in control of the firm. Overall, the position of members in LMFs does not seem to be more at risk than the one of employees in CMFs. Our argument shows that it is likely to be less risky and preferable in many respects, all other conditions being the same.

In order to find a solution to the problem of workers' lack of financial diversification in LMFs various authors have proposed the introduction in LMFs of titles allowing the sharing of economic risk between workers and third parties such as variable yield bonds (McCain, 1977, Vanek, 1977, Smith - Waldman, 1999, Mazzoli - Negrini, 2000) or quasi shares (Albanese, 2000). Variable yield bonds usually are intended to link their remuneration to some measure of the value added of the firm. The objective is to share risks connected to a variable value added between workers and external financiers. The main criticism against this kind of titles is that they may not be incentive compatible. If workers have control over the firm, as it should happen in LMFs, and if an ex ante unknown value added is to be divided in some proportion between workers and external financial supporters, workers will have an incentive to increase current labour income (wages). If one lira of value added is to be divided, an increase in wages will allow workers to appropriate the whole amount and not just a part of it. Worker members can also increase costs to the firm, for example by financing a nicer working environment and by transferring part of their living expenses from individual income to the firm (a phenomenon that is known in the literature as "gold plating"). Again, this way they will reap the whole part of the value added to be divided with external financiers. Smith and Waldmann (1999) propose variable yield bonds indexed to the average dimension of the value added in a whole industrial sector. This way, incentives to behave in a morally hazardous way should sharply decrease. The reason is that members in each singular LMF would obtain a negligible share of additional revenue by increasing costs. Since the incentive to moral hazard would be very weak, they would prefer to pursue optimal investment policies and respect their commitments with external financiers. The main doubts concerning this proposal are linked to the possibility for controlling groups of LMFs in the whole sector to collude and increase current labour income anyway. Furthermore, there could arise serious problems of calculation of a precise index of the value added in a certain sectors, the more so if firms produce heterogeneous goods and services. Even if these new titles were able to improve LMFs capability to collect external finance, they may not represent a satisfying solution to the Furubotn-Pejovich effect. Inefficiencies stemming out of reinvestment of self financed funds in indivisible reserves would not disappear. Finally, external finance is likely to remain more costly for LMFs than for CMFs: third

partis will require a high remuneration given their lack of control over the firm. This fact may not be compatible with the minimisation of the costs of ownership required by Hansmann's definition. Mazzoli and Negrini's proposal is similar to Smith and Waldmann's one.

Quasi shares, in the definition given by Albanese (2000), which builds on a previous work by Jay (1980), are based on a similar subdivision of the value added produced by the firm. Part of the value added would be attributed to worker members in the form of labour remuneration and part would become the remuneration of quasi shares. A minimal amount of quasi shares need to be bought by worker-members at the time the firm is created. Worker members would retain a minimum amount of quasi shares up until they quit the firm this way holding an individual financial stake of equity. Quasi shares could be bought by third parties as well, though they would not give the right to vote in ordinary assemblies. In this latter case their function would be to give worker members the possibility to finance the firm with the present value of future returns on investments. This way, LMFs would be able to rise the capital necessary to finance their present investment. The main objective of the proposal is to find a remedy to the lack of wealth that characterises worker members in newly created LMFs. The sale of quasi shares would allow the firm to gather the necessary finance by selling claims on future returns. The doubts linked to this proposal derive again from incentive compatibility and possible contrasting interests. If quasi shares are sold to external financial supporters, worker members could again have an interest to increase current labour income and costs in order to subtract quotas of value added from third parties. Secondly, since the price of quasi shares issued when the firm is created is based on the present value of future quotas of value added, it will increase overtime. New members will have to pay higher prices to obtain an amount of shares comparable to incumbent members. Their personal wealth may not be compatible with such prices in capital intensive sectors. If the value of shares they are requested to buy remains constant, they may receive a (much) lower number of quasi shares. Since the partition of the value added between labour remuneration and the remuneration of quasi shares can be changed, coalitions with different interests about the partition of the value added may arise within the firm.

The most important insights concerning the difficulties encountered by externally financed LMFs have been overviewed. To complete the section, it is necessary to come back to Vanek's simplest model of an externally financed LMF in order to introduce our own proposal. From our point of view, the major flaw in Vanek's solutions is their incompleteness, whilst he is rights in underlining the importance of loan financing in the case of LMFs.

The author clearly states that loans can be supplied by both third parties external to the firm and by insiders, hence workers members. However, he is not clear about the status of the loans supplied by the two groups of financiers. Will it be exactly the same, or there will be differences? He does not indicate any precise mechanisms that will regulate the flux of loans supplied by members. It seems that the provision of loans by members is intended to be completely left to individual workers' decision. This solution may present problems linked to free riding if the firm needs to meet some target of loans supplied by insiders. The collective of workers will have a convenience to meet the target, but each singular worker can find in his personal interest to withdraw individual funds (more on this issue in section 3.3.4). Furthermore, it is not clear how LMFs completely financed by external loans will absorb possible losses (if revenues deriving from the sale of product and services are inferior to non labour costs *plus* costs of capital *plus* current labour income distributed during the accounting year *plus* depreciation costs). Here we come back to the necessity for LMFs to accumulate equity. The functions that equity has in CMFs, i.e. to serve as collateral for debts, to absorb possible losses, to finance risky investments and to guarantee a smooth profile of consumption to insiders seem to be crucial in LMFs as well. Vanek's model does not deal with the strategic functions of equity in a satisfactory way.

3.4. *Institutional solutions.*

We now come back to Hansmann definition of property. We recall that remedies to the problems posed by the existence of a temporal horizon for worker members in LMFs and the possible imposition of a capital maintenance requirement needs to respect members' residual rights of control and their right to appropriate the residual. We define the residual variable as the value added *less* the cost of capital, also named *total net labour earnings* (TNLE) in Meade's definition. A first problem is to understand what is the nature of the net residual in a LMF. In section 3.3.1 it was argued that it should best be interpreted as labour remuneration. Members usually pay themselves a current income that resembles a wage. However, this fact does not imply that the net residual, calculated at the end of the accounting period, is to be considered as return on equity. When the co-operative is at least partly externally financed, capital will need to be remunerated. However, in this case the remuneration of capital is a cost to be subtracted from the value added to obtain TNLE. The definition itself also states that the residual is appropriated by the factor of production which controls the firm. It implies that all the residual is labour remuneration.

A second ambiguity may arise in the case LMFs reinvest the net residual (TNLE *less* current labour income) in the firm in the form of collective reserves. In this case, it is not clear what the nature of the net residual is, since it is reinvested in the firm without being converted in labour or capital remuneration and it cannot be at the disposition of members during the life of the firm or even upon its liquidation. We consider the question a relevant one, because it pertains to the clarification of the way in which LMF should generally save and invest their net residuals when divisible reserves are introduced. Since all the net residual should be correctly interpreted as labour remuneration, funds reinvested in collective reserves will be labour remuneration used to buy capital equipment. Indivisible reserves cause misallocation of investment funds, but have other positive features, because they constitute an active channel for self-finance and because they are a kind of equity which bears all the relevant economic risks.

When we introduce divisible reserves, the net residual will need to be divided among members following some kind of rule. In this case, as a matter of coherence with the definition given above, the net residual should be distributed as an extension of the current labour income already paid during the accounting year. This technique would be justified by the respect of the economic nature of the net residual in LMFs. At the empirical level, the tradition of co-operative movements clearly shows peculiar institutions that go in this direction. For example, in Italy cooperatives can distribute part or the whole net residual in the form of extensions of current labour income named *ristorni*. The utilisation of current labour income extensions to finance investments in the form of loans could constitute a solution to the problem of under investment in LMFs, but it presents other kinds of problems.

It would have the positive features highlighted by Vanek, insofar as loan financing does not suffer of problems linked to the existence of a temporal horizon for worker members. However, as long as loans supplied by worker members are not part of equity, they would not constitute an acceptable shield against risks for external financial supporters. They would not constitute collateral and they would not contrast the law of increasing risk for financing third parties. Finally, they would not even absorb losses. If loans supplied by workers members remain loans like the one supplied by third parties and do not bear other relevant risks as equity does, they could not represent an important channel of self-finance for the firm, since they would not help to build equity.

A solution that could be attempted would be to charge loans supplied by worker members with all the relevant risks borne by standard equity. Hence a sharp distinction between loans supplied by members and by external financiers would be introduced. Loans supplied by members could constitute collateral for external debt at least as long as the member remains in the firm. It means that the interests and the principal on loans supplied by third parties should be repaid before the interests and the principal on loans supplied by members. Cost of capital on external debt and

reimbursement of the principal can be calculated at the end of the accounting period. If revenues are not sufficient to cover costs, losses (negative net residual) should be charged both on indivisible reserves and members' loans in the same way as positive net residuals are. This arrangement would help to contrast the law of increasing risk as well. Since members' individual capital stakes would be part the equity of the firm, a LMF could have a real opportunity to freely choose the most suitable partition of the net residual between indivisible reserves and divisible reserves constituted by members' loans. If members' individual capital stake were not part of equity, LMFs would tend to select them against because individual quotas would reduce equity, collateral and the firm's capability to be funded by financial institutions.

If loans supplied by members assume all the features of equity, they will become riskier financial assets than standard loans. However, this does not seem to be a great obstacle insofar as it is possible to increase returns on this kind of loans to take into account higher risk. At any rate, their remuneration should remain fixed and decided in advance of the operation of the production process.

The idea to use loans supplied by worker members as part of equity in LMFs encounters another obstacle in a possible phenomenon of *free riding*. If the decision about what part of the individual quotas of the net residual is to be loaned back to the firm is left to the free decision of singular members, free riding is likely to ensue. The whole collective of members does have an interest in investing the optimal amount on money in the firm. In fact, they will receive the maximum benefit by doing so and they will be able to maximise their wealth over their whole life expectancy. However, each singular member may prefer to withdraw his individual quota and to put it at other uses. For example, he may prefer to use that amount of money for consumption or to invest it in different and more profitable projects. The withdrawing of each individual quota may do little harm to the overall investment program, since it may only reduce investments by a tiny fraction. However, the spread of this kind of free riding behaviour would lead again to a dangerous inability to meet optimal investment targets. In the absence of constraints on members' decisions to reinvest their individual quota in the firm, uncertainty would characterise individual investments in the firm. Problems such as the dilemma of the collateral and the law of increasing risk would come to be relevant again because firms could not count any more on individual stakes of equity.

The imposition of the obligation to capitalise the individual quotas of the net residual needs careful justification insofar as it reduces members' freedom to choose between consumption and investment in the firm or between different kinds of investments. One way to justify rigorously forced capitalisation is to note that the investment of individual quotas would produce effects similar to the one of *public goods* (the reader can see, for example (Olson, 1965, Buchanan, 1969, Hirshman, 1983, Cornes - Sandler, 1986). Each individual quota invested would cause an expectation of increased future labour income for all the members of the LMF. In fact, the distribution of revenues in a LMF is usually decided in a conjunct way for the whole membership. It is not possible to isolate the returns stemming out of individual contributions. It means that returns on the investment of individual quotas are at least partly *non excludable*, if referred to the membership of the firm. Though the appropriation of the returns coming from the investment of individual quotas are non excludable, they are likely to be *rival*, since the consumption by one member of part of the returns would reduce the consumption by the other members. Hence, the production of common returns in a LMF does not fulfil the requirements that characterise pure public good (non excludability and non rivalry). Non excludability is only referred to the membership of the firm. Non rivalry is simply absent at least as long as current labour income, whilst the situation for the use of common capital equipment may be different to some extent. Non excludability and rivalry are just the main features of *club goods* (Buchanan, 1965, Cornes - Sandler, 1986). Indeed, many important issues in the economics of labour management could be fruitfully analysed within the analytical scheme of club goods, which has never been applied to the theory of LMF so far. The imposition of the requirement to capitalise individual quotas would just

be motivated by the positive externalities they produce and by the features they share with public goods. When we have non excludability of returns and when the very stringent conditions (Olson, 1965) for the spontaneous production of public goods are not fulfilled, the imposition of a formal forced contribution for the production of the good becomes necessary.

In the absence of any constraint on the capitalisation of individual quotas of the net residual, uncertainty about members' willingness to reinvest the quotas in the firm would be present, and individual financial instruments may be selected against. The mere necessity to survive would push LMFs to rely exclusively on indivisible reserves, with the above highlighted problems. Indivisible reserves can guarantee a certain, though inefficient, amount of investments.

If constraints need to be put on members' reinvestment in LMFs, they will need to be the most rational ones and compatible with the above given definitions. In order to avoid free riding, members may be forced to reinvest optimally in their firm. As already stated, reinvestment should happen in the form of loans remunerated by a fixed interest and bearing all the risks characterising equity. The peculiar nature of these loans can be justified only as long as members retain their share of control over the firm. When they quit or retire they cannot keep on bearing the same kind of risks. In this case, they would lack control and the right to the appropriation of the residual but they would keep on bearing the relevant risks without a justification. Hence, when a member quits the firm, the individual quota she has accumulated overtime should be reimbursed or turned into standard loans that will not bear the risk of losses and serve as collateral any more. Loans due by the firm to quitting or retiring members may be made repayable only after all the terms and conditions on debts toward third parties have been satisfied. These arrangements would reduce the risk of members behaving strategically and quitting the firm when negative economic results are approaching¹⁰.

To sum up the section, the idea of distributing at least part of the net residual in the form of individual quotas calculated as extensions of current labour income and automatically reinvested in the firm up to the optimal Pareto allocation of investment funds seems to be a fruitful one. We will see in the next section how this peculiar institutional arrangement may solve the problems highlighted in the first part of the chapter.

¹⁰ It is true that members could decide to quit the firm strategically and withdraw their loans when the economic perspectives of their firm worsen. We will note that in this case worker members would lose their job as well. It should be evaluated whether it is convenient for them to behave strategically in such a situation. At any rate, loans supplied by members could not constitute collateral for external debt when members quit. In fact, in that case the member would not exert control over the firm any more, and could not be charged with the consequences of decisions taken by incumbent members.

Here an important asymmetry with respect to CMFs is present. In CMFs shareholders are allowed to freely sell their titles on financial markets. However, restrictions are present on the possibility of reimbursement of shares. CMFs do not have any duty to repay full risk capital invested by shareholders. In LMFs, usually legislation obliges the firms to reimburse individual stakes.

We already underlined that ex members' individual capital stakes should not be included in the equity of LMFs since usually they do not share control of the firm any more. However, other kinds of restrictions may be advisable. Individual capital quota could be made repayable not immediately after the exit of a member, but over a certain period of time, that can be linked to seniority. This arrangement would alleviate the pressure on the firm's necessity to reimburse individual quotas.

When the economic results of the firm worsen members can be induced to quit strategically endangering external financiers possibilities to recoup the value of their loans. Since members participated in the decision to stipulate debts with third parties, they need to bear some kind of responsibility for those decisions. A remedy can be constituted by the introduction of a sequential order in the reimbursement of external finance. Loans supplied by third parties should be reimbursed before financial stakes entitled to ex members. This way the risks of morally hazardous behaviour should be further reduced. If members quit strategically in times of bad economic performance, the probability of bankruptcy will increase. Upon liquidation ex members will be likely not to receive any refund for their financial claims toward the firm. The expectation of this probable realisation may induce them not to take ex ante incorrect or too risky decisions. These aspects of LMFs self-finance urge further elaboration.

3.5. The capital maintenance requirement.

Some more words concerning the institutional aspects related to the capital maintenance requirement. We saw that the requirement may become a necessity when workers do not have any kind of personal financial stake in the cooperative. When reinvested returns are completely socialised, as it happened in the Yugoslav case, worker members may have an incentive to consume capital transforming it in current income. It will happen more often in periods of crisis, when investment projects do not promise high returns, or more simply when myopic attitudes spread at the point of strategic decision making. Risk of losses may not act as a countervailing force when worker members stand to gain from capital consumption and have other job opportunities elsewhere. If instead a conspicuous part of the surplus is distributed in the form of capitalised individual quotas, risks of capital consumption should be less severe because the ensuing risk of losses will be privately internalised. When workers know that myopic decisions will lead to the impossibility to recoup their personal capital stake, they will tend to take more conservative attitudes. The consumption of capital and the absorption of losses may be unavoidable in cases of unprofitable past investments. However, the presence of individual capital stakes will act in a particularly against morally hazardous behaviour, irrationality and myopic choices. We saw that in western cooperatives rules prescribing capital maintenance are looser, though existing. However, it must be remarked that in western cooperatives worker members usually have some kind of personal financial stake in their firm. Specific institutional solutions and their effects on personal capital stakes are indeed varied. They can take the form of one shot contributions, as it happens in Italy, or of annual contributions as it happens in the Spanish case in Mondragon. Possible losses may be charged directly on individual contributions or not. In the former case, members will participate directly to negative result, and this fact can represent a further incentive to avoid losses. In the latter case, individual members will undergo negative results only indirectly in the form of reduced probability to increase individual capital quotas. In all cases, one of the most important functions of these individual capital contributions is the personal involvement of individual members in the economic risks faced by the firm. Members will care more about the firm's results than in the absence of individual financial stakes.

There seems to be a clear negative correlation between the existence of a stricter capital maintenance requirement and the existence of individual financial stakes. In the Yugoslav system, where individual financial participation in the capital of the firm was ruled out by law, and the requirement was very rigid since it did not admit any deviation. We saw that in Italy and in France, where individual financial stakes are admitted, though they usually do not represent the most important part of the whole capital stock of the firm, a capital maintenance requirement is present, but in a milder version. Finally, in the Basque cooperatives in Mondragon we do not find any restriction on the negative variations of the firms' capital. In these cooperatives a high percentage of current profits (currently about 50%, see Roleans, 2000) is normally distributed in the form of individual quotas calculated as extensions of current labour income and automatically reinvested in the firm. The more the net residual is privately appropriated by worker members, the less there will be the necessity to put constraints on the variability of the firm's capital.

To sum up the argument, the distribution of part of the net residual in the form of individual quotas reinvested in the firm can act as a particularly strong barrier against myopic and irrational consumption of capital. The more so in the case these quotas undergo losses in the same proportion of the distribution of positive net residuals. It will push worker members to rationalise their decisions and to accept reduction in the capital stock only when they are strictly required by economic results. If the proper mix between indivisible reserves and individual capital quotas is

found, any kind of capital maintenance requirement may become superfluous: optimal choices will be taken both in the case of firm's expansion and capital contraction.

4. Temporal horizon and capital maintenance in the presence of divisible reserves.

So far we discussed institutional arrangements suitable for accumulation of capital and the building of equity in LMFs. Now we will attempt to draw some more precise conclusions about the reasons why those arrangements represent a solution to problems arising out of the presence of a temporal horizon for worker members in LMFs and of the imposition of a capital maintenance requirements. The institutional analysis started from the definition of the firm's ownership given by Hansmann. We saw that the application of the definition to the case of LMFs lead to some constraints that all worker cooperatives should respect, namely worker members' democratic control over the firm and members' right to the appropriation of the residual. In turn, these two elements imply that the remuneration of capital will become a cost (and not a residual variable itself as it happens in CMFs) contracted *ex ante* of the operation of the production process. We then discussed the necessity of the existence of equity in LMFs and the possibility of an at least partial appropriation of the net residual by individual worker members. We concluded that a refined version of Vanek's model, one which allows for the existence of equity in LMFs and for the inclusion of loans supplied by worker members' in the firm's equity, could represent a viable model. It respects Hansmann's definition of a worker cooperative and does not suffer from the shortcomings of the agency problem and law of increasing risk.

In order to draw some conclusions concerning the problem of the temporal horizon and the capital maintenance requirement as presented in the first part of the chapter, we take again into consideration curves II and II' representing the demand for investment and the marginal efficiency of capital. Curves SS and S'S' represent the supply of self-financed investment funds in CMFs and LMFs respectively. If workers are allowed to appropriate at least partially the net residual and reinvest it in the firm in the form of loans remunerated by a fixed interest rate, the scenario presented in the second section will be modified. In figure 3.3 we notice that an LMF which self finances investments up to point C with indivisible reserves will respect constraint (2).

$$a_{LMF} = \frac{i}{1 - (1 + i)^{-T}} \quad (2)$$

However, the same firm can now add new self-financed investment funds in the form of loans, which will be recouped by worker members at some date in the future (e.g. when they quit the firm or retire). As far as individual loan finance is concerned, worker members will find themselves facing constraint (4), the one valid for money saved on a bank account.

$$PV_{BA} = i \sum_{t=1}^T (1 + i)^{-t} + (1 + i)^{-T} = 1 \quad (4)$$

Their position will jump from curve S'S' to curve SS. As we saw in section 3.2, constraint (4) does not present the problems linked to the existence of a temporal horizon for worker members, since workers recoup their savings at the due time. When the remuneration of funds saved on bank accounts is equal to the rate of time preference (*i*), equality of the present value of future returns on a certain sum invested to the same sum is guaranteed.

If part of the net residual is reinvested in the form of loans, LMFs will be able to reach point E, the Pareto optimal point, which characterises investment choices made by CMF. Investment projects will be financed up to the point where the marginal dollar is remunerated at the market interest rate i ¹¹. We can imagine a decision procedure where the most remunerative projects are financed by indivisible reserve. In fact, they do not present problems linked to the existence of a temporal horizon because, for these projects, the rate of return is higher than a_{LMF} . The marginal project financed by indivisible reserves can be the one, which yields exactly the remuneration a_{LMF} . It is compatible with the full depreciation of the initial investment within the temporal horizon of the median member. All the following projects will be financed by divisible reserves, up to the marginal one, which renders the members of a LMF indifferent between investing and saving on bank accounts. Worker members will prefer all the projects yielding returns comprised between a_{LMF} and i to savings on simple bank accounts because the former will allow them to appropriate quasi rents in the form of current labour income, whilst the latter will yield exclusively the market interest rate.

¹¹ As we said, the exact equality between the rate of return on investments and i will be obtained only when the supply curve of investment funds is perfectly elastic, that is any amount of funds is available at a given interest rate. In the general case, where investment funds are scarce and firms requires higher rate of returns to increase their saving, equilibrium will be obtained for values of the rate of return on investments higher than the market interest rate.

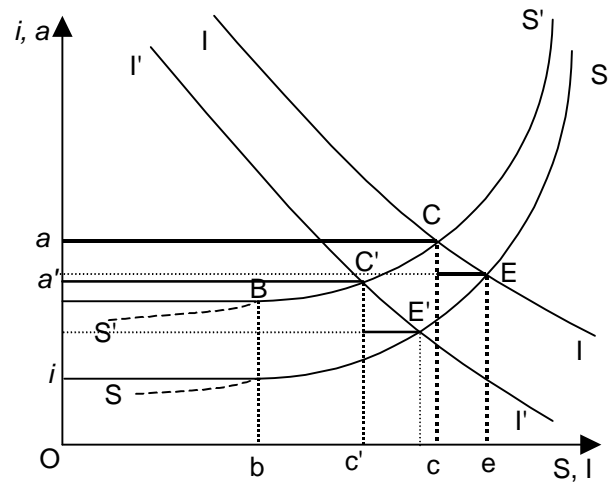


Diagram 3: the introduction of divisible reserves allows the LMF to invest its own funds up to the point of Pareto optimality, in a similar fashion to CMF.

An LMF will not need to self-finance investments through indivisible reserves up to point C. We can imagine LMFs reinvesting funds in indivisible reserves in the range 0c. Within this range, self-financed investments in indivisible or divisible reserves seem to be substitutes. In the former case return on investments will be sufficient to depreciate the initial expenditure (recall the fact that a_{LMF} can be interpreted as the rate of depreciation to be applied to a one dollar self-financed investment in order to fully cover outstanding capital within the temporal horizon of the median member) whilst in the latter case members will withdraw the funds invested at some point in the future and the market interest rate will be a sufficient level of capital remuneration. An LMF may decide to finance all investment projects (range 0e) with divisible reserves, and this choice would be tantamount to a mixed solution. If there is uncertainty about the dimension of the temporal horizon, members will tend to recur more than necessary to divisible reserves applying a discount rate to their expected stay in the firm.

At the empirical level we do not have any news of producers' cooperatives in which self finance is gathered exclusively in divisible reserves¹². The explanation of this fact may be that without indivisible reserves the firm would be excessively subjected to the risk of capital variability deriving from members' turnover. As we observed in section 3.3.2., an excessive importance given to the interest of individual members can represent a serious dangers for LMFs due to a kind of structural instability. Quittance of a high number of members would seriously weaken the financial structure of the firm. Knowing this, some members may hold up the firm and demand too high incomes. A second consequences of capital variability due to turn over is that collective reserves represent a more secure form of collateral for third financing parties. LMFs that reinvest their own funds exclusively in divisible reserves are likely to encounter problems in obtaining external credit financial institutions, which will discount the value of divisible reserves as compared to indivisible ones. To presence of indivisible reserves gives stability to the firm and offer to the management the possibility to obtain credit more easily and plan investment at least over the medium period.

If members have a very short temporal horizon a_{LMF} will be high. In some case too high, and the firm will not find any investment project available for self-finance through indivisible reserves. Here the only efficient possibility would be to self-finance the firm exclusively with loans. When dangers linked to risk capital variability are effective or when a formal rule or law fix a minimum level for indivisible reserves, such firms may not be created altogether. This fact would represent an inefficiency of this kind of system. However, indivisible reserves may be prescribed for CMFs too. Moreover, the missed creation of firms whose members have a very short temporal horizon is does not seem to represent an important problem. At any rate, the objective of the present study is too show that if proper institutional arrangements are devised an LMF should be able to reach a Pareto optimal allocation of its self-financed investments. Given the solutions proposed, this result may be accessible in the vast majority of cases. On the contrary, we saw that when LMFs recur to the exclusive use of indivisible reserves, efficient investment policies will be the exception and not the rule.

Figure 3.3 also shows that the mix of divisible and indivisible reserves does not need to be fixed even when the temporal horizon is given. The proportion of the two kinds of reserves will depend on the level of the marginal efficiency of capital. If the II curve shifts to I'I', the proportion of indivisible reserves (point C') to divisible ones will decrease. In general, a higher rate of return

¹² As we already noted, the most prominent group of cooperatives that uses divisible reserves, the one in Mondragon, does invest a conspicuous part of the net residual in collective funds. In the past a non linear formula used to be applied. For low levels of the net residual, the percentage distributed to divisible reserves was quite high (70%), whilst this percentage decreased as the rate of profit increased (Logan - Thomas, 1982). Nowadays a flat rate of about 50% is applied.

on investments will be associated to the possibility of a higher dimension of indivisible reserves and vice versa.

4.1. Self-extinction forces.

Since the scheme presented allows and tends to require the existence of collective reserves in LMFs, it is important to consider another relevant critique addressed to this kind of self financing arrangement. I was addressed by Vanek (1975, pp. 446-448) and taken up by McCain (1977, pp. 356-357). Vanek's argument is that when capital is common ownership, as it usually happens in cooperatives, members will have an interest to reduce the number of associates because, by so doing, they will increase the average remuneration of remaining members. The reason is that marginal productivity of labour is decreasing, hence a reduction of employment will increase average income per worker. Even if lay-offs are forbidden by statutory rules or by law, reduction in membership is always possible through attrition (retirement or voluntary quittances). The conclusion is that communal property is to be avoided because it triggers *self extinction forces* in cooperatives, i.e. it makes this kind of production organisation shrink overtime and disappear. The argument is meant to justify external financing by means of loans. In the presence of LMFs financed by debt, associates will not have reasons any more to reduce membership since in such a case remaining members will have to bear a higher cost of capital. The problems connected to external finance by means of loans were thoroughly discussed in the previous sections. Here it is important to note that Vanek seems to give too much importance to self-extinction forces. Though not irrelevant, they cannot be introduced as one of the main reasons of the disappearance of cooperative movements in the past, as the author explicitly states (1970, p. 448).

First of all, it may be true that in some situations the reduction of membership would increase income per head, however there are other important forces that will act in the opposite direction. Formal or informal rules preventing lay-offs will bar membership reduction in the short run. One of the most important results of Ward's model is that LMF will increase membership when newcomers will cause an increase in the average income per worker. This possibility can be present in many circumstances. For example, increasing returns to scale, that are often the rule in many industrial sectors (Palermo, 1998, Keen, 2001, pp. 55-87) over the relevant range of production opportunities for the firm, will force LMFs to expand employment and membership. In the presence of increasing returns to scale, the result proposed by Vanek is not guaranteed any more.

Secondly, if reduction of employment is coupled with depreciation of the capital stock, reduction of income per worker and not increase can ensue. If no new member is admitted the temporal horizon of incumbent associates will necessarily shrink overtime. New investment will be less and less acceptable on the basis of economic calculations, and the reduction of the existing capital stock may affect labour income as well. Expansion of the firm and of employment can be the only way to retain existing levels of labour income.

Individual financial stakes are present, as it happens in the most part of workers cooperatives and as we propose in the present study. Reduction of membership entails reductions of capital assets because of the reimbursement due to quitting members, and hence reduction of individual financial stakes through the costs of depreciation. Again, unwillingness to expand membership does not need to be a convenient strategy for incumbent members.

Self extinction forces can be particularly dangerous in cases where the existence of collective reserves entails transfer of wealth from one generation to another. If a group of members invests exclusively in indivisible reserves, it may be reluctant to accept new members, fearing an unjust appropriation of returns on capital assets by persons that did not contribute to investments. However, we saw that members of LMFs will invest in collective reserves only up to the point at

which they will be able to recoup the money invested during their stay in the firm. If this is true, it means that associates will not lose their own money when they enlarge membership. Each generation of co-operators will obtain the returns on what they saved and invested in their firm in the form of increased labour remuneration while capital will be completely depreciated. When divisible reserves exist, members will recoup the non depreciated part of physical assets too upon leaving the firm. Hence the attempt to prevent transfers of wealth from one generation of workers to the other cannot be the rationale of alleged self-extinction forces, at least in the system presented here.

Finally, if members of a LMF decide not to pursue expansionary paths and not to admit new members because they cannot afford expansion or because of idiosyncratic preferences, their firm will go extinct at some point in time. However, they will just consume the capital they self-financed in the past, and if free entry of new firms on the market is allowed, other production organisations will substitute the exiting ones.

To summarise, self-extinction forces are likely not to be sufficient to explain the rarity and disappearance of LMFs. In our work we conclude that the existence of a temporal horizon for worker members in LMFs and of a capital maintenance requirement represent more severe obstacles to the diffusion of this kind of production organisation.

5. Concluding remarks.

The objective of the present study has been the search for institutional solution able to allow workers' controlled firm to reach a Pareto optimal allocation of investment funds. The lacunas in the existing literature were found in a lack of attention to the institutional dimension of the problem. We attempted to fill these lacunas by referring initially to the works of the property right school. We looked for the most illuminating passages already existing in the literature and concerning the private appropriation of the net residual used as a financial basis for the accumulation of equity and for investments. Our solutions focus on the possibility to subdivide at least part of the net residual among worker members. It should be distributed in the form of extensions of current labour income and automatically reinvested in the firm in the form of loans remunerated by a fixed interest rate. This kind of distribution and reinvestment would amount to the creation of divisible reserves.

Loans supplied by worker members of LMFs should have some peculiar feature and be included in the equity of LMFs. They would serve as collateral for debt contracted with third parties, finance risky investments, absorb possible losses and shield worker members themselves against the risk of excessive fluctuations in current labour income. Quitting members would lose the status of firm's owners and their individual financial stake in the firm would not be part of the firm's equity any more. It could be paid back or converted into normal loans similar to the ones contracted between LMFs and external financiers.

The policy recommendations, given the conceptual scheme proposed, imply the introduction in LMFs of the above described form of individual appropriation of the net residual. Since the complete exclusion of indivisible reserves may not be advisable, a good solution for institutional design could be the definition of a range with a lower and an upper bond for both divisible and indivisible reserves. Members would have to distribute at least a minimal part of the net residual both in the form of collective and divisible reserves. The reason is that, this way, at least three relevant objectives would be attained:

- increase workers' motivations and involvement also from a financial point of view;
- eliminate the disincentive to the reinvestment of self-financed funds caused by the existence of a temporal horizon for worker members;

- guarantee the minimum level of stability to the equity of the firm necessary to favour the correct planning of investment projects over the medium run and the support by third financial parties.

Apart from marginal cases, LMFs will be free to choose the preferred allocation of their self-financed investment funds given the temporal horizon of their member, the marginal efficiency of capital, and the value of the other relevant parameters characterising their surrounding economic environment.

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