

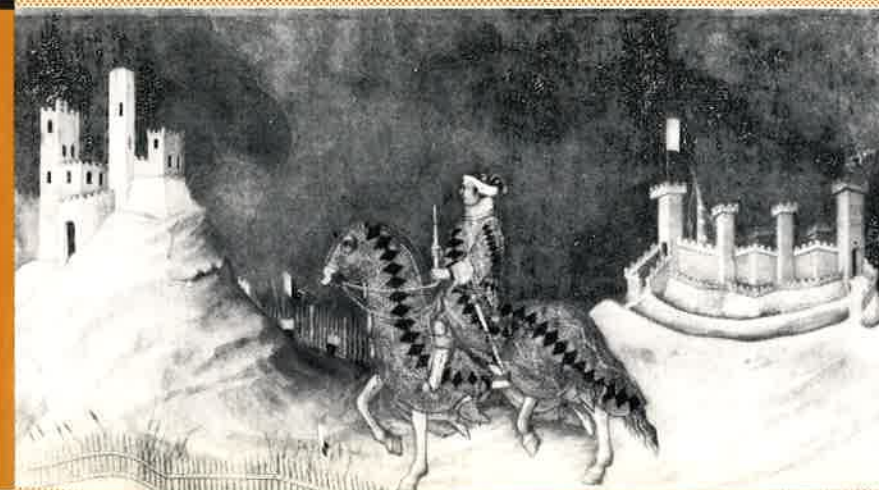
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QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA

Ugo Pagano

PROPERTY RIGHTS EQUILIBRIA
AND INSTITUTIONAL STABILITY



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Ugo Pagano

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Siena, agosto 1990

PROPERTY RIGHTS EQUILIBRIA AND INSTITUTIONAL STABILITY¹.

Introduction. In the New Institutional economics firm ownership or its governance system is endogeneously and efficiently determined by the characteristics of the resources which are used in the organization: namely their degree of specificity and their monitoring requirements. The first section of this paper summarizes the New Institutional view². The second section inverts the New Institutional view by arguing that the characteristics of the resources, employed in the firm, are, in turn, determined by the nature of its ownership and/or governance system. This view supports some of the claims of the Radical economists³ who have traditionally argued that the technology and the internal organization of the firm are often not due to the need for increasing efficiency and can be better explained as an outcome of given property

¹ This paper was written for the SCASSS conference on the *Microfoundations of Political Economy: Problems of Participations, Democracy and Efficiency* held in Sweden in June 1990. I thank the participants to the conference, and in particular Sam Bowles, Gregory Dow, Louis Putterman, Martin Weitzman and Gilbert Skillman for their stimulating comments. I am also very grateful for earlier comments and discussions to Maurizio Franzini, Frank Hahn, Lionello Punzo, Michio Morishima, Hamid Sabourian and Bob Rowthorn.

² The best general reader on the "New Institutional" and "Radical" view of the firm is Putterman (1986). Interesting contributions are also contained in Langlois (1986).

³ Although Radical Economists have drawn extensively from Marx and, in particular, from his analysis of the factory system, the Marxian analysis can also offer arguments in favour of the "efficiency view" entertained by New Institutional economics. Indeed, if we accept the Marxian view of the ultimate primacy of the development of productive forces over property rights, the Marxian approach becomes very close to that of New Institutional Economics. By contrast, if we emphasize the Marxian analysis of the capitalist factory system, where capitalist property rights shape the quality and the direction of productive forces, then we can find many arguments which can be used to criticize the "efficiency view" of New Institutional Economics. Cohen (1978) and Brenner (1986) are respectively the best examples of the first and the second Marxist philosophies of history. Roemer (1988) offers a very good survey of both. The Marxian analysis of the factory system was updated by Braverman (1974). Other radical economists, like Marglin (1974), Edwards (1982), Bowles and Gintis (1983) and (1986), Bowles (1985) have pointed out that the system of rights can shape and constrain the organization of production and technology.

relations. The two arguments are integrated by introducing the concept of property rights and technological equilibria. In section 3 this concept is developed by means of a simple model. There, we argue that institutionally stable property rights equilibria need not be efficient. Finally, the last section considers Williamson's contracting scheme and suggests two ways in which the scheme can be generalized.

1. New Institutional economics includes transaction costs literature and property rights literature. The first stems from Coase (1937) and has found its most complete exposition in Williamson (1985). The second stems from another article by Coase (Coase 1960) and has been enriched by the contributions of Alchian and Demsetz (1960, 1972), Alchian (1984, 1987), Demsetz (1966).

Both streams of literature have concentrated their attention on the economic nature of the firm, the existence of which is explained on the basis of market transaction costs. The first stream has emphasized the role of the firm as a governance system able, under some circumstances, to organize production at costs lower than market transactions. The second has emphasized the ownership of the firm by particular agents as a condition of its efficiency. The differences between these two streams of literature are however more a matter of focus and terminology than a matter of substance. Property rights, if interpreted in a general way, imply management rights and governance systems, and the latter are founded on explicit or implicit system of rights.

Moreover, these two streams of literature come to the common conclusion that the ownership structure of the firm or its governance system can face the asset specificity and monitoring problems better than the market- this being a relative advantage which explains the very existence of the firm⁴.

The asset specificity problem arises because, under conditions of bounded rationality, market transactions, supported by specific investments, expose the partners to the hazards of opportunistic behaviour. After "the fundamental transformation" (Williamson, 1985, chap. 2) due to the development of specific assets, the agents cannot move on to trade relations with other partners without suffering

⁴ A limit to the New Institutional Economics is that it has concentrated its attention on the market transaction costs which arise in an equilibrium situation. However, as Marx emphasized, the superiority of firm-type organization may be due to the disequilibrium costs which characterize market transactions (Pagano 1990a). Another limit of this literature is that it considers only firms and not also standard markets as institutions the existence of which has to be explained. On this point see Hodgson (1988).

substantial losses. Hence, the threat of competition cannot monitor the opportunism of the partners and market relations fail to support specific investments, even if they are technologically superior.

The monitoring problem arises when it is difficult to write, or to enforce a market contract specifying the contributions of the agents. Typically, these problems arise with team production when joint inputs are required for the production of a non separable output but, are by no means limited to this case (Alchian and Demsetz 1970 and Jensen and Meckling 1976). In this case firm hierarchies replace market contracts to ease the monitoring problem.

Thus, monitoring and asset-specificity⁵ are used to explain the emergence of the firm. They are also used to explain the property or the governance structure of the firm. The rights in or the control of the firm are likely to be acquired by the owners of firm-specific or difficult to monitor resources instead of owners of general purpose or easy to monitor resources. The former will be willing to offer a higher price for the control of the firm than the latter.

This is clear if we consider the case of owners of firm-specific resources. The value of their resources will increase or decrease with the success or the failure of the firm, will change with the policies of the firm and will be lost if they are fired from the organization - a set of circumstances which does not hold for the owners of the general purpose resources⁶. Thus the owners of specific resources will be willing to offer a higher price for the control of the firm.

⁵ The asset specificity problem and the monitoring problems are strictly related. As Alchian (1984 p. 39) observes, "Team production makes measurability of marginal products difficult, but not impossible. Even without team production, the contribution of one person in an exchange may not be economically measurable in all pertinent characteristics. If one party can gain by shirking in its performance, this means that the other party is specific to the shirker by the circumstances. This mode of expression emphasizes the specificity of one resource to another, but it obscures the significance of measurement of performance. On the other hand, if measurement of performance is emphasized, then the significance of expropriability of coalition interspecific rents resource quasi-rents is obscured. Even if measurement were no problem at all, opportunistic behaviour can occur blatantly because contracts are not costless to enforce, though I presume that without substantial expropriable quasi-rents of specific resources, blatant defiant cheating is not likely to be a serious problem."

⁶ "General" purpose resources may require a different type of safeguard and they should be distinguished from "generic" resources. In my opinion New Institutional economics is weak on both points. I will consider this problem in section 4. Until that point the New Institutional definition is accepted and used.

Consider now the case of the owners of the difficult to monitor resources. If they own the firm, they will have an incentive to perform efficiently and the high cost of measuring their contribution can be saved. Such saving will obviously be much less if the owners of the easy to monitor resources own the organization. Thus, if the owners of the difficult to monitor resources own the organization they can make it more profitable and so they will be willing to offer a higher price for the control of the organization.

It may be useful to concentrate our attention on some simple cases in which capital and labour are either entirely general purpose or entirely specific.

Denote general purpose capital and labour respectively by K_G and L_G and denote firm specific capital and labour respectively by K_S and L_S . Call M_K spot markets for renting capital and F_K a firm controlled by capital owners. Similarly, denote by M_L spot markets for labour and by F_L a firm controlled by labour.

We can then distinguish four cases:

A) $(K_G, L_G) \longrightarrow (M_K, M_L)$

Both capital and labour are general purpose resources. In this case spot markets for labour and capital can efficiently organize production. This is the case considered in orthodox economics where firms do not really exist and "it does not really matter who hires whom" (Samuelson, 1957, p. 894). No factor makes investment specific to an organization of production and therefore no factor is interested in its control. Anyone can move to trade relations with other partners at low costs.

B) $(K_S, L_G) \longrightarrow (F_K, M_L)$

Capital is specific to a certain organization of production, whereas labour is general purpose. In this case the organization of production cannot entirely be left to the market and a "capitalist firm" is likely to exist. Capital has an interest in controlling the organization of production because it is specific to this organization and would lose its value if it was separated from it. Thus, Capital will be interested in the management of the organization and, in particular, in holding firing and hiring rights. Labour is general purpose and can move to other organizations without losing its value. Capital will offer more than labour for the control of the organization. Thus, a capitalist firm and a labour market, where labour is hired by capital, will be generated. This is also an efficient solution because the control of the organization is given to

the factor which is more interested in its efficient management because its value is organizational-specific.

C) $(K_G, L_S) \longrightarrow (F_L, M_K)$

In a similar way, when capital is the general and labour the specific factor, New Institutional Economics explains workers ownership of the firm and a rental market for capital. This justifies the relationship above.

D) $(K_S, L_S) \longrightarrow (F_K, F_L)$

In this case both labour and capital are specific to the organization of production. As a consequence both will be interested in some degree of control of the latter because they are both liable to be expropriated if they are separated from the organization. Many solutions, such as "governance institutions" or "labour-capital partnerships", can satisfy this requirement. In all these cases the efficient solution is achieved by safeguards and joint decision making which make the expropriation of one specific factor by another specific factor more difficult and costly⁷.

We can now join together points a, b, c and d and obtain Figure 1.

⁷ Of course, the specificity problem does not only arise between capitalist and workers but also among capitalist and workers. Leijohufvud (1986) points out how the joint stock company arises as solution to the specificity problems among the owners of machines. Rowthorn (1986) and Pagano (1989) suggest that "solidaristic corporatism" can be considered as a symmetrical solution for the workers. This solution is however much more difficult and unstable because, unlike capital, collective ownership of labour-power is in contrast with the condition of self-ownership which is at the foundation of individual liberties.

Figure 1

	L_e	L_d
K_e	M_K, M_L	F_L, M_K
K_d	F_K, M_L	F_K, F_L

A figure similar to Figure 1 can be constructed for the monitoring problem. Denote by a subscript E "the easy to monitor resources" and by subscript D "the difficult to monitor resources". Then K_e and L_e will stand for easy to monitor labour and capital⁸ and K_d and L_d will stand for difficult to monitor labour and capital.

⁸ Capital is "difficult to monitor" when user induced depreciation cannot be inferred by observing capital before and after it is used. Some information on the way capital has been used is therefore important in order to estimate its value after use. If the owners of the firm own the capital employed in the organization, then they have an incentive to take care of their capital. When user induced depreciation is difficult to monitor, the possibility of careless use makes the rental of "difficult to monitor capital" more expensive than its ownership. See Alchian and Demsetz (1970).

Figure 2

	L_e	L_d
K_e	M_K, M_L	F_L, M_K
K_d	F_K, M_L	F_K, F_L

a) $(K_e, L_e) \longrightarrow (M_K, M_L)$

The market solution is implied by a situation where both labour and capital are easy to monitor resources. Here, standard contracts can easily specify the characteristics of the goods and the services to be exchanged.

b) $(K_d, L_e) \longrightarrow (F_K, M_L)$

The capitalist firm solution arises when labour is the easy to monitor resource and capital (possibly including not only machinery but also management services) the difficult to monitor resource. Under capitalist ownership, the relatively higher costs of monitoring capital can be saved by having it as the residual claimant.

c) $(K_e, L_d) \longrightarrow (F_L, M_K)$

Opposite conditions, where labour is the difficult and capital the easy to monitor resource, generate the labour owned firm.

$$d) (K_D, L_D) \longrightarrow (F_K, F_L)$$

If both labour and capital are difficult to monitor then a system of joint ownership that gives to both capital and labour an incentive to improve the efficiency of the organization is the most preferable solution.

In conclusion, changes in technology affect the degree specificity and the monitoring characteristics of the assets which it is optimal to employ and, in this way, determine property rights. Transaction costs due either to the specificity or the monitoring characteristics to be employed justify the existence of the variety of institutions which characterize a market economy by their relative efficiency.

2. In the New Institutional literature the firm exists because of costs which would otherwise be incurred through market exchanges. At the same time, the efficiency of firms relies on the fact that the property rights on these organizations can be exchanged and acquired the individuals who can rule them more efficiently and therefore are able to offer a higher price for their ownership. Still things are not so simple. If transaction costs are admitted these gains may be lower than the costs of exchanging property rights. Moreover exchange may take time. Because of the costs and the time taken by the transactions, changes in technology may have a weak or slow effect on the re-allocation of property rights. This point is important because if property rights are not immediately exchanged according to the dictates of efficient technology, then in the meantime the opposite effect may take place. Property rights may influence the technology used by the firm and, in particular, the degree of specificity and the monitoring characteristics of the resources used by these organizations.

However, the influence of property rights on technology also has to be examined for a more fundamental reason. Technology is not created and adopted in a property rights and institutional vacuum. The technology adopted by the firm may well determine that some property rights have to be changed following the efficiency drive examined by New Institutional Economics. But, in turn, this technology is always shaped within the framework of a certain ownership structure which influences the nature of the technology and the resources employed by

the firm. In particular, the specific or general and the difficult or easy to monitor character of the resources employed by the firm cannot only be a factor determining the ownership structure of the firm but must also be influenced by it. In fact, we are going to argue that fig. 1 and fig. 2 can be put upside down and the causal relationships, underlining the following figures 1' and 2' are as convincing as those considered in the original figures

Figure 1'

	M _L	F _L
		
	:	:
	:	:
M _K	: K _c , L _c	: L _s , K _c
	:	:
	:	:
		
	:	:
	:	:
F _K	: K _s , L _c	: K _s , L _s
	:	:
	:	:
		

Figure 2'

	M _L	F _L
		
	:	:
	:	:
M _K	: K _E , L _E	: L _D , K _E
	:	:
	:	:
		
	:	:
	:	:
F _K	: K _D , L _E	: K _D , L _D
	:	:
	:	:
		

A') (M_K, M_L) → (K_G, L_G)

Only spot market relations, where factors are rented, are possible for both factors and it is not possible to acquire any right which guarantees one factor against the possible opportunism of the other in unforeseen circumstances. In this situation both capital owners and workers will be inhibited in the development of specific resources. The employment of general resources will be strongly preferred. An insurance cost will have to be sustained to employ specific resources to guarantee them against the opportunism of the other factor owners.

a') (M_K, M_L) → (K_E, L_E)

If both capital and labour can only rent their services on the market, they have a strong incentive to keep the costs of monitoring these services low. If a factor becomes more difficult to monitor it also becomes more expensive to rent and loses its competitiveness. In this

situation, investments which increase productivity but imply an increase in monitoring costs tend to be strongly discouraged and investments characterized by lower productivity and lower monitoring costs tend to be strongly preferred. Thus a system, where sometimes labour hires capital and other times capital hires labour, is characterized by a strong incentive to plan investments that shape capital and labour as "easy to monitor" factors. Investments, otherwise yielding high benefits, are sacrificed because the property right system cannot easily deal with "difficult to monitor" factors.

B') (F_K, M_L) → (K_S, L_G)

In this case resources are employed in an organization controlled by capital owners. This insures the owners of specific capital against the possible opportunism of the workers at a zero or low insurance cost. By contrast, no similar guarantee exists for the workers who develop firm-specific skills. An insurance cost will therefore be sustained for the employment of these factors, and the technology of the firm will therefore be biased in the direction of the employment of firm-specific capital and against the employment of firm-specific labour. This is a result consistent with the job de-skilling hypothesis⁹ considered by Braverman (1974). Braverman describes and explains job de-skilling on the basis of the property relations which, according to him, characterize capitalism. This job de-skilling effect is obtained by (over-)applying the Babbage criterion¹⁰. A very detailed division of labour is introduced because this organization of the labour process minimizes the insurance costs which would otherwise be sustained in order to develop workers' firm-specific assets. In particular, under capitalist ownership, the development of firm-specific learning and assets specific to the preferences of the worker¹¹ presently employed in the firm is inhibited. Human resources will tend to be general purpose (or, better, "generic") instead of firm-specific.

⁹ This argument will be completed in the final section where it is shown that "classical capitalism" can inhibit the development of both "general" and "firm-specific" human skills and may be only be consistent with the use of "generic" skills. I have considered the interpretations of Braverman's de-skilling hypothesis in Pagano (1990b). Important developments as well as criticisms of Braverman include Littler (1982) and Edwards (1979). A survey is offered by Thompson (1983).

¹⁰ An analysis of this point can be found in Pagano (1989).

¹¹ On the concept of workers' preferences and their unsatisfactory treatment in economic theory, see Pagano (1985).

(B') (F_K, M_L) ———> (K_D, L_E)

Ownership of capital by its users saves monitoring costs and makes the investment in "difficult to monitor capital" cheaper. By contrast any investment in "difficult to monitor labour" is relatively expensive under this property right system. The workers have no property rights in the firm and they have little incentive to perform well. Monitoring hired labour is expensive and this cost can be reduced by investing in "easy to monitor labour". Thus the classical capitalist firm (F_K, M_L) has investments relatively biased in favour of "difficult to monitor capital" (K_D) and "easy to monitor labour" (L_E). Again, this analysis provides a rationale for the analysis of the labour process under capitalist relations given by the Radical economists and, in particular, by Braverman (1984). Whereas in New Institutional economics the workers have no rights in the firms where they work because they are "easy to monitor" and/or "general purpose" factors, in Braverman's book the workers become "easy to monitor" and "general purpose" factors because, under capitalism, they have no rights in the firm where they work. According to Braverman, it is because of capitalist property rights that a detailed division of labour (on the lines suggested by Babbage and Taylor) is implemented and workers perform simple tasks which are easy to control, and require only "generic" skills. Under capitalism, the development of difficult to monitor human resources is inhibited by the fact that the workers have no rights in and attachment to the organization where they work.

C') (F_L, M_K) ———> (K_G, L_S)

Whereas in the previous case capital hires labour, in this case labour hires capital. If labour can hire and fire machines, machine owners will want an insurance cost to cover the risks of premature termination in circumstances, unforeseen in the market contract, where workers may behave in an opportunistic manner¹². By contrast, firm-specific labour can be employed without paying the insurance costs

¹² A possible objection to this argument is that, instead of renting machines, the workers may borrow money, buy the machines and use them as collateral. Still, this objection can be answered by observing that firm-specific machines are less valuable as collateral than general purpose machines because it is more difficult to liquidate them in case of bankruptcy. In both cases it will be more expensive to rent firm-specific capital than general purpose capital.

which are sustained by the capitalist firm. Thus, whereas the capitalist firm will tend to employ firm-specific capital and general-purpose labour, the workers' managed firm will be biased in the opposite direction. It will be a hospitable environment for the development of firm-specific labour and general purpose capital.

(c') (F_L, M_K) ———> (L_D, K_E)

Under workers' ownership of the firm, each worker has some incentive to work and an incentive to see fellow workers doing their share of work. Under these circumstances cheap horizontal monitoring may be performed, jointly with production activity, by each one of the workers¹³. As long as workers have some knowledge of each others' activities, "difficult to monitor labour" is relatively inexpensive for firms characterized by this system of property rights. By contrast, "difficult to monitor capital" is costly for these organizations because the agents leasing the equipment know that for any given rent the agents have an incentive to use the equipment with insufficient care if this is cheaper. Hence the workers will have to pay a relatively high rent for "difficult to monitor capital" which inhibits their investment in this type of equipment¹⁴. Thus, a classical workers' co-operative (F_L, M_K) will have investments biased in favour of "difficult to monitor labour" (L_D) and easy to monitor capital (K_E).

D') (F_K, F_L) ———> (K_S, L_S)

If both workers and capital, or at least some of them, have rights in the firm which guarantees them against the opportunism of the other partners in unforeseen circumstances, then both firm-specific labour and capital will be developed in the organization. Even if rights and safeguards do not have necessarily zero-sum characteristics, some clashes of rights may occur and may make them less effective. In spite

¹³ On the advantages of horizontal monitoring see Aoki (1987, 1988) and Putterman (1982).

¹⁴ Again, difficult to monitor capital, like firm-specific capital, is less valuable as collateral than easy to monitor capital because it will be more expensive for the lender to monitor user induced depreciation. Thus, also in this case borrowing money and buying machines may not be a solution to the problem of difficult to monitor capital.

of these caveats¹⁵ the obvious advantages of this solution explains its success among economists and real-life economies.

(d') $(F_K, F_L) \longrightarrow (K_D, L_D)$

If both labour and capital have some property rights on the organization (F_K, F_L) , then neither the investment in "difficult to monitor capital" (K_D) nor the investment in "difficult to monitor labour" (L_D) are inhibited. If a co-operative attitude among the holders of these rights is developed within the organization, then the co-existence of labour and capital rights can favour investments in both types of "difficult to monitor resources". However, the same caveats considered in case (d), also apply in this case.

Thus, the arguments developed by New Institutional economics can be inverted by following the suggestions of the Radical economists. However, in our opinion the arguments, developed by the two streams of literature are far from being incompatible. We believe that the analysis of property rights and technology can progress only by integrating the contributions of these two streams. In order to visualize in the easiest way the meaning of this integration, denote by K_E-G and L_E-G easy to monitor and/or general capital and labour and by K_D-S and L_D-S difficult to monitor and specific capital and labour. Let us now join A with A' and a with a', B with B' and b with b', C with C' and c with c', D with D' and d with d'. We obtain the following relations which capture the interaction of property rights and technology and provide the framework for a definition of the notion of "equilibrium property rights and technologies".

(A) $\longrightarrow (M_K, M_L) \longrightarrow (K_E-G, L_E-G) \longrightarrow (M_K, M_L) \longrightarrow$

$(K_E-G, L_E-G) \longrightarrow$

(B) $\longrightarrow (F_K, M_L) \longrightarrow (K_D-S, L_E-G) \longrightarrow (F_K, M_L) \longrightarrow$

$(K_D-S, L_E-G) \longrightarrow$

¹⁵ One of these caveats, due to the "unstable ownership" which may have under a system of joint ownership, is considered in Ognedal (1990).

(C) $\longrightarrow (F_L, M_K) \longrightarrow (K_E-G, L_D-S) \longrightarrow (F_L, M_K) \longrightarrow$

$(K_E-G, L_D-S) \longrightarrow$

(D) $\longrightarrow (F_K, F_L) \longrightarrow (K_D-S, L_D-S) \longrightarrow (F_K, F_L) \longrightarrow$

$(K_D-S, L_D-S) \longrightarrow$

We can in fact give the two following definitions which clarify the reasons for which the relations considered above may define equilibrium property rights and technologies.

Definition 2.1. A property right system (F_i, M_i) ($i = K, L$) is a property right equilibrium if it generates a technology (K_j, L_j) ($j = E-G, D-S$) which re-generates (F_i, M_i) .

Definition 2.2. A technology (K_j, L_j) ($j = E-G, D-S$) is an equilibrium technology if it generates a property right system (F_i, M_i) ($i = K, L$) which re-generates (K_j, L_j) .

The arguments, which we have examined so far, provide some good reasons to believe that all the four relations considered above may define equilibrium property right and technologies. In other words, joining together the two streams of literature may imply that property rights and technologies have a self-generating capacity which may characterize and define their equilibrium states.

In order to make the argument simpler let us concentrate our attention on cases (B) and (C) which define respectively the "capitalist" and the workers' property rights equilibria.

In the first case (B) a system where the capitalists own the firm and hire labour on the market (F_K, M_L) implies that investment is biased in favour of "difficult to monitor and specific capital" and "easy to monitor and general purpose labour" (K_D-S, L_E-G) ; but this technology implies that capital can save more than labour on monitoring and insurance costs if it owns the firm. Therefore this technology re-generates the initial system of property rights (F_K, M_L) which, in turn, again brings about the technology (K_D-S, L_E-G) and so on.

In the second case (C), a system where the workers own the firm and hire capital on the market (F_L, M_K) implies that investment is biased

in favour of "difficult to monitor labour" and "easy to monitor capital" (K_E, L_D); but this technology implies that labour can save more on monitoring costs than capital if it owns the firm. Therefore this technology regenerates the initial system of property rights (F_L, M_K) which in turn again brings about the technology (K_E, L_D) etc.

This argument implies that history matters in the sense that property rights equilibria may depend on initial conditions having self-generating and self-reinforcing properties which cause their institutional stability¹⁶. Or, in other words, sometimes past history rather than a-historical efficiency may determine which particular property right equilibrium exists. The purpose of the following section is to make these intuitions a bit more precise. In particular we will concentrate our attention on cases (B) and (C). These have been chosen only in order to simplify the analysis and not because they are more relevant than the other cases.

3. In our simple model there are two agents, capitalists and workers. Capital can be employed either as difficult to monitor and/or specific (D-S) capital K or as easy to monitor and/or general (E-G) capital K . Similarly, the workers can be employed in either difficult to monitor or specific (D-S) labour L or in easy to monitor (E-G) labour L . R and R are respectively the price of one unit of E-G capital and of one unit of D-S capital (net of insurance and monitoring costs). W and W denote respectively the price of one unit of E-G labour and one unit of D-S labour (net of insurance and monitoring costs).

We focus our analysis on one representative firm and we assume that ownership of the firm goes to the owners of factors of production, *presently employed in the firm*, which would cost more, because of the D-S character of their resources, if employed in other agents' organizations. In other words, these resources are most valuable in organizations controlled by the owners of the resources. These agents will be able to reap a pure rent, because of the D-S character of their resources, when they own the organization. This rent is equal to the price which should otherwise be paid by employers of their resources (different from themselves) as insurance and monitoring costs.

We assume that the workers sustain an additional cost Z when they employ a unit of difficult to monitor and/or firm specific (D-S) capital which is not sustained by the capitalists when they employ this

¹⁶ Some other reasons, which also imply that the existing property rights can have self-generating properties, are considered by Putterman (1982) and Levine (1990).

factor. We also assume that the capitalists pay an additional cost H when they employ D-S labour. H is not paid by the workers when they employ D-S labour. For this reason Z is also the rent which is realized by the owners of capital on each unit of D-S capital when they own the organization and H is the rent which is realized by the workers on each unit of D-S labour when the workers own the organization. The total capitalists' rent under capitalist ownership will be equal to ZRK and the total workers' rent under workers' ownership will be equal to HWL . We will call ZRK and HWL the total ownership rents perceived by the factors.

We can now state the two following assumptions. The first concerns the behaviour of the firm for any *given* (capitalist or workers') ownership. The second concerns the ownership of the firm for any *given* amounts of factors employed in the firm.

Assumption 3.1. The firm maximizes profits (inclusive of ownership rents). Profits are equal to:

$$R^C = Q(K, K, L, L) - [RK + RK + WL + (1+H)WL] \quad (1)$$

under capitalist ownership

and to:

$$R^L = Q(K, K, L, L) - [RK + (1+Z)RK + WL + WL] \quad (2)$$

under workers' ownership.

Assumption 3.2. For any given amounts of factors employed in the firm, its ownership will be acquired by the factor which can earn the highest ownership rent.

Assumption 3.2 implies that capitalist property rights will prevail if, given the factors currently employed,

$$ZRK - HWL > 0 \quad (3)$$

workers' property rights will prevail if, given the factors currently employed,

$$HWL - ZRK > 0 \quad (4)$$

We introduce now the following definition concerning the characteristics of the technology employed in the firm:

Definition 3.1: A technology which satisfies (3) is a "D-S capital intensive technology" and a technology which satisfies (4) is a "D-S labour intensive technology". The ratio K/L denotes the degree of D-S capital (labour) intensity of a technology.

Conditions (3) and (4), expressing respectively the definitions of a D-S capital intensive and a D-S labour intensive technology, can be rewritten in terms of the degree of D/S capital intensity as follows:

$$Z_R/H_W K/L > 1 \quad (3')$$

$$Z_R/H_W K/L < 1 \quad (4')$$

The following proposition follows immediately from assumption 3.2 and definition 3.1.

Proposition 3.1. A D-S capital (labour) intensive technology "causes" the introduction of capitalist (workers') property rights.

We can also state the following "inverse" proposition:

Proposition 3.2. Capitalist (workers') property rights imply the choice of a more D-S capital (labour) intensive technology than the one implied by workers' (capitalist) property rights.

Given the usual standard assumptions about the shape of the profit function, Proposition 3.2 follows immediately from comparing the values of K and L which maximize (1) and (2). Denote by K^c and L^c the values of K and L which maximize (1) and by K^L and L^L the values of K and L which maximize (2). Then, we have:

$$K^c > K^L \text{ and } L^L > L^c \quad (5)$$

Or,

$$K^c/L^c > K^L/L^L \quad (5')$$

which is a different way of stating proposition 2.

Proposition 3.1 expresses the mechanism by which technology influences property rights and proposition 3.2 the mechanism by which property rights influence technology. Joining together these two propositions we obtain cumulative processes by which property rights influence themselves (via technology) and technology influences itself (via property rights). Thus, we have the following two propositions 3.3 and 3.4.

Proposition 3.3. Capitalist (workers') property rights are self-reinforcing in that they bias technology in a direction which is favourable to capitalist (workers') property rights.

Suppose, for instance, that we have capitalist property rights. Then, a technology more D-S capital intensive than that prevailing under workers' property rights will be introduced (Proposition 3.2 and conditions 5'). This increases the probability that constraint (3'), expressing the conditions of a D-S capital intensive technology, will be satisfied. In turn the satisfaction of this constraint implies the introduction of capitalist property rights (Proposition 3.2).

Proposition 3.4. A D-S capital (labour) intensive technology is self-reinforcing in that it biases property rights in a direction which is favourable to this technology.

Suppose, for instance, that we have a D-S capital intensive technology. This implies that capitalist property rights will prevail (Proposition 3.1 and condition 3'). In turn, capitalist property rights will bias the technology towards a higher degree of D-S capital intensity which reinforces the D-S capital intensive character of the technology.

We introduce now two new definitions of property rights and D-S technological equilibria which specify the meaning of definitions 2.1 and 2.2 in the context of the present simple model.

Definition 3.2. A given set of property rights are equilibrium property rights when the technology, maximizing the profits of the present owners of the firm, does not upset these property rights.

In particular:

Capitalist property rights are equilibrium property rights if, the technology which maximizes (1) satisfies (3) or, if profit maximization

under capitalist property rights implies the introduction of a D-S capitalist intensive technology which, in turn, implies capitalist property rights. Or, capitalist property rights are equilibrium property rights when:

$$ZRK^c - HWL^c \geq 0 \quad (6)$$

Workers' property rights are equilibrium property rights if the technology which maximizes (2) satisfies (4), and, therefore, when:

$$HWL^L - ZRK^L \geq 0 \quad (7)$$

Definition 3.3. A given (D-S capital or labour intensive) technology is an equilibrium technology when the profit maximizing choices, taken under the associated system of property rights, do not upset this technology.

In particular:

A D-S capital intensive technology satisfies (3) by definition and implies capitalist property rights which involve the maximization of (1). A D-S capital intensive technology is an equilibrium technology when the technology resulting from the maximization of (1) also satisfies (3). Or a D-S capital intensive technology is a technological equilibrium when:

$$ZRK^c - HWL^c \geq 0 \quad (6')$$

In the same way it can be argued that a D-S labour intensive technology is a technological equilibrium when:

$$HWL^L - ZRK^L \geq 0 \quad (7')$$

We have seen that a property right equilibrium defines a technology supporting the initial set of property rights. Could it be that the system is not in a technological equilibrium even if it is in a property right equilibrium? Clearly not, because the technology which is implied by these rights in the first place will be again be implied over and over by them.

Similarly, suppose that the system is in a technological equilibrium. This would mean that the existing technology supports property rights which imply the same technology. This in turn must imply the same property rights. Thus the system must also be in a property right equilibrium.

For this reason it is not surprising that a D-S capital intensive technological equilibrium and a capitalist property right equilibrium occur under the same conditions (6) and (6') and that a D-S labour intensive equilibrium and a workers' property rights equilibrium occur under the same conditions (7') and (7).

Thus, a property right equilibrium is also a D-S technological equilibrium and a technological equilibrium is also a property right equilibrium. Referring to one of them simply emphasizes the initial conditions relative to the technology or the property rights on the basis of which the equilibrium is determined.

In what follows we will therefore refer to property rights - D-S technological equilibria or simply to property rights equilibria.

Proposition 3.5. At least one property right (D-S technological) equilibrium exists.

Supposing that this is not so, then conditions (6) and (7) would simultaneously not be satisfied. This implies that the two following conditions would be simultaneously satisfied

$$ZRK^L - HWL^L \geq 0 \quad (8) \quad HWL^c - ZRK^c \geq 0 \quad (9)$$

But if (8) is satisfied then

$$HWL^L - ZRK^L \leq 0$$

and because of (5)

$$HWL^c - ZRK^c \leq 0$$

which contradicts the possibility that (9) is also satisfied and proves the existence of at least one property right (D-S technological) equilibrium.

We will now consider three relevant cases of property rights - D-S technological equilibria. In the first two cases the system has a unique property rights - technological equilibrium independent of initial conditions. In the third case, the system has two property rights - technological equilibria which depend on the initial conditions of the system.

$$a) ZRK^L - HWL^L \geq 0 \quad (8)$$

or condition (7) cannot be satisfied. Even under workers' ownership or a initially given D-S labour intensive technology, a workers' property right equilibrium is not sustainable.

Because of proposition 3.5 a capitalist property right equilibrium

$$ZRK^c - HWL^c \geq 0 \quad (6)$$

is sustainable. The system has a unique capitalist right equilibrium independent of initial conditions. Workers' property rights cannot be equilibrium property rights.

$$b) HWL^c - ZRK^c \geq 0 \quad (9)$$

or conditions (6) cannot be satisfied. Even under capitalist property rights or an initially given D-S capital intensive technology, a capitalist property right equilibrium is not sustainable. Because of proposition 3.5 a workers' property right equilibrium

$$HWL^L - ZRK^L \geq 0 \quad (7)$$

is sustainable. The system has a unique workers' property right equilibrium independent of initial conditions.

$$c) ZRK^c - HWL^c \geq 0 \quad (6) \text{ and } HWL^L - ZRK^L \geq 0 \quad (7)$$

then the system has two property rights equilibria which depend entirely on the initial conditions. Capitalist and workers' property rights are simultaneously feasible because of (5) and propositions 3.3 and 3.4.

We can therefore state the following proposition:

Proposition 3.6. Multiple property rights - D-S technological equilibria are possible. These equilibria are historically dependent and self-sustaining in the sense that they reproduce a given set of initial property rights or D-S technological conditions. Or, in other words, a given set of initial property rights or D-S technological conditions may be an equilibrium because it has first come into existence.

Observe that even in the case in which we have multiple equilibria these equilibria are efficient in the sense that they minimize costs and, in particular monitoring and insurance costs for an initially given structure of property or technological conditions.

Still, efficiency can be defined as unconstrained by these initial conditions in terms of the property right equilibrium which is characterized by the lowest costs. Or, in other words, we could state which set of initial conditions would have allowed cost minimization.

Observe that, although in a capitalist property right equilibrium $ZRK^c \geq HWL^c$, only HWL^c will be effectively paid and will involve the expenditure of useful resources.

Observe also that, although in a workers property right equilibrium $HWL^L \geq ZRK^L$ only ZRK^L will be effectively paid and consume real resources.

We can therefore say that overall efficiency is achieved when these costs, which are effectively paid, are minimized. In other words, capitalist property rights are efficient when:

$$ZRK^L - HWL^c \geq 0 \quad (10)$$

and workers' property rights are efficient when

$$HWL^c - ZRK^L \geq 0. \quad (11)$$

Proposition 3.7. When only one property right - D-S technological equilibrium exists, then that equilibrium is efficient.

Suppose that we are in a unique capitalist property right equilibrium defined by :

$$ZRK^L - HWL^L \geq 0 \quad (8)$$

then, because of (5), also (10) is satisfied.

The same argument holds for a unique workers' right equilibrium.

In the case of multiple equilibria it follows from conditions (10) and (11) that only one of the two property rights equilibria defined by conditions

$$ZRK^c - HWL^c \geq 0 \quad (6) \text{ and } HWL^L - ZRK^L \geq 0 \quad (7)$$

can be efficient, except for the special case in which conditions (10) and (11) are satisfied as equalities which implies:

$$ZRK^L = HWL^c$$

We can therefore state the following proposition:

Proposition 3.8. When multiple property right equilibria exist, then property rights equilibria can be inefficient.

It follows from proposition 3.8 and 3.5 that

Proposition 3.9. A given set of property rights - D-S technological conditions may be institutionally stable in the sense that the fact that it has first come into existence explains that it is the equilibrium of the system even if it is inefficient.

In order to clarify and to expand on this characteristic of the institutional stability of property rights equilibria, imagine that an inefficient property rights - D-S technological equilibrium is subject to "weak" technological or to property rights shocks.

Let us define a technological shock as an exogeneous change in the productivity of the factors. A technological shock, such as an innovation, may imply that a given property right - D-S technological equilibrium becomes inefficient. Suppose, for instance, that we are in a capitalist efficient equilibrium where both conditions:

$$ZRK^C - HWL^C \geq 0 \quad (6) \quad \text{and} \quad ZRK^L - HWL^C \geq 0 \quad (10)$$

are satisfied. Suppose now that the technological shock implies that workers' ownership becomes more efficient and (10) is not satisfied because ZRK^L is now smaller than HWL^C .

However, because of (5), ZRK^C is greater than ZRK^L . This implies that (6) could still be satisfied even if (10) is not satisfied. In this case we would still be in a capitalist property right equilibrium even if, after the technological shock, this equilibrium is now inefficient. In other words the technological shock may not be strong enough to imply that the capitalist - D-S capital intensive equilibrium is upset and the economy moves to a workers' property right - D-S labour intensive technological equilibrium. Thus, equilibria can resist technological shocks which imply that a different equilibrium is more efficient.

Let us now define a property right shock as an exogeneous change of property rights. In our simple model a property right shock can only be a change from capitalist to workers' ownership and vice versa. Property right equilibria can be resistant to property rights

shocks even when these shocks would push the system towards more efficient solutions. Suppose that we are in an inefficient capitalist property right equilibrium or that conditions

$$ZRK^C - HWL^C \geq 0 \quad (6) \quad \text{and} \quad ZRK^L - HWL^C \leq 0. \quad (11)$$

are satisfied. If a property right shock occurs and the workers are given by authority (for instance, state intervention) the ownership of the firm, the new owners of the firm will find themselves with a structure of resources given by (6) which is the result of the preceding capitalist property rights equilibrium. Under these circumstances it may be convenient for both the capitalists and the workers to transfer back ownership to the capitalists because, with the resources employed by the capitalists in the preceding equilibrium, monitoring and insurance costs are higher under workers' ownership. Still, if workers' ownership is protected for some time (i. e. immediate exchange is forbidden) they will then employ a new structure of resources which allows the achievement of the more efficient workers' property rights equilibrium. In other words inefficient property rights may be resistant to property rights shocks which do not last long enough to allow the development of a technology consistent with the new property rights.

We can define as "weak technological shocks", shocks which imply that a different equilibrium is more efficient but do not violate condition (6) and as "weak property rights shocks", shocks which do not last for a sufficiently long time to develop resources consistent with the new property rights. We can then state the following proposition.

Proposition 3.10. Inefficient property rights - D-S technological equilibria are institutionally stable in the sense that there are "weak" property rights and technological shocks to which they are resistant, even if these shocks push the system in the direction of an efficient equilibrium.

We may conclude this section by pointing out some limitations and possible extensions of the simple model which we have considered:

i) We have implicitly assumed the entire human and physical capital can be immediately adjusted according to the profit maximizing behaviour defined by (1) and (2). If we assume that only part of the stock of human and physical capital could be immediately adjusted, then the institutional stability properties of the model would become much

stronger. Any change in the technological specification of the resources, bringing about new property rights, would take time. In the meantime, the existing property rights would continue to shape technology and reinforce themselves. Changes which cannot immediately be implemented, may never be implemented.

ii) We have also implicitly assumed that transactions of property rights between firms' members take place at zero transaction costs. If transaction costs are positive, then, denoting by T the value of these transaction costs conditions (3) and (4) should be rewritten as follows:

$$ZRK - HWL > T \quad (3')$$

$$HWL - ZRK > T \quad (4')$$

Clearly, the assumption of positive transaction costs would reinforce the institutional stability characteristics of property rights equilibria. (Indeed for a sufficiently large value of T property rights equilibria would become resistant to any shock). Transaction costs could also be introduced into the analysis by assuming that transactions take time. This would also greatly reinforce the institutional stability characteristics of property rights equilibria. While transactions could be organized, in the meantime the existing property rights would shape the technological specification of the resources in a self-reinforcing manner. Transactions, which cannot immediately take place, may never take place.

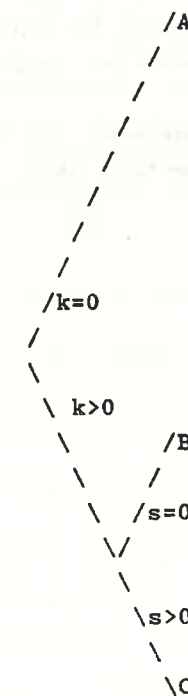
iii) We have simplified the analysis by considering the case of representative firm. This restricts the generality of the propositions which have been considered in this section. It is the task of further research to state which of these propositions hold under a less aggregate analysis. Indeed, the purpose of these propositions is to stimulate research in this direction rather than state any definitive conclusion on the subject.

4. The analysis carried out in the preceding section has been restricted to the particular cases of rights implying either complete workers' or capitalist ownership. The New Institutional Economics has concentrated its attention on more complicated cases. Still, even in these other cases and, perhaps, even more in these cases, the set of rights and duties and the governance system characterizing the modern firm must be seen not only as an "efficient" outcome of the technological

specification of resources but also as one of its causes¹⁷. This suggests that the concepts of property rights equilibria and institutional stability have a wider application. In what follows I will try to argue that the Oliver Williamson contracting scheme, which is the most popular expression of this approach, can be generalized by developing the approach considered in the preceding sections.

Williamson (1985) summarises his contracting scheme in the following figure 3.

Figure 3

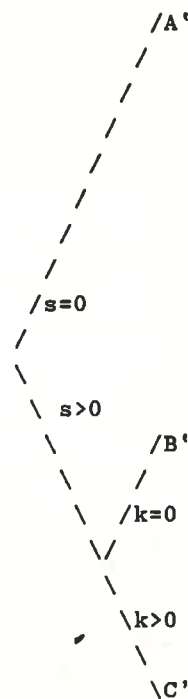


¹⁷ The efficiency explanation of the industrial organization seems to be very weak on empirical grounds. Different countries (think of West Germany, the U. S., Japan and Sweden) seem to have organized production in such different ways that a "pure" efficiency explanation of these differences seems difficult to accept. By contrast, property right - D-S technological equilibria, which may be institutionally stable even when they are inefficient, are compatible with this variety of experiences. Although any serious analysis of real life economies is beyond the scope of this paper, I will briefly consider this point in the concluding section.

In this figure $k=0$ denotes absence of specific investment and $k>0$ denotes its existence. Williamson argues that, in the case of the adoption of the specific technology, there will be a tendency to develop safeguards ($s>0$) to protect this specific investment. If these safeguards are not developed ($s=0$), then specific investments cannot be sustained because the agents will be subject in an uncertain world to the possible opportunism of their partners. For this reason, Williamson argues that node B is unstable and that there is a tendency to move either to node A or to node C. Typically, Williamson explains the existence of the unions as due to the interest of the workers in protecting their specific assets. Thus, the existence of a particular technology explains the rights (such as safeguards against premature termination or even job tenure) which the workers have in particular organizations.

Still, there is no reason why Williamson's scheme could not be "inverted" on the lines suggested in the preceding sections as it is done in the following figure 3'.

Figure 3'



For instance, workers may want safeguards in their jobs in particular firms for reasons other than the protection of their specific assets (changing the distribution of income being an obvious one). However, once they have these safeguards ($s>0$) they may be ready to invest in firm-specific assets without claiming any additional insurance premium. One can argue that if specific investments ($k>0$) are generated, then workers' rights are particularly stable (node C) because the workers have an additional interest in defending them. Otherwise, these rights or safeguards may be lost ($s=0$) and the system may turn back to node A'.

The priority given by Williamson to (specific vs. general purpose) technology is due to the fact that he sees the general or specific character of the resources as independent of the property rights or the safeguard systems. However, the specific, general (or, as we will, see generic) nature of the resources may entirely depend on the property right or the governance system which is adopted.

In order to appreciate this possibility consider the case of two identical firms where four identical tasks t_1, t_2, t_3, t_4 are performed. Suppose that in the first firm there are two jobs

$$J_1 = \{t_1, t_2\} \quad \text{and} \quad J_2 = \{t_3, t_4\}$$

and in the second firm there are two jobs:

$$J_3 = \{t_2, t_3\} \quad \text{and} \quad J_4 = \{t_1, t_4\}.$$

Then, in spite of the fact that identical tasks are carried out in each one of the two firms, jobs are firm-specific. This situation is likely to arise if the workers have rights in their jobs in each one of the firms and these safeguards guarantee their firm-specific investments.

Two alternative property rights systems may push the technology adopted in a different direction. The first relies on a different system of rights and safeguards at industry level which brings about a form of job standardization across firms which eliminates the firm-specific character of the jobs. The second is the likely result of a situation where workers have no rights either at firm or at industry level.

In the first case, otherwise firm-specific skills become general purpose. The organization of work is the subject of a contractual agreement between unions and employers' association with the possible support of the state and, in particular, public educational institutions. The contractual agreement specifies the definition of jobs and of job training which becomes the same for all the firms operating in a

particular industry. In the particular case of our example the structure of the the organization of labour will be either

$$J_1 = \{t_1, t_2\} \quad \text{and} \quad J_2 = \{t_3, t_4\}$$

or

$$J_3 = \{t_2, t_3\} \quad \text{and} \quad J_4 = \{t_1, t_4\}.$$

for both firms. This implies that jobs cease to be firm-specific. In this way, occupational markets are created and the workers have an incentive to enhance their skills even if they have no right to a job in a particular firm. If fired by a particular organization, the workers can still exploit the skills they have acquired in other organizations. In this system the occupational market which is created is a public good for both employers and employees. Each employer may have an incentive to free ride on the rules and safeguards which allow a market for skilled labour. Each one of them may find it advantageous to introduce an organization of work which is more specific to the particular needs of their own firm. In this case, the occupational markets for skilled labour may collapse. Then, whereas the free-rider employer takes all the benefit of his free-riding, all the other employers and employees share the damage caused by his misbehaviour. However, if everyone misbehaves, then all the agents will be worse off. It will therefore be in the interest of all employers and employees to organize some form of monitoring to prevent each employer from free-riding¹⁸. Observe that a market for general purpose skilled labour may require rules, safeguards and rights which are more complex than those required for the development of firm-specific skills. Williamson seems to miss the point when (see figure 3) he suggests that only firm-specific assets imply the creation of safeguards and rights. Occupational markets do also require safeguards. It is ironic that the market which is often regarded by New Institutional economists as some sort of "natural environment", where efficient institutions spontaneously evolve, needs itself to be supported by those institutions which it is supposed to select.

In the second case no general or specific resource is created and no safeguard exists. In this case there will be an incentive to employ "generic" resources. These resources are "generic" in the sense that they can be employed in a wider variety of uses only because they have developed neither general nor specific qualities which could otherwise increase their productivity. Their employment is convenient only because

¹⁸ On the potential instability of occupational markets see Ryan (1984) and Marsden (1986).

it does not require the existence of those rights and safeguards which would be necessary to employ specific or general resources. In the particular instance of our example we can imagine that the need for specific or general skills is eliminated by introducing a very detailed division of labour. Or, in other words, the organization of work becomes:

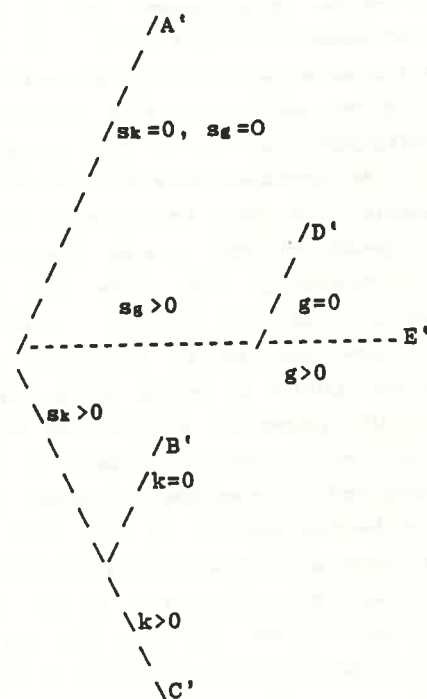
$$J_1^* = \{t_1\}, \quad J_2^* = \{t_2\}, \quad J_3^* = \{t_3\} \quad \text{and} \quad J_4^* = \{t_4\}.$$

for both firms which implies that jobs cease to be either general or firm-specific.

Under this organization of work, workers can move, without the development of any safeguard, from one firm to the other. Thus, "generic" resources are characterized by the same market flexibility of general resources. But, here, market flexibility may be due to a failure of the system of rights and safeguards which inhibits the development of either specific or general qualities and must not be associated with the Pareto efficiency qualities of competitive markets. The Tayloristic methods of production, where the workers do not develop general or specific skills, may bring about this situation for labour power. Observe that the kind of market flexibility associated with Taylorism is complementary to the existence of rigid hierarchies. Only if bosses tell the workers the detailed task which should be done, how it should be done and the time within which it should be done, can "generic" unskilled labour be employed. Again, the working of markets needs the support of non-market institutions. Indeed, the more "flexible" the markets are (in the sense that rights and safeguards do not exist for either general or specific resources) the more rigid the hierarchies of the firms operating in these markets may have to be. When workers do not develop general and/or specific skills the hierarchies become rigid in two senses. The first is that only simple orders and simple instructions can be given to workers having these characteristics. The second is that few chances of promotion either within a firm or in an occupation having a recognized status in more firms exist under this system.

Also in the case of general resources, the rights and safeguards associated with them can reinforce these resources and be the cause of their existence. However, the opposite may also be true: the existence of general skills may give an incentive to develop rights and safeguards which can defend the investments sustained in these resources and favour their development. In both cases whatever comes first reinforces the other and, the possible failure of the second to follow the first weakens the first. The case in which general resources come first is

Figure 4'



Rights and safeguards for jobs in different firms can logically and/or temporally come before the development of general resources. For instance, collective bargaining can come in the first place for political or distributional reasons and may include the negotiation of a uniform job specification which is seen as a necessary condition for the negotiation a uniform wage. Thus safeguards and rights concerning job definition can come before standardization and be the cause of the development of general resources instead of being only one possible effect of it. Still, one may wish to distinguish between those cases in which, after the institution of these safeguards, there is a development of general resources and those cases in which this does not happen. In the first case, (node E', where $g>0$), the development of general resources reinforces the initial system of rights and safeguards. The workers (as well as the employers) will have a vested interest in their defence because they protect the general type of investments that they have sustained. In the second case (node D', where $g=0$) the absence of the development of general resources makes these rights and safeguards

more unstable. The workers do not have the same vested interest in their defence and the system is more likely to switch to a different set of rights and safeguards.

The entire argument can be re-formulated by using the concepts of property rights and technological equilibria which we have developed in the preceding sections. An economic system may have multiple equilibria in the sense that nodes A', A, E, E' C and C' may all be institutionally stable equilibria even if some of them are inefficient. The equilibrium which is, actually, achieved depends on the initial conditions of the system. These initial conditions can either be specified in terms of the starting technological conditions of the system or in terms of the starting system of rights (or safeguards). These two cases are described by the following figures 5 and 5' which respectively describe technological equilibria and property right equilibria.

Figure 5.

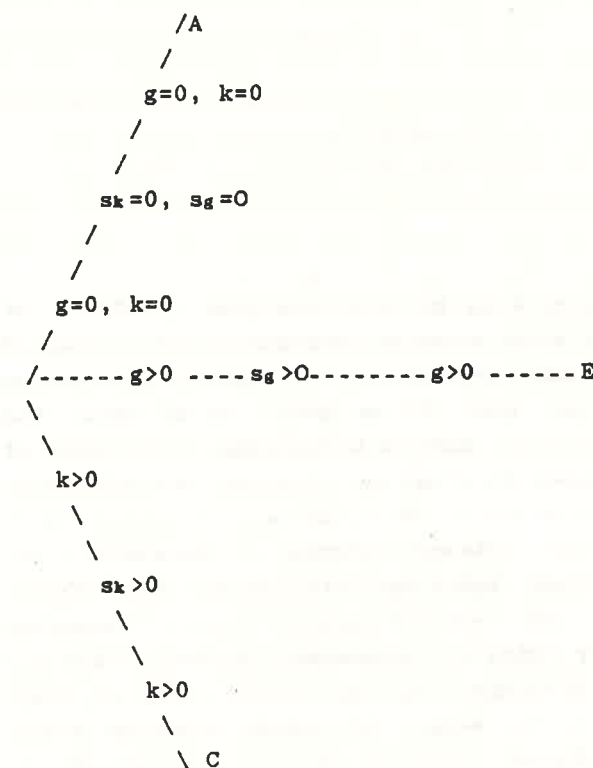
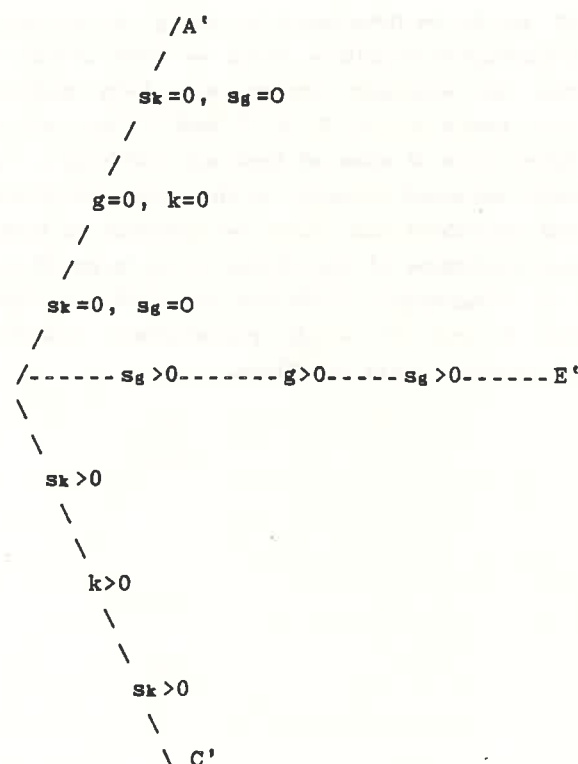


Figure 5'



In the case of figure 5 an initial technological specification of resources is such as to bring about an existence or an absence of safeguards and rights which re-produces the initial specification of resources. In the case of figure 5', an initial set of rights and safeguards is such as to bring about a technological specification of resources which re-produces the initial set of rights and safeguards. Real life systems could be in one of the equilibria considered in fig. 5 and 5' because of their different histories of technological and property rights shocks. These shocks may determine new and different initial conditions which can reinforce and re-produce themselves creating different property rights and technological equilibria which may then show a remarkable institutional stability. This stability will imply that "history matters" in the sense that simple efficiency stories independent of initial conditions will be unable to take into account the full strength of this statement. Efficiency may also matter but it is always constrained by the past history of the system.

Conclusion. We may conclude and complete the argument by offering (very incomplete) suggestions about the implication of the analysis on two issues. The first is how the concepts developed in this paper can be used to explain the diverging histories of the three major western industrial economies. The second concerns the difficulty that more democratic organizations of production may find in establishing themselves even if they are more efficient.

The concept of multiple technological and property rights equilibria can help to explain the existence of alternative organizations of production which have characterized the histories of different western industrialized economies. Some of them have shown greater efficiency at times but each one of them has shown a remarkable institutional stability in spite of its relative inefficiency. In particular, if we take the experience of the three major industrialized countries (the U.S., West Germany, and Japan) there no doubt that none of them can be characterized by the exclusive dominance of one type of property rights or technological equilibria. Each one of these countries is characterized by the co-existence in different sectors and for different resources of the three types of each of the equilibria which we have considered. Moreover, some arrangements are common to all of them¹⁹.

Still, on the basis of empirical work it is appropriate to say that Japan has been characterized by the existence of a relatively large sector of the economy where firms have developed safeguards and rights, such as job tenure and seniority rules, at firm level and by the fact that workers have invested quite a lot in firm-specific human skills²⁰. At the same time, West Germany has been characterized by relatively well developed occupational markets where job specification rights in each firm belong to fairly centralized unions and employers' associations²¹. These institutions co-operate together with educational authorities for the development of their excellent system of vocational training. Here, workers seem to have invested more in general than in

¹⁹ For instance, typically the organization of health care is such as to guarantee an occupational market for medical doctors which allows their mobility among different hospitals. The organization of the work of doctors and their common training and qualification is established by the union or the order of doctors together with employers. Dasgupta and David (1988) argue that, unlike technologists, scientists are organized on similar lines. A transition from what, in Pagano (1989) I have called "unionized" capitalism and "company workers" capitalism can be found in Elbaum and Wilkinson (1988).

²⁰ See Aoki (1988) and Morishima (1982).

²¹ See Maurice et al. (1984) where they argue that, unlike France, West Germany has these characteristics.

firm specific skills and the existence of these skills makes it convenient to employ German workers in spite of their relatively high wages. By contrast, the U. S. seems to be the country where the dominance of Taylorism has been most pronounced and where a relatively large fraction of workers has been employed without safeguards and rights either at firm level or at industrial level. These workers have often invested very little in either specific or general skills and they have only the generic abilities which are required by the Tayloristic model of organization of production.

These different characteristics of three major industrialized countries have been remarkably stable in the post-war period. Simple efficiency explanations cannot elucidate this variety of experiences. By contrast, the dominance of one of these sectors in each one of these three countries seems to provide an example of one of the self-sustaining property rights - technological equilibria which we have considered in figure 5 and 5'. Moreover, this variety of experiences must mainly be due to the fact that these economies have gone through different property rights shocks. For, technological shocks, in the form of innovations changing the relative productivity of general, generic and firm-specific resources are more likely to have been shared by these economies.

Although an analysis of these property rights shocks (as well as any proper analysis of real-life property rights equilibria) is beyond the scope of this paper, it is worthwhile to give an example of a "strong" property right shock which may have determined the different property rights and technological equilibria which have characterized the development of these economies after the war. Both Japan and (West) Germany, unlike the U. S., lost the war and in both cases the local employers were punished for their war effort. Employers' rights were severely limited and the workers acquired some rights at the work place. However, these rights were acquired at a more centralized level in Germany (where a strong party linked to relatively centralized unions was able to establish itself and defend the rights of these unions) and at firm-level in Japan (where in 1950, after an initial honeymoon, centralized unions came under the attack of the occupying forces and were replaced by company unions²²). As a consequence of this "strong" property rights shock, the workers may have substantially invested in general resources (mainly in West Germany) and in firm-specific resources (mainly in Japan). These investments may have then reinforced

²² See chapter 5 of Morishima (1982), where he gives a detailed account of the rights acquired by the workers immediately after the war and of the consequences of the U-turn of the occupying forces in 1950.

and re-generated the initial sets of property rights creating two new different property rights - technological equilibria. Recent attempts by U. S. to import the more efficient Japanese system are not endogenous to U. S. (in the sense that they occur under the threat of Japanese competition) and are proving difficult and slow. This seems to imply that inertia and pre-existing property rights and technologies are important to explain the variety of organization of economic systems - a variety that a simple efficiency story would fail to explain.

This brings us to the second point. Why is that democratic rights, such that workers have the necessary safeguards to invest in themselves and their working environment, come about only with great difficulties and resistance under capitalism? The answer suggested by this paper should by now be obvious. Under capitalism there is a tendency to have "easy to monitor workers" and a tendency to under-invest in both firm-specific and general (not generic) human skills. This brings about a property right - technological equilibrium which may be remarkably stable in spite of its inefficiency. Democratic rights at the work place and the technological specification of resources associated with them may be blocked by the ability of capitalist property rights to re-produce themselves.

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