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ORGANIZATIONAL EQUILIBRIA AND PRODUCTION EFFICIENCY[1].

New Institutional Theory has pointed out mechanisms by which technology can influence property rights and organizational forms. We argue that the argument can be integrated and enriched by using also the opposite argument: property rights and technology can also influence technology. We develop an "organizational equilibria" framework and we show that when New Institutional Theory is developed in this direction, a multiplicity of "organizational equilibria" can arise and production efficiency may no longer be achieved. The paper introduces the argument by pointing out some similarities between Marx's theory of history and modern transaction cost theories, which imply a common substantial departure form the standard methodology of traditional neoclassical neoclassical theory.

[1] This paper has been written for the conference on Production Organization, Dynamic efficiency and Social Norms to be held in Rome on April 4-6 1991. I thank the discussant of this paper Stefano Zamagni for his useful comments.

Introduction.

A simple definition of an organization of production can be based on two factors. The first is its technology and, in particular, the technological characteristics of the resources used in production. The second is the set of rights (which may be legal rights and/or customary rights supported by social norms) on the resources employed in the organization and on the organization itself.

The relationship between these two factors has traditionally been a controversial issue in social sciences: if causation exists, it can go both ways. On the one hand property rights can be seen as factors shaping the nature and the characteristics of the resources used in production. On the other hand, the technological characteristics of resources employed in production can be considered to be the cause of changes in the system of property rights.

This double way relationship was at the very root of the Marxian theory of history and of his view of the firm. It was the source of interesting problems and contradictions within this theory . Indeed, one could even say that the Marxian framework contains two views of history and that each view is related to a particular direction of causality existing between property rights and productive forces. These contradictions disappeared in Neo-classical theory. Unfortunately, also some interesting problems disappeared with them. Recently, both New Institutional and Radical Economists have re-considered the interaction between rights and technology. However, the relationship between rights and technology is still very controversial. In these two streams of literature the direction of causality runs in opposite directions. In New Institutional economics rights are endogenously and efficiently determined by the characteristics of the resources employed in the firm: namely their degree of specificity and their monitoring requirements. By contrast, in the Radical Literature the characteristics of the resources employed in the firm are in turn determined by the rights which owners of different factors have on the organization.

This paper starts by re-considering the Marxian and Neo-classical approaches and the more recent New Institutional and Radical theories. It draws from both New Institutional and Radical economists and integrates their arguments by introducing the concepts of organizational equilibria. Organizational equilibria define situations where a set of rights (technological characteristics of the resources) brings about technological characteristics of the resources (rights) which are consistent with this set of rights (technology). It can be shown that multiple organizational equilibria exist and that the equilibrium which is selected may depend on initial conditions due to "strong" shocks to the set of the rights or to the technology. History rather than abstract production efficiency, may determine which organizational equilibrium comes into existence.

1. Marxian contradictions and neo-classical consistency.

In Marx' s theory of history the "level of development of productive forces" was considered to be the cause of a certain set of relations of production or property rights systems. At the same time not only could relations of production favour or fetter the development of productive forces but they could also determine their quality.

The Marxian theory of history is interesting for at least two reasons. The first is that when we come to "theories of history" "there is so little in the way of an alternative vision which is available" (Hicks 1969 p. 3). The second is that it illustrates the tension (and often the ambiguities) of a theory which wants to consider both aspects of the relationship between property rights and technology. Indeed, one could even say that the Marxian theory embodies two views which could be nicknamed a "*technological deterministic view*" and a "*romantic view*" of history[1]. The former stresses the influence that the characteristics of productive forces, which it is optimal to employ at a certain stage of development, have on property rights. The latter stresses the influence of property rights and institutions on the characteristics of the resources which are developed.

This tension is well expressed by the Marxian view of the firm.

Like Coase[2] (and well before him) Marx regarded the firm as a form of organization alternative to the market. Unlike Coase, Marx believed that the increase of

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[1] 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.

[2] However, according to Marx, the superiority of firm-type organization was due to the *disequilibrium* costs which characterize market transactions. On this point see (Pagano 1991c).

efficiency in the organization of production (or the development of the productive forces) would have necessarily required an expansion of the firm-type organization relatively to market-type organization. This tendency was already at work under capitalism but it could have only been completed under socialism. Socialism (at least in its early stages) was bound to be a single-firm economy where the authority of a chief employer was extended from the firm to the society taken as a whole. In other words, an outcome of the "*technological deterministic view*" of history was an authoritarian model of a "single firm socialism" corresponding to the alleged needs of the development of productive forces.

At the same time, in the Marxian theory, the set of rights characterizing the capitalist firm were not simply an expression of a certain stage of the development of productive forces but were also developing a particular quality of productive forces[1]. De-skilled and detailed jobs, alienated and oppressed workers, machines and organization of production complementary more with workers' stupidity than with their skills were the productive forces developed by the capitalist firm. Communist rights (at least at a later stage) should have developed productive forces characterized by different qualities. Highly skilled men and women performing interesting and challenging production activities should have become the most important of the productive forces to be developed by the new society. In other words, in the Marxian theory, the "*romantic view of history*" was somehow related to an "anti-capitalist firm model of communism"[2] where the quality of the development of productive forces would finally correspond to the needs of people as producers.

The relationship between property rights and the characteristics of productive forces, which created so many interesting problems and contradictions (as well as so many wrong "predictions") in the Marxian approach became a non-issue in neo-classical theory. In a market economy workers' or capitalists' ownership would have had no effect on the characteristics of the resources (or of the productive forces) employed by the firm. At the same time, the characteristics of the resources employed in the firm had no implication whatever on the form of ownership which was going to characterize the firm.

This point of view was well expressed by Samuelson when he argued that "In a perfectly competitive economy it doesn't really matter who hires whom...." (1975 p. 894). Samuelson' s sentence can be understood by observing how in orthodox economics perfect competition brings about an efficient allocation of resources and that

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[1] The Marxian analysis of the factory system, which considers the effects of capitalist property rights on the organization of production and the quality of productive forces is contained in the first volume of Capital. It was updated by Braverman (1974). Other radical economists, like Marglin (1974), Edwards (1982), Putterman (1982), Bowles and Gintis (1983) and (1986), Bowles (1985) and (1989) have pointed out that the system of rights can shape and constrain the organization of production and technology.

[2] An examination of the Marxian alternatives to Capitalism can be found in chap. 3 of Pagano (1985).

this result is independent of the initial distribution of property rights including those rights which the individuals have on the firms.

Samuelson statement makes sense within a standard neo-classical model of a perfectly competitive economy with no "missing" market, where the prices for all goods exist, property rights on these goods are well defined and the agents can exchange these rights without any transaction cost (a set of circumstances which also implies that all externalities have been internalized by an appropriate definition of property rights and their exchange at zero transaction costs). In this economy the individuals will sell their rights to those agents who can employ the goods, over which the rights are defined, in the uses where a marginal unit of them is more highly valued. As a consequence, under perfect competition, the final allocation of property rights is Pareto efficient: the value of production is maximized and it is impossible to improve the welfare of an individual without worsening the welfare of other individuals. Whatever the initial distribution of property rights happen to be, the techniques and the organization will be optimal. The initial distribution of property rights is important to determine the distribution of wealth but is irrelevant for the nature of the organization of production. A perfectly competitive market economy determines endogenously an efficient final allocation of any initial distribution of property rights.

In this framework questions like "who owns the firms" and "who hires whom" become irrelevant: the techniques and the organization of production will not change because, in any case, they will be efficiently determined by the competitive system.

Consider the case in which capital owns the firm and hires labour. The workers will rent their labour to the capitalists who can employ their labour power, where it is at the margin more productive and can therefore pay them the highest wage. The capitalists will have an interest to employ not only the labour which they rent but also their own capital in those uses where its marginal productivity is highest.

Consider now the case in which labour owns the firm and hires capital. The capitalists will now rent their capital to those workers' cooperatives which can employ it in those uses where it is more productive at the margin and which can therefore pay them the highest rent. The workers will have an interest to employ not the capital which they rent but also their own labour in those uses where its marginal productivity is highest[1].

In both cases, in equilibrium the organization of production will be such that the marginal productivity of each factor is the same in each use and, as a consequence, such that the productivity of each factor is maximized. In a competitive economy each rational agent has an incentive either to employ or to make other agents employ its

[1] In other words when complete contracting is feasible (capitalist or workers') ownership does not matter. On this point see Grossman and Hart (1986) who observe that ownership matters in specifying actions which could not be specified in the contract.

resources in those uses where they yield the highest benefits. This holds for either workers' cooperatives or capitalist firms acting in a competitive economy and implies the equivalence and the efficiency of these alternative institutions. A competitive economy with complete markets always brings about an efficient organization of production. In this sense who owns what and who hires whom does not matter.

In the neoclassical approach, problems and questions which have been the source of passionate political debates, lose their meaning: advocates of alternative systems of organizing production would have wasted their time and effort. Supporters of workers' cooperatives and capitalist firms should simply consider that in a competitive system these differences are irrelevant: there the technology and the labour process are independent of firm ownership and are shaped by the dictates of economic efficiency. Any deviation from this optimal world should be related to the absence of competition which prevents firms from developing these ideal characteristics. Economics could raise above political passions and conciliate different parties by pointing out the common irrelevance of their arguments.

In spite of this dignified viewpoint a puzzle remained in the orthodox approach: if competitive markets can bring about these marvellous results, then not only the ownership of the firm but also the existence of the firm itself does not matter and cannot be justified on the grounds of efficiency. In the orthodox approach there is no reason why the workers should work under a common collective direction or capitalists or managers bother to direct them: production could be entirely organized by selling and buying goods and services. The management activity of capitalist firm and the self-management activity of workers cooperatives do not make sense: they could be saved by completely abolishing the administration of resources which takes place inside the firm and by letting each agent cooperate with the other only by means of market exchanges. Resources could be saved by abolishing firms altogether - an opportunity which should not be wasted in a perfectly competitive economy. In other words, in the neo-classical world, the irrelevance of firms' ownership may be due to the trivial reason that, in that world, firms do not really exist.

2. New Institutional economics: explaining the existence and the ownership of organizations.

"Why do firms exist?" Coase' s question (as well as his answer) was not entirely original (Pagano 1985 p. 151) but it was very appropriate within the context of neo-classical theory. According to Coase, in order for this question to be answered, market transaction costs should be compared with the management costs sustained within the firm. Firms can exist because and when the former are smaller than the latter.

Coase considered the costs of writing and enforcing complex contracts and argued that costs could be saved by internalizing these transactions within firms. Recent New Institutional literature[1] has better specified the nature of these costs. As we are going to show, within this literature the nature of the costs which explain the existence of the firms also explain which particular factors are going to have rights in the organizations. Or, in other words, some of the reasons which explain the nature of the ownership of the firm, are also the reasons which explain its existence - a point which may help to explain the absence of both in traditional neo-classical theory.

Both the existence of the firm and the nature of its ownership can be traced in New Institutional economics to two key concepts: monitoring and asset-specificity.

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 in 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.

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[1] The most complete exposition of the New Institutional Literature is Williamson (1985). Useful Readers are Putterman (1986), which also includes some contributions of the Labour Process Literature, and Langlois (1986). The New Institutional Literature is usually defined to include what are sometimes called the Transaction Costs and the Property Rights Literature. Important contributions are Coase (1937) and (1960), Demsetz (1967), Alchian and Demsetz (1972a) and (1972b) North and Thomas (1973), North (1981) and Alchian (1987a) and (1987b). Grossman and Hart (1986) and Hart and More (1988) offer a more mathematical treatment which emphasizes the importance of future decisions which are not contractible. While this is a useful assumption for developing their interesting model, the issue is the cost (relative to internal organization) at which future decisions are contractible. Milgron and Roberts (1988) and Kreps (1990) offer useful surveys of the literature. Kreps (1990) expresses the "jump" which New Institutional Economics is creating in modern textbooks where the firm suddenly changes from a consumerlike agent to a marketlike institution.

The asset specificity problem[1] 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 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.

Thus, monitoring and asset-specificity[2] are used to explain the existence of the firm. They are also used to explain the efficient property structure or the organization of production of the firm. The rights in or the control of the firm should be acquired by the owners of firm-specific or difficult to monitor resources, instead of owners of general purpose or easy to monitor resources. Monitoring or insurance expenses can be decreased if the former instead of the latter own the organization and the value of the organization will be higher under their ownership. According to the New Institutional view, firms are there to mitigate asset-specifity and monitoring problems. For this reason they are going to be owned by relatively more firm-specific and difficult to monitor factors. These factors can solve more efficiently the problems which are the cause of the existence of the firm.

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 resources. Thus, the owners of specific resources will be willing to offer a higher price for the control of the firm because they can save on the high insurance costs which should be otherwise be paid to induce their firm-specific investments[3].

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

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[1] Williamson ignores that "true" general purpose resources may even require more safeguards and rights than specific resources and that they should be distinguished from "generic" resources. This point is considered by Pagano (1991d).

[2] Milgron and Roberts (1990) argue that costs due to monitoring and asset-specificity are particular cases and sources of bargaining costs. According to them these bargaining costs have to be compared to the "influence costs" incurred under centralized management in order for the markets versus firms to be correctly stated.

[3] In order to simplify the analysis we will often consider the asset-specificity problem arising between capitalists and workers. However the specificity problem also arises among capitalists and among 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 (1991a) suggest that "solidaristic corporatism" might be considered as a symmetrical solution for the workers.

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. For this reason they will offer a higher price for the control of the organization.

In some ways New Institutional economics shares some aspects of the Marxian theory. It is perhaps particularly close to the "*technological deterministic view*[1]" of history which can be found in the Marxian theory: also in New Institutional economics (unlike in Neo-classical economics) the quality of productive forces is not "institutionally neutral". By contrast it has clear implications on the property rights which are going to prevail. However, in comparison with the Marxian theory, "New Institutional" economics has the great advantage that it has proposed some fairly precise mechanisms which clarify how the characteristics of the resources (productive forces) employed in production influence property rights; these mechanisms may not be the only ones at work and may not even be the most important ones at work but they have the great advantage that they make us understand *how* changes in the resources which are employed influence the structure of property rights.

An example of the consequences of this approach can be given by considering the changes in the structure of property rights implied by the development of the economy. The development of an economy implies employment shifts from agriculture to industry and from industry to services. It is easy to see that the monitoring and the specificity characteristics of the labour input are likely to be different in these three sectors. Agriculture activity requires that workers are dispersed on the land and implies that their effort cannot be easily inferred from their output because of the influence of the weather. These two circumstances do not characterize the industrial sector and they make agricultural workers more difficult and costly to monitor by outside observers than industrial work. At the same time a considerable element of human capital-specificity characterizes agricultural work. Land and weather conditions are different from place to place. Their knowledge (often in the form of "tacit" skills) can influence productivity. The same does not so generally hold true in the case of industrial production. In many respects the service sector shares many of the characteristics of agriculture. Work is necessarily dispersed. Services must be specific to particular customers requiring for this reason specific skills.

The development of an economy may therefore require that many workers have rights in relatively small organizations in the "early" agricultural and "late" service

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[1] However, there is "technological determinism" in New Institutional economics only in the sense that the technological characteristics of the resources which have to be employed determine the structure of property rights and the type of organization which minimize transaction costs. Technology does not by itself imply that only one organization is possible and Williamson (1985) criticizes the idea that indivisibilities and increasing returns imply that only large firms are possible. Technology acts indirectly by determining the organization of production which minimizes transaction costs.

stage of an economy. Larger organizations where workers have few rights may prevail in the intermediate industrial stage. This may be a too audacious and schematic hypothesis but it shows that, unlike Neo-classical economics and similarly to the Marxian theory, New Institutional economics can offer some keys which may be useful to understand the influence of changes in productive forces on property relations.

3. Radical economics: explaining the nature of the technology.

We have seen that New Institutional economics gives new meaning and new analytical power to the idea that the productive forces employed in the economy have an important influence on property rights - this being a direction of inquiry that with reference to the Marxian theory we have nicknamed the "*technological deterministic view*" of history. In this section we will briefly consider the "radical" stream of literature which has recently developed the opposite direction of inquiry - that is the line which, again with reference to Marx, we have nicknamed the "*romantic view*" of history.

Radical economists have emphasized that "easy to monitor" and "generic" labour, which can be found in the organizations of production suggested by Taylor and Ford, and before them by Babbage and Ure, are not the neutral consequences of the dictates of technological efficiency. By contrast they argue with the "romantic" Marx that they are the outcome of capitalist rights.

Instead of examining in detail the arguments of the Radical economists I will directly consider the possibility that the arguments suggested by New Institutional economists themselves can be inverted following the direction of causality suggested by the Radical economists.

In 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 by the individuals who can rule them more efficiently and are therefore 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 "produced" and shaped within the framework of a certain ownership structure which influences the nature of the technology[1].

For all these reasons the influence of property rights on the technological characteristics of the resources deserves as much attention as the opposite line of inquiry.

Let us now consider more in detail how the specificity and the monitoring characteristics of the resources can be influenced by any given initial assignment of property rights. In particular consider the case where workers are "easy to monitor" and "generic" factors whereas capital is the "difficult to monitor" and "specific" factor and where, unlike the capitalists, the workers have no rights in the organization where they work. In New Institutional economics this situation may be explained on efficiency grounds. Workers have no rights in the firms where they work because they are "easy to monitor" and/or "general purpose" factors. Resources can be saved by having specific and difficult to monitor capitalists owning the firm. However it is perfectly legitimate to explain the same situation inverting the direction of causation and by pointing out that, unlike machines, the workers may have become "easy to monitor" and "general purpose" factors because they have no rights in the firm where they work. For instance, following Braverman' s book *Labour and Monopoly Capital*, it can be argued that it is because of capitalist property rights that the detailed division of labour along the lines suggested by Babbage and Taylor is implemented with the result that the workers perform simple tasks which are easy to control and require only general purpose or "generic" skills[2].

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[1] Different "technological trajectories" can be generated by alternative property rights structures. On "technological trajectories" see Nelson and Winter (1977) and Dosi (1988).

[2] This argument is considered in more detail in Pagano (1991a) and (1991b) where it is shown that the kind of "classical capitalism" considered by Braverman can inhibit the development of both "general" and "firm-specific" human skills and may be only be consistent with the use of "generic" skills. The consequences of alternative kinds of capitalism on skill development are also examined in these papers. I have considered the interpretations of Braverman 's de-skilling hypothesis in Pagano (1991b). Important developments as well as criticisms of Braverman include Edwards (1979), Littler (1982), Wood S. (1982) and Bowles (1989). A survey is offered by Thompson (1983).

Under capitalism the development of difficult to monitor human resources may be inhibited by the fact that the workers have no rights on the organizations where they work. The high costs of monitoring labour will imply that capitalist technology will be biased against "difficult to monitor labour". By contrast no similar bias exists against "difficult to monitor capital[1]" because the owners of the organization owning the capital employed in it have no incentive to misuse this capital and to act against their own interest. Thus "classical" capitalism may be characterized by underinvestment in "difficult to monitor" labour.

Similarly, the development of firm-specific workers' skills, as well as the development of assets specific to the preferences of the present workers, may be inhibited by the fact that under classical capitalism the rights to these assets are ill-defined. These assets belong neither to the employers (who can lose them if the workers quit) nor to the workers (who can lose them if they are fired from firm). Under capitalism no similar problem exists regarding the case of firm-specific machines.

Thus the property rights of "classical capitalism" imply underinvestment in difficult to monitor *and* firm-specific labour. In principle the argument that the easy to monitor and "general-purpose" workers of the assembly line (coupled with specific and difficult to monitor capital) are the cause for the existence of capitalist property rights seems as good as the argument that the latter are the cause of the former.

The "inverted" argument which we have considered is quite general. Whichever factor happens to own the organization will have fewer inhibitions than the other factors to become "difficult to monitor" and specific to the organization. For instance, if the workers own the organization there will be a tendency to under-invest in firm-specific and difficult to control capital. Difficult to control and specific capital is more likely to be developed under capitalist rights[2] and difficult to monitor and specific human capital is more likely to be developed when the workers have some rights in the firm. In general for every factor or group of factors the "*romantic view*", where causality runs

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[1] The concept of "difficult to monitor capital" is not immediately clear but Alchian and Demsetz (1970) show that it makes sense. Capital is "difficult to monitor" when user induced depreciation cannot be inferred by observing capital before and after it is used. Some costly information on the way capital has been used is therefore important in order to estimate its value after use.

[2] It could be argued that the workers are not at disadvantage when they rent "specific" capital because instead of renting machines, they can borrow money, buy the machines and use them as collateral. However, 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. For similar reasons, difficult to monitor capital, like firm-specific capital, is less valuable as collateral than easy to monitor capital. In this case 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.

from property relations to productive forces, turns out to be as convincing as the "*technological deterministic view*", where the opposite direction of causality arises.

4. Organizational equilibria: compromising technological determinism with romanticism.

Is there a possible compromise between romanticism and technological determinism?

In spite of possible everyday life evidence of the contrary, we will try to show that a compromise is possible. Indeed, we will even claim that it is only by putting together these two views can we better understand the dynamics of economic systems.

We will start by introducing the concept of organizational equilibrium which includes as special cases the two concepts of property rights and technological equilibria which I have discussed in an earlier paper (Pagano 1991d).

Definition 4.1. An organization of production O is an organizational equilibrium if the property rights P and the technology T defining it are such that:

(a) the property rights P generate the technology T.

(b) the technology T generates the property rights P.

In other words, in an organizational equilibrium the property rights reproduce themselves via technology[1] and the technology reproduces itself via property rights. Or to put it in a different way the notion of an organizational equilibrium contains the notions of a property rights equilibrium and technological equilibria where these concepts are defined in the following way:

Definition 4.2. A property rights system P is a property right equilibrium if it generates a technology T which re-generates P.

Definition 4.3. A technology T is a technological equilibrium if it generates a property rights system P which re-generates T.

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[1] Putterman (1982) and Levine (1990) consider alternative mechanisms by which property rights may reproduce themselves.

According to the way in which we assume that the initial conditions of the system were given, an organizational equilibrium can be interpreted as a property right or a technological equilibrium . If we assume that the initial conditions of the system were given in terms of a "strong" property rights shock, then definition 4.2 is the appropriate interpretation of definition 4.1. By contrast, if we think that a technological innovation or a change in the structure of demand has changed the technological characteristics of the resources to be employed, then the appropriate interpretation of definition 4.1 is definition 4.2 because the initial conditions have occurred in terms of a strong technological shock. In many cases, after some time, it may be hard "to know" whether an organizational equilibrium is a property rights equilibrium or a technological equilibrium. Indeed after the initial shocks no distinction between them is possible .

Are organizational equilibria likely to exist?

We will argue that joining together the "New Institutional" and the "Radical" argument allows us to give a positive answer to this question[1].

Consider that the definition of an organizational equilibrium implies that we must be able to argue that (a) certain property rights *P* imply a certain technology *T* and that (b) that technology *T* implies those property rights *P*. The first part (a) of the argument is provided by the "Radical economists". The property rights *P* will tend to generate a technology *T* where the owners of the organization will tend to become relatively more "difficult to monitor" and "specific". The second part (b) of the argument is provided by the "New Institutional economists". The technology *T* will tend to generate property rights *P* characterized by the fact that more "difficult to monitor" and "specific" factors will find it advantageous to have rights in the organization. Thus we have a mechanism by which the initial set of rights *P* re-generates itself via the technology *T*. Or, in other words, we have that type of "organizational" equilibrium which can be interpreted as a "property right equilibrium". In a similar way and, indeed, just inverting the sequence of propositions (a) and (b) the Radical and New Institutional arguments can be integrated to justify the existence of the type of organizational equilibrium which can be interpreted as a technological equilibrium.

The integration of Radical and New Institutional theories does not only allow us to show the existence of organizational equilibria but also to show that these equilibria are not necessarily unique.

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[1] The propositions considered in this section are shown by means of a simple formal model in Pagano (1991d). By contrast they will be considered in a more intuitive way in this section.

Indeed whenever some factors happen to have rights on the organization, they will tend to become more difficult to monitor and specific than in the case where they do not have these rights. This makes it more likely that these rights may become equilibrium rights. Thus, it is well possible that multiple property rights equilibria exist and that we have a particular set of equilibrium rights for each initial distribution of property rights.

The case of a unique property right equilibrium cannot be excluded. Indeed, it can arise when difficult to monitor and firm-specific units of a particular factor are very productive. Then, only the equilibrium where this factor owns the organization may be sustainable. If another factor owns the organization it will find it convenient to employ such a large amount of this factor that a change of ownership makes the organization more profitable by decreasing monitoring and insurance costs.

However multiple property rights equilibria are possible and this possibility is rooted in the definition of property rights equilibria themselves.

A similar argument can be made for the case in which organizational equilibria are defined in terms of technological equilibria. In this case a certain technology defining the monitoring and specificity characteristics of certain factors tends to generate property rights of these factors on the organization which, in turn, tend to reinforce the initial technology. Thus this technology may be an equilibrium only because it has first come into existence and alternative technologies may also become equilibrium technologies under the same circumstance. Again, although the case of a unique technological equilibrium cannot be excluded, multiple technological equilibria are also possible. In general, if we accept that both the "New Institutional" and the "Radical" directions of causation between rights and technology are relevant to understand the dynamics of an organization, then multiple organizational equilibria cannot only be an intellectual curiosity .

In our framework production efficiency can be defined by observing that resources can be saved if the relatively more costly to monitor and specific factor owns the organization. In this sense, a particular organization of production can be more efficient than another.

If only one organizational equilibrium exists, then it is clear that it is also consistent with the requirements of production efficiency. Suppose that labour and capital can both be difficult to monitor and specific or easy to monitor and general purpose and that each of these four factors can be employed in an organization. Suppose also that only the equilibrium characterized by workers' ownership can be sustained. In other words, even if the capitalists own the organization they end up employing so much "difficult to monitor and specific" workers that it is convenient to sell them the organization to decrease monitoring and insurance costs. This occurs in

spite of the capitalist bias against "difficult to monitor" and specific labour and means that the "difficult to monitor and specific labour intensive technology" is so much more productive than "the difficult to monitor and specific capital intensive technology" that the latter cannot be sustained even under the favourable conditions of capitalist ownership. Thus, the only organizational equilibrium - the workers' ownership equilibrium - is efficient and, indeed, it is the only organizational equilibrium because it is much more efficient than the other equilibrium.

Thus, when only one organizational equilibrium exists that equilibrium is necessarily efficient. However, when two or more organizational equilibria exist, it is only by chance that monitoring and insurance costs can happen to be the same in the two equilibria. In general only one organizational equilibrium can be efficient. Therefore, in the case of multiple organizational equilibria, we can have inefficient equilibria. In other words, the rights and the productive forces which characterize a certain organization can be inefficient in the sense that there is a better organizational alternative which is available and, in spite of this, they define an organizational equilibrium in the sense that there is no tendency to move away from this configuration of productive forces and property rights. For instance, consider the case of an inefficient organizational equilibrium characterized by capitalist rights and by a "difficult to monitor and specific capital intensive technology". In this situation decisions are biased in favour of this technology because, under capitalist rights, difficult to monitor and specific labour are relatively more expensive. Under capitalist rights the "difficult to monitor and specific capital intensive" technology can be chosen in spite of its relative inefficiency. In turn, this technology implies the re-generation of capitalist property rights. These rights can therefore survive in spite of their inefficiency.

The fact that inefficient organizational equilibria can exist and survive is due to the fact that the rights and the technologies which define these equilibria are self-sustaining. This self-sustaining character of organizational equilibria also implies another characteristic of these equilibria: that they are "institutionally stable" in the sense that they are resistant to "weak" property rights and technological shocks.

"Weak" property rights shocks can be defined as changes in the system of property rights which last such a short time that the new property rights cannot bring about the "naturally" associated technology.

Suppose that we are in an inefficient capitalist equilibrium and also suppose that the workers are given property rights on the organization by the means of state intervention. Or, in other words, suppose that we move from a regime where capital hires labour to a regime where labour hires capital. If the workers could not immediately exchange the rights on the organization or, in other words, if we had had a "strong" property right shock, then they would introduce a (superior) "difficult to

monitor and specific labour intensive technology". In this case the new property rights become self-sustaining.

Suppose now that it is possible to exchange immediately back property rights on the organization, or that we have a "weak" property right shock. In this case this exchange will take place because with the structure of resources inherited from the capitalists the organization is more profitable under capitalist ownership. Or, in other words, organizational equilibria can resist "weak" property rights shocks.

Technological shocks can change the productivity of specific and difficult to monitor factors and can imply that it is optimal to employ different proportions of these factors. Suppose that we are in an efficient capitalist organizational equilibrium and suppose that a technological shock implies that the capitalist equilibrium is no longer efficient because it is now optimal to employ a greater amount of difficult to monitor and specific labour. Observe that even in this case we can distinguish between a "strong" and a "weak" (technological) shock. In the first case the shock is strong enough that, *in spite of their bias against difficult to monitor and specific labour*, the capitalists employ such a great amount of it that it becomes convenient to sell their rights on the organization to the workers. In the second case, the shock is strong enough that the capitalist equilibrium becomes inefficient but not strong enough that it implies a change of the organizational equilibrium. Even if it would be efficient to do so, *because of their bias against difficult to monitor and specific labour* the capitalists do not employ enough of it to cause a change in property rights. Thus, even when a "weak" technological shock implies that an organizational equilibrium becomes inefficient, the organizational equilibrium can be resistant to this technological shock.

Even if "weak" property rights and technological shocks tend to push the system towards a more efficient equilibrium organizational equilibria can be resistant to these shocks. Inefficient organizational equilibria can be institutionally stable.

"Conclusions".

Organizational equilibria are intended to integrate the "Romantic view" of Radicals with the "Technological Deterministic view" of New Institutional economists. In this respect the *possible* multiplicity, production inefficiency and institutional stability of organizational equilibria suggest two brief "conclusions". One concerns what we observe and the other concerns what we do not observe in market economies. What we observe (and would like not to observe) is likely to be there also

because it is "technologically necessary"[1] but there is a real chance that it survives and reproduces itself in spite of its inefficiency. What we do not observe (and would like to observe) is likely not to be there because it is "a romantic illusion" but there is a real chance that it is not there because no historical shock gave it the possibility of becoming an "organizational equilibrium" in spite of its efficiency.

[1] A "technological efficiency explanation" of the industrial organization seems also weak on empirical grounds. Different countries (think of West Germany, the U. S., Japan and Sweden) have organized production in such different ways that a "pure" technological efficiency explanation of these differences seems difficult to accept. By contrast, the existence of alternative property rights and technologies which reproduce themselves in different organizational equilibria, is compatible with this variety of experiences. This point is briefly considered in Pagano (1991a) and (1991d).

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