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EFFICIENCY AND STABILITY OF INSTITUTIONAL ARRANGEMENTS: SELF-REINFORCING MECHANISMS BETWEEN MARKETS AND ORGANIZATION

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1. INTRODUCTION

Half-way between the polar cases of markets and hierarchies, among the existing forms of capitalistic organization of production there is a relatively recent one, typically originating from some Non-Anglo-Saxon late developed productive systems, but also spreading in various degrees to the rest of the Western economies. As an operational definition, this kind of economic organization can be qualified as a 'business group', meaning that production is organized according to market relationships within the group and to non market relationships between groups. Although still vague to some extent (or, perhaps, precisely because of this), such a definition is general enough to admit as historical examples some aspects of the Italian industrial districts (Brusco, 1982; 1990), of the Japanese Keiretsu (Gerlach, 1992a, b), and of the German 'organized capitalism' (Kocka, 1978; 1990). More precisely, in effect, this definition is basically intended to include on the various forms of institutional regulation between competition and cooperation that, since the classic book on the reappraisal of craft production by Piore and Sabel (1984), have been indicated as distinguishing features of productive systems quite successfully adapted to the technological and markets' conditions of the post-fordist era. As is well known, according to this view, the best way to effectively respond to the challenges of both computer-based technologies and the increased volatility of markets consists of combining a flexible use of the resources with a high degree of specialization and dedication which, in turn, is only possible if an adequate balancing of incentive effects and appropriability conditions is provided. In this sense, the following quotation summarizes as a slogan the need of the corresponding institutional mix between market and non market productive relations: "[Under flexible specialization] no firm or individual has a right to any particular place in the community, but all have a claim to some place within it." (Piore and Sabel, 1984, p. 269).

Notwithstanding the considerable amount of descriptive literature originated by that book, however, this kind of economic organization suffers from a certain degree of analytical invisibility (Granovetter, 1995)[1]. In a related paper (Battistini, 1998b), it has been shown that such an invisibility can be ascribed to two difficulties encountered by the standard new-institutional economics. The first, more subtle, deals with the issue of the differences between markets and

[1]Exceptions are the contributions by Encaua and Jacquemin (1982) and Goto (1982).

hierarchies -namely, if they are in their nature or are just 'a matter of degree'-, and consists of almost completely identifying non market productive relationships with ownership of physical assets. Despite the long-lasting recognition of its risks[2], from this identification it follows indeed that the hybrid forms of economic organization like that just defined are virtually excluded from the analysis.

The second problem, decisive but probably just due to the relatively recent character of the literature, lies in the adopted partial equilibrium approach which, de facto, restricts the analysis to just bilateral relationships. Especially for the notion of specificity (Williamson, 1975, 1985; Klein, Crawford, and Alchian, 1978), this limitation is particularly relevant because, due to its intrinsically relative character, it often turns out to be misleading to say an investment is specific to a particular relationship without reference to what is going on in the rest of the economy. To see the point, note that in terms of just bilateral relationships a quasi-rent -i.e., the extra value over the next best alternative use by which specific investments are usually defined- is both necessary and sufficient for specificity. While it is always necessary because otherwise the threat of opportunistic behavior would be innocuous, in this context it is also sufficient because without specificity there is no extra value and, as a consequence, the alternative is between bearing the cost of specificity, and obtaining its benefits, or obtaining nothing. The fundamental new-institutional proposition by which, with asset specificity, market relations would be optimally substituted with hierarchical relations then follows by observing that, in such a situation, market relations are burdened with high transaction costs and therefore, with inefficiently low ex ante incentives to invest.

The problem behind such a proposition, however, becomes immediately apparent when multilateral settings are considered. Here, assuming potentially imitable productive activities, one can have a quasi rent without specificity simply by imitating an existing investment. Indeed, while the return of investments depends on their novelty character and therefore remains unchanged until the next innovation (Schumpeter, 1911), their specificity tends to vanish

[2]"Once we attempt to add empirical detail to Coase's fundamental insight that a systematic study of transaction costs is necessary to explain particular forms of economic organization, we find that his primary distinction between transactions made within a firm and transactions made in the marketplace may often be too simplistic. Many long-term relationships (such as franchising) blur the line between market and the firm. (...). Firms are therefore, by definition, formed and revised in markets and the conventional sharp distinction between markets and firms may have little general analytical importance. The pertinent economic question we are faced with is 'what kinds of contracts are used for what kinds of activities, and why?'" (Klein, Crawford, and Alchian, 1978, p.326).

or at least to gradually reduce once they are imitated and alternative users become available. As a result, the costs of specificity and of the associated non market relationships end up for being 'organizational experimentation costs' in the sense that they will only be borne by first investors while they can be saved by later investors exploiting competition among counterparties.

In such a multilateral context, in other words, asset specificity is not able to create the quasi rents by which it is usually defined. More prosaically, instead, it may be understood as a costly consequence of the fact that to be first also means to be unique and as a source of important externalities not just in the relationships between investor and counterparty but also in the relationships among investors. While its benefits can be appropriated by opportunistic counterpaties because of the 'hold-up' problem, its costs can be saved by competitors behaving as 'organizational free-riders'. Accordingly, together with the causation mechanism emphasized by the new-institutional literature -which goes from specificity to the contracts-, for this class of investments there is also another going from expected competition to specificity and, as a consequence, measuring expected competition with the probability of being imitated, the resulting institutional structure of production would be marked by a tendency to over- or under-invest depending on whether this probability value is higher or smaller than a given threshold level. A necessary condition for the attractiveness of the investment being the expectation of not being imitated so as to remain unique the time needed to recover the costs of being first, in equilibrium, in specificity, either all invest (being all unique) or no-one invests (nobody being first).

Most importantly, finally, in a so redefined framework the grouping form of economic organization described above may be explained as a possible solution to the inefficiencies implied by this tendency to over- or under-invest. With market relations within the group and non market relations between groups, it is possible to implement assets which have an extra value over their best alternative use because they maintain their novelty character, but are not under the threat of opportunistic behavior as they have lost their character of uniqueness. Thus, naming them as 'general purpose'[3], such assets can be understood as a combination of the respective advantages of specific and generic assets and this is why they need the corresponding institutional mix between market and non market productive relations. Of course, not even this is a first

[3]To avoid terminological confusion, note that, positing a difference between generality and genericity, we call 'generic' what in the literature is indicated as 'general purpose'.

best solution because there are costs in reaching the needed investors' agreement. However, to the extent in productive systems like those referred to above such costs are not too high for cultural, historical or other exogenous reasons, the cooperative internalization of the externalities between investors and counterparties- that is, the creation of a 'quasi-market' preserving the novelty character while eliminating the uniqueness character-, can also be a way to internalize the externalities among investors.

In this paper, we analyze this idea in a dynamic framework. There are two reasons for doing so. First, one can study path-dependence making the analysis more suitable for exercises of comparative business history and, in approaches where institutional complementarities, multiple equilibria and possible inefficiencies play a major role like in that adopted here, such exercises are the most desired applications[4]. Second, while the extension to multilateral settings permits an endogenous determination of the degree of specificity of the investments, by introducing dynamics one can close the causation circle by endogenously determining the intensity of expected competition. In effect, because of the irreversible character of such investments, taking proper account of time amounts to the recognition of a self-reinforcing mechanism in the specific investments decision process. The direction of causality going from specificity to contracts, in other words, links itself to that which goes from expected competition to specificity given that the prevailing type of contracts in the economy determines the number of potential imitators and, with it, the probability of being imitated and the intensity of expected competition (fig. 1).

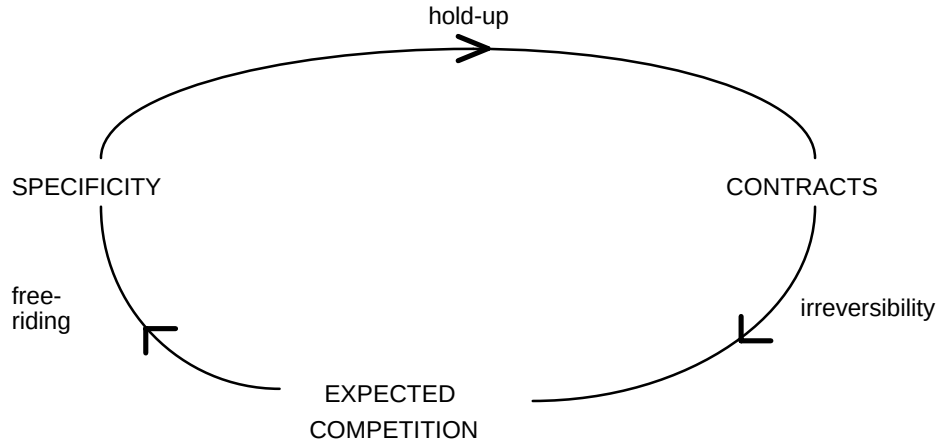

Fig.1

[4] In this sense we approach the methodology that Aoki (1995) calls Comparative Institutional Analysis.

For example, when the number of specific investments increases, because of the increased 'hold-up' risks, there is an increase in the average length of the contracts needed to protect them and, because of their irreversibility, expected competition decreases. Accordingly, the number of specific investments increases further because of the diminishing 'free-riding organizational' problem. Furthermore, when specificity increases, due to the equilibrium condition implying the recovering of its costs in the output market, so does product differentiation[5]. Then, an analogous cumulative causation circle may be identified between the competitive structures of both input and output markets or, in other words, as a result of the complementarities between markets and organizations (fig. 2).

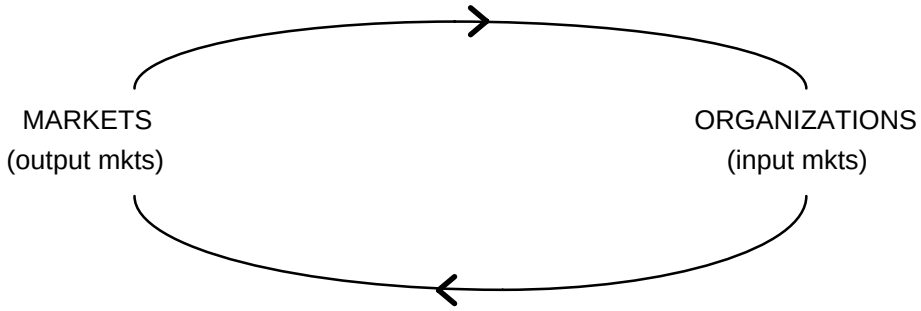

Fig. 2

Here, when for example input markets become more competitive as a result of diminishing hold-up problems, the same thing happens to output markets because of the increased probability of being imitated. Consequently, input markets become even more competitive because of the diminishing specificity.
In both cases, as usual for path-dependent self-reinforcing mechanisms like these[6], the stable equilibria are only the two polar cases in which agents all choose the same strategy confirming the existence of a tendency to over- or under-invest. Thus, even for such a dynamic framework, the emergence of the business groups' solution may find an efficiency rationale given that the intermediate situation in which the investment strategy spontaneously co-exists with that of imitation ends up by being intrinsically unstable.

[5]Depending on specific investments reduce costs or improve quality, output market will be characterized by vertical or horizontal differentiation.
[6]From an institutional point of view, similar mechanisms have also been studied by Banerejee and Newman (1993), Bardhan (1987), Bowles and Gintis (1995), David (1993) and Pagano and Rowthorn (1994).

The rest of the paper is organized as follows. In the next section the specific investment decision process is analyzed by means of a simplified version of the so-called Polya processes. We sketch a model in sub-section 2.1. and subsequently we try to apply its results to the historical record of business firms. Finally, section 3 briefly concludes.

2. THE DYNAMICS OF THE SPECIFIC INVESTMENT DECISION PROCESS AS A POLYA PROCESS

Before explicitly introducing dynamics, let us briefly recall the basic idea behind the 'free-riding organizational' problem. At the time t=0, an investor, say A, must decide whether or not to make an investment to reduce the costs or to improve the quality of the product. Such investment is specific because the capital will be committed irreversibly for two periods, its costs will be repaid by consumers in both periods, and, to implement the investment, A needs the cooperation of a counterparty that we call B. As a matter of fact, for these three reasons, in t=1, the capital previously employed will have a greater value within the relationship between A and B than elsewhere but, for the lack of alternative users, such an extra value can be appropriated by B instead of being used to repay the sunk component of the investment of A.

To illustrate the point, it may be useful to refer to the very famous Fisher Body-General Motors example, that is, the FB's rejection of the GM's proposal to construct a plant close to theirs to obtain a reduction in transportation costs. Were such a proposal to be accepted, GM could have threatened to break the relationship, and in this way, it would have been able to obtain more than was originally agreed or to reduce its effort without FB being able to punish this behavior in some way. Referring to the literature, in other words, here we have the combination of the Williamsonian 'fundamental transformation' with the non-verifiability condition of Grossman and Hart (1986) or with the existence of the Milgrom and Roberts' (1988) bargaining costs.

Thus, returning to our example, given that the investment is worth making, it is rational that A and B negotiate to the maximum before and to the minimum after this 'fundamental transformation' takes place, meaning that, at t=0, a contract is agreed that lasts two periods and gives to A the authority to decide in the event of unforeseen contingencies and to monitor the performance of B. Of course, even this arrangement is costly because B must be compensated in some

way for accepting such a long term contract in a subordinate position[7]. However, to the extent that such costs are lower either than the investment's benefits and the market transaction costs, this contract is efficient in the sense it maximizes the benefits to the parties involved and such a removal from competitive markets illustrates the effect of specificity on contracts.

While this is just an adaptation of the standard new-institutional story, consider now what happens when extending this reasoning to multilateral settings. Accordingly, imagine that in t=1 another investor, A', is in the same situation as A in t=0. Assuming that investments can be replicated, however, A' has now an additional option, imitation. Behaving this way, that is imitating the investment of A, A' does not have to agree to a long term contract with B', the conterparty necessary to A' as B to A. Notwithstanding its investment is also irreversible for two periods, in t=2 the contract linking A with B expires which is sufficient to guarantee that B' will not be able to behave opportunistically. In the FB-GM case, for example, A' could be any supplier of automobile component that, building its own plant in the same geographical area as those of GM and FB, can easily substitute with GM its own producer of automobiles.

Thus, if A' can confine itself to have a one period contract with B', it does not have to bear the corresponding costs and it is able to gain positive profits to the detriment of A, who would be suffering a corresponding loss. Imitation, exploiting the situation created by the leader's investment, re-establishes the attractiveness of the market discipline which permits the follower to save the costs that the leader has paid for. Of course, from this it follows that in t=0 the leader, anticipating the risk that the follower behaves as an organizational free-rider, will not make its investment and such a situation shows the (depressing) effect of expected competition on specificity.

As noted in the introduction, however, this under-investment equilibrium is not the only possible outcome. By making an investment different from that of A and specific to B', A' can increase product differentiation and, if not imitated, it is able to extract a rent which is certainly preferable to the earnings obtained by

[7]In a context à la Grossman and Hart, such compensation can be rationalized with any reason for which B dislikes to be monitored, and, in a context à la Milgrom and Roberts one can think of the amount needed to make the renegotiation threat not credible. Exactly as the explanation of the nature of the firm rests on the recognition that using the market is costly in some relevant way, however, the very important point is that non market relations also have to be necessarily burdened with some kind of costs because otherwise it would be difficult to explain why markets can exist at all. Not by chance, this role has been widely recognized in the literature and it is played by the impossibility of selective intervention (Williamson, 1985), by the lack of incentives for the party without authority (Grossamn and Hart, 1986), or by the so-called 'influence costs' (Milgrom and Roberts, 1988).

immediate imitation. For the sake of precision, indicating with R such a rent, with G the gain deriving from active imitation, and with L the loss from being imitated, it may be that to A' the following holds:

(1) $\left[-qL+(1-q)R\right]^{\theta} > G,$

where $0 \leq \theta \leq 1$ indicates the time preference rate, $q < \frac{R}{R+L}$ is the probability of being imitated and R>G.

In turn, this implies that for A it can be optimal to make first its investment in t=0 if there are good reasons to believe that A', in t=1, will actually effect this alternative specific investment rather than competitive imitation. Then, and contrary to before, in this case both agents make specific investments and each one protects itself from the 'hold up' risk by long term contracts with the counterparties. To the follower, the lack of expected competition renders it less attractive to behave as 'organizational free-rider' and, as a consequence, the leader is little concerned about it. Not surprisingly, the effect of expected competition determines opposite results depending on its own intensity.

After this recalling of the basic mechanisms at work, we are now in a position to see how dynamics can close the causation circle. To do so, suppose first that the number of players is now so high that there is no strategic interaction, that is, every investor neglects the effect of its choice on the aggregate. In a two-players situation like that just described, the equilibrium strategies are chosen at t=0 and so the passing of time has no real effect. Secondly, assume that the process takes place sequentially and, because of irreversibility, once a specific investment has been made, suppose that the investor comes out from the pool of potential imitators for the corresponding period[8].

In such a situation, the probability that the generic investor is imitated, that is, the intensity of competition it expects, is negatively related to the population share of specific investments not yet expired. The reason for this is very simple: when this population share increases, the number of potential imitators of the generic investor decreases correspondingly. Consequently, the probability that the 'next' investor makes a specific investment is in turn increasing in such population share. On the other hand, of course, when this latter probability

[8] There are two ways to justify the assumption that investors cannot simultaneously adopt both the investment and the imitation strategy. Firstly, one can think of binding financial constraints. Secondly, one can think of a retaliation preventing commitment.

increases, so does that population share and therefore the process exhibits the typical features of a self-reinforcing mechanism. In particular, the probability of unit increments for the two possible choices is not independent of the current proportion in which they are present in the population. The (strong) Borel law of large numbers does not apply and so we are dealing with a process of the so-called Polya kind[9]. The model below is an attempt to formalize these simple observations.

2.1. The Model

Formally, let i=1,...,n and t=1,...,m, respectively indicate the generic investor and the time sequence in which decisions are taken. Then, assume that both the two alternatives, specific investment and imitation, have a fixed length, respectively, T and T', with T'<T. To keep things as simple as possible, in addition, we restrict the analysis to a period of length T, implying that, when a specific investment is made, the corresponding investor comes out forever from the pool of potential imitators[10]. T/m is thus the interval between a decision and the following, while m ≥ n implies that the imitators have probably to decide more than once.

Accordingly, $x_t = \frac{Y_t^H}{w+t}$ is the population share of specific investment at time t, with Y_t^H being the number of specific investment at time t and w the total decisions number at the starting time t=0.

Of course, $Y_1^I = w - Y_1^H$ is the number of imitations occurring at t=1, and $r_t^i = n - t + Y_t^I = n + w - Y_t^H$ is the number of potential imitators of the generic i at time t.

Finally, assume that q is monotonically increasing in r and continously decreasing in x. Thus, recalling the preceding discussion of the 'free-riding organizational' problem, the imitation and specific investment pay-offs can be respectively rewritten as:

(2) $\Pi^I = G$

[9]The basic reference for such processes are the collected papers by Arthur (1994) which also contain many possible applications. For the way they have been used here, also useful are Hill, Lane and Sudderth (1980) and Kuran (1987).

[10]This is clearly a very restrictive assumption, but it may be dropped without obtaining significant changes in the results. On this point see footnote 12.

(3) $\Pi^H = \left[-q(x)L + (1-q(x))(R)\right]^{\theta}$, where, as in (1), q<R/(R+L), 0≤θ≤1, and R>G.

Now, if investors are heterogeneous because of differences in their financial structure and so there are k types depending on their time preference rate (θ_j , j=1,...,k)[11], for every j it exists a threshold population share $\tilde{x}(\theta_j)$ such that $x_t \geq (<) x \Leftrightarrow \Pi^H \geq (<) \Pi^I$.

As a consequence, the probability that the generic i with time preference rate θ_j will make a specific investment at time t is: (see. fig.3)

$$(4)\ p_j^i(q(x_t)) = p_j^i(x_t) = \begin{cases} 0 & \text{if } x_t < \tilde{x}(\theta_j) \\ [0,1] & \text{if } x_t = \tilde{x}(\theta_j) \\ 1 & \text{if } x_t < \tilde{x}(\theta_j) \end{cases}$$

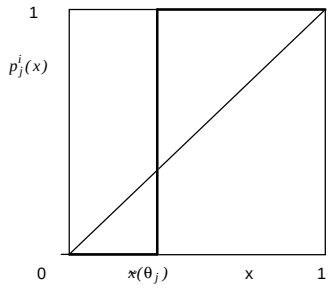

Fig. 3

[11]Here, we are implicitly assuming imperfect capital markets so that investors are the more impatient the higher is their debt/capital ratio. Alternatively, one could think of differences in their risk attitude. In any case, this population heterogeneity could be better exploited in the analysis by making the probability of being imitated dependent not just on the number of potential imitators but also on their 'type'. In effect, assuming that players do not know the population time preferences distribution, they could employ the current population share of specific investments to form the relative expectation. In this sense, called $F^E(\theta | x_t)$ such expected distribution, and defined $\bar{\theta}(q)$ as the minimum θ such that, for every given q, $\left[-qL + (1-q)R\right]^{\theta} \geq G$, the rational expectation q* would be the solution of the equation $F^E(\bar{\theta}(q) | x_t) = q$.

In the aggregate, the evolution of the specific investment population share is described by the following equation:

$$(6)\ x_{t+1} = x_t + \frac{1}{w+t}\left[p(x_t) - x_t\right] + \frac{1}{w+t}\xi(x_t),\ \text{with}$$

$$(7)\ \xi_t(x_t) = \beta_t(x_t) - p(x_t)\ \text{and}\ \beta(x)\ \text{being a random variable defined as:}$$

$$(8)\ \beta(x) = \begin{cases} 1 \text{ with probability } p(x) \\ 0 \text{ with probability } 1 - p(x) \end{cases}.$$

Noting that the conditional expectation of ξ_t with respect to x_t is zero, however, we can write the expected motion of x_{t+1} as:

$$(9)\ E\left[x_{t+1} \middle| x_t\right] = x_t + \frac{1}{w+t}(p(x_t) - x_t)\ \text{, where}$$

(x_0, w) indicates the initial conditions and the urn function p(x) is a function that, inverting $\tilde{x}(\theta_j)$, for every x finds the minimum time preference rate such that $\Pi^I = \Pi^H$ ($\tilde{\theta}(x)$), and then it calculates the probability that 'next' investor has higher time preferences ($\theta > \tilde{\theta}(x)$).

In particular, assuming that time preferences are distributed according to the β-distribution[12], p(x) is simply its cumulative density function , that is:

$$(10)\ p(x) = p(\theta \geq \tilde{\theta}(x)) = \int_{\tilde{\theta}}^{1} \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} \theta^{\alpha}(1-\theta)^{\beta} d\theta\ ,\ \text{with}\ \alpha, \beta > 1$$

Differentiating twice this expression, it turns out that the second derivative is zero at $\bar{\theta} = \frac{\alpha}{\alpha+\beta}$, that is, at the time preferences distribution average value.

Thus, the reasoning just explained in words can be graphically represented as in fig. 4.

[12]Graphically, such distributions have the same shape as the normal distribution, but they are defined in (0,1) instead of (-∞, +∞).

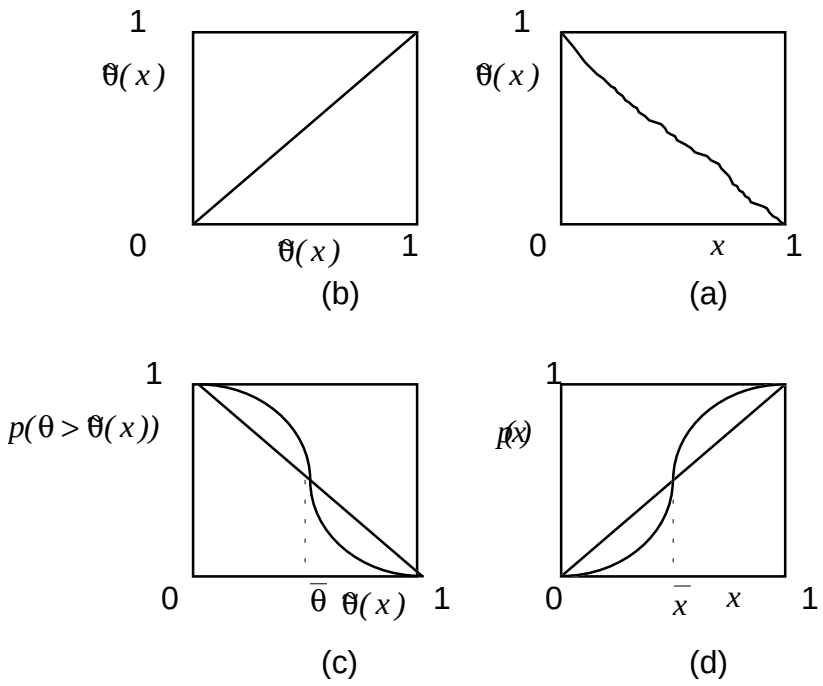

Fig. 4

For example, if x_t is low (high) because the minimum time preference rate which equalizes the two payoffs is high (low), the probability that the 'next' investor is so patient (impatient) to prefer the investment strategy is correspondingly low (high).

Equilibria

Following Arthur (1994), for processes like this, equilibria must be looked for among the fixed points of the urn function p(x), that is, among the population shares that equalize the corresponding probability value. Therefore, the equilibrium set of the process defined by (4) through (10) is:

(11) $E = \{ x^* : p(x^*) = x^* \} = \{0, \bar{x}, 1\}$.

Equally easily, they can be characterized by noting that $\bar{x}$ is the population share by which the investor with average time preferences is indifferent between the two strategies so that the following holds:

(12) $\bar{x}:\left[q(\bar{\theta}(x))R+(1-q(\bar{\theta}(x))(-L)\right]^{\bar{\theta}}$ = G.

Then, in order to explicitly determine its value, it suffices substituting $\bar{\theta}=\frac{\alpha}{\alpha+\beta}$ in the relation represented in fig. 4a ($\bar{x}=\bar{\theta}(x)$).

Stability:

To analyze the dynamic properties of the process, instead, note that from (9) and (10) it turns out that:

(14) $x_t > \bar{x} \Rightarrow p(x_t) > x_t \Rightarrow x_{t+1} > x_t \Rightarrow$

and

(15) $x_t < \bar{x} \Rightarrow p(x_t) < x_t \Rightarrow x_{t+1} < x_t \Rightarrow$

In words, if x_t in on the right (left) with respect to $\bar{x}$, that is, if x_t is high (low), since p(x) is over (below) the 45° degree line, it must be that p(x)>x (p(x)<x), and therefore x_{t+1} will be even more high (low).
When the population share of specific investments is already low (high), to put it another way, it is very difficult for the next investor to be so patient (impatient) to be an innovator (imitator) upsetting the prevailing population trend. So, in probabilities, the process rests in $\bar{x}$ only when it starts in that point while in the other cases it converges to 0 or 1 depending on where it started [13].

[13]Formal proof of this proposition are in Hill, Lane and Sudderth (1980) for the bidimensional case, and in Arthur, Ermoliev and Kanioski (1983, 1986) for the multidimensional one. The algebra for the present case is available upon request. Interestingly, in addition, it has to be noted that we may obtain similar results in an evolutionary game context where, in each period, innovators and imitators are randomly paired. Being the relative pay-off matrix as in fig. 5a, following Weibull (1995) it may be transformed as in fig. 5b showing that this is a coordination game with three Nash equilibria, two pure (IM,IM; IN,IN) and one in mixed strategies ($\frac{R-G}{R+L-G},\frac{L}{R+L-G}$).

	IM	**IN**
IM	**0,0**	**G,-L**
IN	**-L,G**	**R,R**

FIG. 5a

	IM	**IN**
IM	**L**	**0**
IN	**0**	**R-G**

FIG. 5b

In this sense, due to the path-dependent features of the process, the equilibrium selection problem is solved once the initial conditions are known, and consequently, S= {0, 1} is the set of locally stable equilibria.

Efficiency:

In the two extreme equilibria x*=1 and x*=0 agents all choose the same strategy respectively determining the over- or the under- investment equilibrium. In the first case, being all different and necessitating safeguards against oppurtunistism, the benefits of specific investments are achieved at the price of a multiplication of their organizational costs and, possibly, there is too much differentiation in the output market. In the second case, there are no investments so that their benefits are not achieved at all and, consequently, too little differentiation is created[14].

By contrast, this is not the case for the intermediate equilibrium in which $x = \bar{x}$. Here, the investment strategy co-exists with that of imitation obtaining a combination of their respective advantages. Moreover, in such an equilibrium, the investment strategy is only chosen by the most patient investors, that is, by the investors for whom such behavior is less costly. Then, it is not difficult to intuitively recognize this equilibrium as the most efficient one. Unfortunately, however, this is only true cooperatively, that is, when investors are able to reach an agreement explicitly providing for the possibility of imitation. In the non cooperative case, on the contrary, this intermediate solution where competition and innovation are in the balance is not the optimal solution. As shown by the preceding stability analysis, the lacking internalization of the externalities originated by specific investments renders the needed population strategies'

Now, it is a standard result that only q=0 and q=1 are stable attractors in the replicator dynamics described by the equation $\dot{q} = \left[Lq - (R-G)(1-q)\right]q(1-q)$, where q is the imitators' population share. So, two observations are in point in respect to the model of the text. First, this result derives from the average payoff function having a minimum in $\bar{q} = \frac{R-G}{R+L-G}$, and this confirms that the intermediate situation in which the investment strategy co-exists with that of imitation may be non cooperatively not available. Second, this game works with technical assumptions which are exactly opposite to those made in the model of the text. Here, indeed, time is continous, the population is homogeneous, and the decision process is simultaneous and repeatable for both the two possible choiches.

[14]In a more general model, these conjectures about an efficiency evaluation of the degree of the output market differentiation could be made more precise by explicitly considering consumers and their preferences.

distribution unattractive for the single investor, and as a consequence, this equilibrium ends up by being dominated by the two extremes where agents follow the strategy previously prevailing in the population (see also footnote 12). For this reason, the resulting trade-off between static and dynamic efficiency can only be consciously settled from the outside by means of the business groups' solution. In this way, making the same investment, investors are capable of reducing counterparties' specificity and obtaining savings in compensation costs that, eventually, may more than compensate the agreement bargaining costs and the decrease in the produced quantities due to the diminished product differentiation. In particular, measuring efficiency with the investors' ex post joint profits[15] and respectively indicating with $\sum_{i=1}^{t}(R_i - C_i)$, $\sum_{i=1}^{t}\overline{R}_i - B$, and $\sum_{i=1}^{t}\Pi_i^N$ the amounts corresponding to the three equilibria defined in the equilibrium set E, the conditions under which this is the case can be detailed in the form of the following

PROPOSITION:

Assume $\sum_{i=1}^{t}C_i - B > \sum_{i=1}^{t}(R_i - \overline{R}_i)$ and $B < \sum_{i=1}^{t}(\overline{R}_i - \Pi_i^N)$, where C_i represents the compensation cost for non market contracts in the non cooperative investments' case, B is the agreement bargaining cost, $\overline{R}_i$ is the reduced investment's rent in the cooperative case, and Π_i^N is the normal profit when investments are absent.

Then, $\sum_{i=1}^{t}\overline{R}_i - B > \sum_{i=1}^{t}(R_i - C_i)$ and $\sum_{i=1}^{t}\overline{R}_i - B > \sum_{i=1}^{t}\Pi_i^N$.

Under these conditions, the grouping form of economic organization before defined as consisting of market relations within the group and non market relations between group, emerges as a solution to inefficiencies resulting from the non cooperative tendency to over- or under- invest. The reduction in both compensation and technological costs (or the quality improvement) do outweigh the fixed costs of the investment and the agreement bargaining costs so that the total cost of production (technological *and* organizational) ends up by being lower than in the two alternative outcomes.

[15]This choice of the efficiency measure is justified because through the paper there are no distributive problems as in the standard new-institutional economics. While this assumption may provide theoretically more interesting results, it also poses epistemologic issues about their adherence to reality.

In the next subsection, influential accounts of the business firms' historical evolution are combined to see to what extent this theoretical conclusion is empirically relevant.

3. APPLICATIONS FROM THE HISTORICAL RECORD ON BUSINESS FIRMS

There is a curious habit in the historical literature on business firms, that of identifying three basic types of industrial capitalism. According to Chandler (1990), the leading contributor of the field, they are the English personal capitalism, the American competitive managerial capitalism, and the German cooperative managerial capitalism, meaning by such labels the various forms of industrial firm taken on in the three most developed countries during the period between W.W.I and W.W.II. The differences between managerial and personal capitalism basically concern the ownership structure -only in the first is there separation between ownership and control-, the governance structure -only in the first is there effective managerial hierarchy-, and the degree of vertical integration -very much higher in the first than in the second-. Such differences are seen as the result of the three-pronged investment in production, distribution, and management that the same author already had recognized as essential to the development of the modern firm (Chandler, 1977). The differences between competitive and cooperative managerial capitalism, instead, concern the relationships between firms. Because of the differences in the financial structure -equity-based in U.S., bank-based in Germany- as well as the different institutional settings -think, for example, of the U.S. antitrust law-, we have keen competition in oligopolistic markets in the first case whereas firms, Government, and Unions cooperate in a broader context comprising of educational, social, and legal aspects in the second.

According to Lazonick (1991), instead of types it is better to speak about historical phases. The general argument is that in the evolution of industrial capitalism's institutions it is possible to detect a pretty clear tendency of a progressive substitution of the market as a coordination mechanism. The idea is that such a tendency can be explained in terms of the increasingly collective features of the learning process and, with it, of the innovative activities needed to achieve competitive advantage. In this sense, the English proprietary capitalism represents the first stage of this development, the American managerial capitalism is the second, and the Japanese collective capitalism is

the third. The first is described as a system of relatively small firms managed by their owner relying on the market for the input demand as well as for output supply. The second is characterized by the separation between ownership and control, and by an high degree of vertical integration as in Chandler, while the third is finally defined as a group of legally independent firms where the substitution of the market extends to the shop floor workers and to the firms joining the group.

In respect to the two difficulties in explaining business groups before attributed to new-institutional economics, these two classifications confirm the usefulness of extending the analysis to multilateral settings. Especially in the account of the more recent developments in the capitalistic organization of production, the issue of firms' relations has a great relevance in both approaches. At the same time, however, they seem to share the other problem of the new-institutional literature, that is, the tendency to identify non market relationships with ownership of physical assets. Restricting the main theoretical question to the 'make or buy' decision as in that literature, they end up by being hardly concerned with empirical facts different from vertical integration. As already argued in the Introduction, by contrast, to give account of hybrid organizational forms half-way between markets and hierarchies an approach is needed in which the differences between market and non market relationships are just a matter of degree and, consequently, the best empirical applications must be looked for in the correspondence between labour contracts and the principles of the division of labour, that is, in relationships among counterparties which cannot be bought. Not by chance, in the A-A' example, having a non market relationship with the counterparty does not necessarily mean buying it but signing a long term contract of which ownership is the limiting case with infinite term.

Another useful classification, then, can be found in the work by Piore and Sabel quoted above. Again, we have three types of capitalism but now they are craft production, mass production, and flexible specialization. The first is characterized with generic machines and specialized workforce, the contrary - generic workforce and specific machines- is true for the second, while the latter is seen as a combination of the two preceding as it has been already pointed out in the Introduction (and as its own name suggests). For our objectives, this latter classification has merits in that it gives the right weight to industrial relations and division of labor but, unfortunately, the topics of organizational economics are just implicitly considered and the links between theory and history are weaker than in the other described approaches. To fill this gap, we may refer to

another contribution by Pagano (1991), where the classic principles of the division of labor are explained in terms of the specificity of the workers' skills. In particular, respectively relating the Smithian principle of maximizing 'learning by doing' to a better acquisition of new skills and the Gioa-Babbage's principle of minimizing 'learning before doing' to the optimal utilization of given skills, historical examples of two polar cases showing the tendency to over- or under-invest can be respectively found in the 19th century English classical firm and in the 20th century American Taylorist firm. In the first case, the primacy of labor over technology and the corresponding persistence of the harsh principles of the craft regulation of work -the so-called 'aristocracy of labor' (Hobsbawn, 1964)- would testify for an over application of the Smithian principle, that is, for a multiplication of the costs to create new skills. In the second case, the establishment of the principles of the Tayloristic organization of work -the dissociation of the labor process from the skills of the workers, the separation of conception from execution, and the diffusion of a detailed managerial control of each step of the productive process (Braverman, 1974)- would prove instead an over-application of the Gioia-Babbage's principle, that is, the inhibition of the dynamic gains of the learning process. Confirming the theoretical relations behind the preceding model, in the small and differentiated regional markets of the19th century England, the threat of competitive imitation was relatively less plausible than in the big and standardized American markets a century late.

To find applications to the cooperative group solution, instead, we must turn back to the post-fordist productive systems briefly described in the Introduction and, in particular, to the features of the workforce induced by the Third Industrial Revolution. In this sense, the temporal or permanent transfers to manage employment crises and the 'job rotation' practices can be considered as examples of the advantages of a flexible resources' use, while the high specialization and the slogans about 'permanent training' can be understood as a demonstration that the need of their continuous refining has been altogether recognized. Thus, to the extent such technological and market conditions can be seen as requiring a combination of the advantages of both the Smithian and the Gioia-Babbage principles, we find here correspondence with our definition of 'general purpose' assets, and consequently, with the corresponding institutional mix between market and non market productive relations[16]. In any case, to make

[16] Interestingly, starting from a paper by Williamson (1988) where specific and generic assets are respectively associated with equity and debt financing because of the differences in their liquidation

more clear the links between this and the preceding section, based on the same variables as the model, the table below provides a classification of the three forms of capitalistic organization of production just discussed[17].

ORGANIZATION	COMPETITIVE THREAT (output market structure)	DIV. OF LABOR (workers' skills)	LABOR MARKET CONTRACTS
English classical firm	low (regional / differentiated)	Smith (specific)	Non market
American fordist firm	high (national / standardized)	Babbage (generic)	Market
NonAnglo saxon business groups	low (domestic mkts) high (foreign mkts)	Smith-Babbage (general-purpose)	Non market (between groups) Market (within the group)

value in the event of bankruptcy, this correspondence between assets features and productive relationships may be extended to the financial structure linking the notion of 'generality' to the German-Japanese system of banks-firms relationships. In effect, as Aoki (1993) had already explained in an asymmetric information framework, in such systems the bank -the main bank and the *Hausbank* in particular- often combine creditholding with shareholding determining a hybrid financial structure half-way between the two ideal-types of pure equity or debt financing. On this possible extension see also Battistini (1998b).

[17]To reduce at least in part the over simplification risks implicit in this kind of classifications, some qualifications are in point. First, this is an autorefential exercise in the sense that the features attributed with one particular production mode must be only judged in relation to the others which take part in the exercise. For example, were it compared to the preceding forms of economic organization, the 19th century English capitalism would certainly occupy a different position. Second, it is only justified for expositional convenience so that its time and space specifications have not to be rigidly considered because of course in each period and in each region there are examples of each category. Finally, as a further research direction, it could be completed by a joint consideration of both organizational and technological aspects of the firms' structure and, in particular, by a systematic study of their complementarities.

4. CONCLUSION

Generalizing the intuition by which he was able to explain the nature of the firm at the end of thirties, in his subsequent article on the problem of social cost Professor Coase (1960) made clear that taking proper account of transactions costs means to face a trade-off between the degree of competition and the number of profitable economic activities. In this sense, assuming that economic organizations emerge from an exchange process between farsighted individuals with no wealth constraints, the actual combination between market and non market institutions may be its optimal solution.

Dealing with economic change and development, on the other hand, a very similar trade-off had already been recognized by Schumpeter (1911) some time before. Here, deviations from perfect competition were rationalized as a price to be paid in order to guarantee appropriability conditions and the starting of the value creation process. Thus, the positive problem being the explanation of why real world phenomena like firms and imperfect competition were so widespread despite neoclaxical orthodoxy, in both cases, the normative conclusion was that some intermediate solution, optimally combining the opposing requirements of their respective trade-offs, were also spontaneously available without external intervention.

While in the Coasean framework this conclusion is independent of the competitive relations between producers, however, in the Schumpeterian approach there is independence from the productive relations between employers and employees. Starting with such an observation, in this paper it has been argued that when these relationships have to be jointly considered as for imitable specific investments, notwithstanding their unchanged desiderability, such intermediate solutions are no longer automatically available because the interaction between these two trade-offs tends to be explosive rather than mutually dampening. Making the corresponding population strategies' distribution unattractive for the single investor, indeed, the chain of externalities originating from the specificity of investments determines a 'band wagon' effect in the behavior of economic agents so that in the stable equilibria they end up by all choosing the same strategy. For this reason, meaning that the substitution of the 'invisible hand' of the market with the 'visible hand' of authority (or rules) may be explained in efficiency terms not just for the bilateral relationships between investors and counterparties but also for the group relationships among investors, in this context the right balance between static and dynamic efficiency

can only be achieved from the outside by means of the cooperative business groups' solution. Of course, as shown by the post-fordist productive systems in which this solution has been partially implemented, it does not necessarily imply explicit Government intervention neither it is necessarily the best one because of its organizational costs. Nevertheless, the same empirical examples also prove that the contrary is not always true and suggest that a political economy of the capitalistic institutions of production could gain from an authentic case by case comparative approach.

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