



Document de travail

Hicks and Richardson on industrial change: analysis and policy

N° 2008-28
September 2008

M. AMENDOLA
University of Roma La Sapienza

S. BRUNO
University of Roma La Sapienza

J. L. GAFFARD
University of Nice Sophia Antipolis and OFCE

Observatoire Français des Conjonctures Économiques

69, Quai d'Orsay 75340 Paris Cedex 07

Tel : 01 44 18 54 00 Fax : 01 45 56 06 15

E-mail: ofce@ofce.sciences-po.fr Web: <http://www.ofce.sciences-po.fr>

Hicks and Richardson on industrial change: analysis and policy

M.Amendola*, S.Bruno* and J.L.Gaffard**

Abstract

This paper is aimed at showing the complementarity between Richardson's and Hicks' contributions as regards the sketching out of a proper analytical framework for dynamic analysis. These contributions deal with two essential analytical ingredients that the out-of-equilibrium analysis of processes of economic change calls for: investment, in the sense of *construction* of productive capacity, and the *relations* which must be established for construction looked at as a process over time. In particular, light is thrown on the specific co-ordination problem that characterizes a process of economic change; a problem that arises at the junction of two strictly related lags: the phase of construction of productive capacity - which entails sunk costs - and the delay of transmission of information - which implies uncertainty. The analytical framework thus sketched out helps to understand why the economic agents' interaction does not bring about chaotic results, as long as the decision-makers are characterized by roughly stable patterns of behaviour and/or as long as a fair amount of co-ordination takes place, through various forms of cognitive exchange. It helps to show that the adoption of routines, the compliance to rules and customs, communicative action, the sharing of expectations about the behaviour of the system, the search for explicit agreements, are all mechanisms (or strategies) producing some degree of co-ordination, which confer the required order and stability to the environment.

* University of Roma La Sapienza.

** University of Nice Sophia Antipolis and OFCE e mail jean-luc.gaffard@ofce.sciences-po.fr

1. Change as an out of equilibrium process

Dynamic analysis depends on dealing with issues that are in the nature of dynamic problems rather than on referring to supposedly dynamic methods. Qualitative economic change - a change that implies a structural modification which can only be brought about through a process in real, irreversible time - is the crucial issue involved whenever a thorough dynamic problem is contemplated. Innovation, which implies creation of new resources and construction of different choice sets, is the foremost example of qualitative change; but also a speeding up of the growth rate or a simple change of the technique in use partake of the same nature. In all these cases, the previously existing productive structure is disturbed, its way of functioning is affected, its harmony over time, assured in the previous equilibrium state, is perturbed. As a result, problems of intertemporal complementarity arise which call for co-ordination over time of economic activity, to render the process of change undertaken viable. This process comes down to the construction (in the limit the creation anew) of a new productive structure which most of the times also implies the creation of new specific resources; in particular the appearance of new skills of the human resource, where the term 'skill' must be taken in a wider sense as referring not only to the intrinsic characteristics (qualifications, competences,...) of this resource, but also to its relations with the productive environment with which it interacts (organizational capabilities, institutional features...).

New aggregates of elements that exhibit different complementarity relations among them have thus to be shaped up for a different productive structure with its distinctive way of functioning to emerge. This can only come about through a process which is in the nature of an out-of-equilibrium process; its viability is the crucial problem involved, and this depends mainly on being able to re-establish the harmony over time of productive activity broken up by the undertaken structural modification. In this perspective, complementarity and co-ordination over time appear as the relevant issues for viability.

This paper is aimed at showing the complementarity between Richardson's and Hicks' contributions as regards the sketching out of a proper analytical framework for dynamic analysis such as we just defined it.

2. Investment co-ordination and the delay of transmission of information

Standard equilibrium analyses, and models, are not suited to deal with the two essential aspects of the out-of-equilibrium analysis which qualitative change calls for: investment, in the sense of *construction*

of productive capacity, and the *relations* which must be established for construction looked at as a process over time to be carried out¹.

Both investment and relations between agents appear as strictly related problems in the analysis developed by Richardson in his book *Information and Investment* (1960). This can be read in his very words. "It is of the essence of the private enterprise that although its individual members are independent (in the sense that they are free from central direction) yet their activities are nevertheless interrelated" (ibid. p.30). "Any single investment will in general be profitable only provided, first, that the volume of competitive investment does not exceed a critical limit set by the demand available, and, secondly, that the volume of complementary investment reaches some minimum level."(Ibid. p.31)². On the other hand the decisions about the investment to be carried out are taken by entrepreneurs on the basis of expectations whose reliability depends on them being grounded on adequate information or evidence. According to Richardson "the availability to entrepreneurs of this information (...) is a function of the nature of the particular form of organization or system within which they are presumed to operate" (ibid. pp. 29-30). The assumed market structure has therefore an important bearing on the way expectations are formed, and decisions taken as a consequence; and, as we shall see better in the last section of this paper "some market imperfections may be essential to the process of successful economic adjustment" (ibid. p.38).

If we put on the lenses represented by the above proposed interpretation of qualitative change we can see in which way Richardson's analysis helps to deepen our understanding of how, and due to which factors, a co-ordination problem arises and becomes the main issue to be dealt with in the out-of-equilibrium process on the viability of which the endeavoured change depends.

For a process of change to take place investments must be decided and actually undertaken which, after a phase of construction, will result in a new productive capacity to be matched by a corresponding demand for final output. As stressed by Richardson, the profitability of any investment project depends on the setting up of a satisfactory amount of both complementary and competitive investments along the way. If entrepreneurs had immediately complete information on all existing investment projects this profitability would be assured because the entrepreneurs themselves would behave in such a way that no imbalance between supply and demand would appear on the market for final output. However, this is not likely to happen in a "private enterprise system; the larger the

1. Standard theory looks at production from the vantage point of trade and exchange, and production itself comes actually down to an analytically instantaneous assembling of given generic inputs. On the other hand co-ordination of economic activity - an activity interpreted as allocation, not as construction or creation of resources - is guaranteed by assumption by the price mechanism, and the theory is silent on how this actually takes place.

2. According to the author investment may be termed complementary (competitive) where the profitability of one is increased (reduced) by the carrying out of the other. Intermediate products or effective substitutes are examples of the one or the other, respectively.

number of firms in each industry, and the less the co-operation between them, the more difficult it is to see how the required information could be obtained". Thus "it seems more reasonable to assume that entrepreneurs will generally learn of the investment commitments of others only after a certain period of time which, for convenience, will be called the 'transmission interval'. The duration of this interval, it seems safe to presume, would not be greater than the gestation period, after which the extra flow of goods would have themselves felt on the market, but could be shorter than this, where entrepreneurs were able to obtain evidence about the amount of construction under way" (ibid. p.51). The very existence of this delay in the transmission of information implies that adequate market information is no longer obtainable and hence involves a co-ordination problem.

How - in particular, as the result of the establishing of which kinds and forms of relations - the required information can be made available is the specific object of the analysis developed by Richardson. However, he focuses on "how entrepreneurs can be supplied with the information which will enable them to take the investment decisions required by a rational allocation of resources" (ibid. p. 45). What we are after, instead, is a theory able to explain change interpreted as the process by which new and different productive options are brought about: where the focus is on *creation*, not on *allocation* of resources.

The problem of co-ordination, the existence of a delay of transmission of information and its relation with investment activity, the coherence of expectations formation - together with other interesting insights on the policy issues involved by the co-ordination problem, which, we shall see, Richardson's analysis also provides - are essential analytical ingredients of this theory. However, for the theory itself to be properly developed we still lack a crucial element: a representation of production as a time-structured process dealing explicitly with the intertemporal complementarity, which provides the adequate sequential framework for an-out of-equilibrium analysis³.

3. Intertemporal complementarity of production and the construction lag

Articulation over time of the production process is the distinctive feature of the Neo-Austrian model (Hicks 1970, 1973). In this model production appears as a scheme for transforming a sequence of primary labour inputs into a sequence of homogeneous final output. The production process is fully vertically integrated. This makes it possible both to exhibit explicitly the phase of construction of productive capacity by bringing it inside the production process and to stress that it must necessarily

3. The gestation period stressed by Richardson refers to the time lag required for obtaining the output from a *given* productive capacity; it has got nothing to do with the process through which this capacity is brought about, which represents the true time element of production.

come before the phase of utilisation of the same capacity⁴. Focus on the time structure of the production process, and on its intertemporal complementarity, allows to actually deal with the transitional dynamics of an economy, in the sense of bringing to light “what happens on the way” (Hicks 1973, p.10). In particular, the transition between two different techniques (a Traverse) is analyzed by following the process through which this transition takes place in its sequential development (Hicks 1973). This allows important analytical insights: in particular it makes it possible a demonstration of Ricardo's ‘machinery effect’, according to which the introduction of machinery has an adverse effect on employment in the short run. The reason that the focus on the time structure of the production process renders evident is the temporal dissociation of inputs from output and of costs from proceeds during the Traverse (a consequence of the change in the age structure of productive capacity resulting from the modification of the balance between processes in the phase of construction and processes in the phase of utilization implied by a change in the technique in use) with the result of a temporary fall in final output, and hence in the resources available to sustain employment.

The message of the analysis of the Traverse is that any attempt to change a given productive structure implies bringing back into light the time articulation of the production process - its having to go first through a phase of construction of a different productive capacity in order to be able to use it later for current production - obscured by the synchronization of production in a given equilibrium state. However it is a message the analytical potentiality of which cannot be fully exploited within the context sketched out by Hicks⁵. As a matter of fact no decision process is contemplated in this context. The barter economy dealt with in the analysis is made to move along the sequence of periods from the one technique to the other by means of the mechanism provided by the assumption of Full Performance. This implies that all the output not absorbed by consumption out of wages paid to workers engaged on existing production processes or by consumption of other kinds, is in fact used to start new production processes. The rate of starts, thus made endogenous, sketches out the path followed by the economy, a fully predetermined path once the values of the technical parameters of the model are given. Full Performance, on the other hand, also implies flow equilibrium in each period, both in the sense that final output is totally absorbed by existing demand and in the sense that investment is equal to ex ante saving. Thus the existing productive structure is smoothly transmuted into the one adapted to the new technique as resources are gradually freed and invested into the

4. The Neo-Austrian analysis of the production process is consistent with Richardson's vision of the nature of the firm. In his paper on Adam Smith (1975) Richardson considers “the implications of giving firms the freedom to practise a vertical division of labour”, i.e. the implications of bringing back to the surface the temporal dimension of the production process. This leads him “to regard firms as undertaking *activities* rather than making and selling products, these activities having to do with the discovery and estimation of future wants, with research development, and design, with the execution and co-ordination of processes of physical transformation, with the marketing of goods, and so on”. These activities look very much like vertically integrated (and separable) production processes as defined in the Neo-Austrian model.

building of the latter one. In this context no co-ordination problems can arise: Full Performance assures co-ordination⁶.

The importance of dealing with the decision moment of economic actions in a sequential context is recognized explicitly by Hicks himself in his attempt to define sequential causality as opposed to the contemporaneous causality concept prevailing in economic theory (Hicks 1979). “Even the simplest case of sequential causation in economics has two steps in it: a prior step, from the objective cause to the decisions that are based on it, or influenced by it, and a posterior step, from the decisions to their (objective effects). With respect to the decision, the prior step is one of formation, the posterior of execution”(ibid. p. 88). We have thus a posterior lag (it could be Richardson's gestation lag, or the construction lag in the Neo-Austrian model) and a prior lag, the consideration of which might appear as the missing link for developing a thorough dynamic analysis along Neo-Austrian lines. But this is not so, at least in the way Hicks himself deals with the problem. Although stressing that the problem raised by the existence of a prior lag consists of two logical moments - the first one, which is a matter of information, concerning the decision in itself, and the second one, which is a matter of negotiation, concerning the arrangements for making the decision effective - he actually focuses only on the second moment. Thus the constraints, not the motivations of the decision process come into light⁷. This allows to put the accent on the existence and the role of reserves - and in particular on liquidity, which in this light appears as freedom from financial constraints as it gives ability to respond to oncoming opportunities - but not to grasp the implications of a decision process: in the first place, its interaction with the intertemporal complementarity of the production process interpreted as construction (or creation). It does not allow, in other words, passing from a sequence ‘constraints-constraints’ to a sequence ‘constraints-decisions-constraints’, which is the effective backbone of an out-of-equilibrium process of change.

4. The co-ordination problem in a dynamic context

This is where Richardson comes to the rescue. His analysis of the delay of transmission of information is the missing link that we need. It makes it possible to account for the specific co-ordination problem that characterizes a process of qualitative change; a problem that arises at the junction of two strictly related lags: the phase of construction of productive capacity - which entails sunk costs - and the delay of transmission of information - which implies uncertainty. Both lags must be taken into account in the analysis, because cancelling one of them also cancels the co-ordination problem.

5. This is the likely reason why there have been only scanty and unsuccessful attempts to pursue the line of research proposed by the Neo-Austrian model.

6. Which is rather odd, in a context where productive capacity is not adapted and that hence, in principle, should deny co-ordination.

This is why we stressed that it is indeed the absence of the latter lag in the Hicksian analysis of the 'Traverse' that eliminates the problem of co-ordination by automatically assuring the equilibrium between supply and demand in each period of the sequence through which a superior technique is adopted by the economy. On the other hand overlooking of the lag represented by the construction phase, even in presence of incomplete information leading to mistakes in investment, allows not only a revision of plans, but this to be instantaneous, so as to cancel imbalances at the very moment of their appearance. In this case too, hence, no co-ordination problem arises.

When both lags are properly taken into account, and a co-ordination problem then arises, it can be shown that any kind of qualitative change that involves a modification of the productive structure of the economy may (and will actually do, failing very specific assumptions) bring about a distortion of productive capacity that implies that not only construction and utilization, but also investment and consumption, and supply and demand, are no longer harmonized over time. The initial distortion, through the interaction of the intertemporal complementarities of production and decisions, stirs an out-of-equilibrium process, which carries and possibly amplifies the existing imbalances over a sequence of periods. This process, via expectations, may become cumulative, so that its very viability may be hampered. The problem, then, is to bring to light the conditions for viability, that is, what is required to re-establish the consistency over time of the relevant interacting magnitudes of the economy (Amendola and Gaffard 1988, 1992, 1993, 1998).

This means in the first place to re-establish the harmony between construction and utilisation, so as not to have too strong imbalances between supply and demand of final output that might render the economy not viable. The required out-of-equilibrium strategy - which must be aimed in particular at dealing with the sunk costs due to the dissociation over time of inputs from output, and of costs from proceeds, as the result of the distortion of productive capacity - is more properly examined with reference to the most typical qualitative change, innovation interpreted as a process of creation of resources.

This strategy, as already mentioned above, needs market connections usually considered as market imperfections - that is, implicit or explicit agreements with other firms - but also to establish more complex relations than the market ones. Price relations, the only market relations usually considered, give information on what exists, allow learning in the sense of getting to know what is already there. A process of creation of resources, instead, needs creation of information, that is, creative learning that can only take place through an out-of-equilibrium process (Bruno 2004). Out-of-equilibrium contexts, on the other hand, need stressing non-price relations that allow focusing on quantity adjustments besides the price ones. Price rigidity - rendered by a fix-price hypothesis (Hicks 1965, 1989), which on

7. Like in the analysis of the Traverse, where the assumption of Full Performance is made exactly in order to

one hand allows disequilibria to come to the surface through the appearance of stocks - is on the other hand the expression of a behaviour which, through the management of these stocks, tries to correct the sheer working of price adjustment mechanisms. In particular in the utilization phase, when the problem is harmonising step by step final demand with the existing productive capacity, the role of sales intermediaries is paramount as regards avoiding strong fluctuations in prices which would be a threat to the required harmony over time between supply and demand.

In order to assure the viability of a process of change, co-ordination through co-operation or direct relations between firms may be more effective than co-ordination through anonymous market transactions, which may induce ever growing distortions in the structure of productive capacity. As a matter of fact, if demand and supply are continuously kept in equilibrium by flexible prices, strong (and may be erratic) variations of quantities exchanged may be recorded in a context of imperfect competition. Thus the practice not to allow prices to vary can be the correct method by which the relevant information is acquired (Richardson 1960, p. 66). However, while prices are kept fixed, the need for adaptability persists. This is assured by holding reserve assets - be they real or financial assets. As a matter of fact, the degree of synchronization between costs and proceeds “will be either neither complete nor wholly predictable” (ibid. p. 154). Thus the possibility of making expenses in excess of income appears as a condition for adaptation and viability. Of course viability will be enhanced “by the possession (...) of some source of readily-available purchasing power” (ibid.) whatever the way in which it is provided.

In order to better understand this point we can refer to an analysis of liquidity along Hicksian lines. Uncertainty calls for reserve assets (or borrowing power). Reserve assets reflect a precautionary motive: when information about the future is incomplete firms look for more liquid positions. Whatever the source of liquidity firms have access to (reserve assets, overdrafts,...) “liquidity is not a property of a single choice, it is a matter of a sequence of choices, a related sequence” (Hicks 1974, p. 38). In this perspective, reserve assets belong to a bundle of complements. Firms need reserve assets to realize their choices and carry out production processes. Reserve assets and real (productive) assets appear as complements: they are complements over time (Amendola 1991). And this complementarity relation is essential for rendering viable a process of change out of equilibrium.

In *Information and Investment*, Richardson had already developed a similar argument. Indeed in discussing the way in which a firm selects a strategy under conditions of imperfect knowledge, he stresses “it is necessary not only to construct the probability estimates, but also to judge how far the relevant information could be augmented by inquiry, by experiment or by the mere postponement of the decisions to be taken” (ibid. p. 147). Thus he recognises that any choice, at any period of time,

actually dispense with the problem of the constraints.

belongs to a related sequence of choices, and that this sequential character of the procedure of choice is the main reason for holding liquid assets or being able to rely on borrowing power. Summing up. Richardson's ideas and Hicks' insights evoke essential points for sketching out a proper out-of-equilibrium analysis and strategy; and their similarity - often a thorough complementarity - is striking. The focus on intertemporal complementarity and on co-ordination problems, the need for adjustment and the role of real and monetary reserves in this process, the role of fix prices in the acquisition of information, are but ones of these points.

5. Co-ordination ex ante versus co-ordination ex post

The analytical considerations developed above are rich of normative suggestions. These concern both the firms and the governments wanting to foster development and change, though obviously in slightly different ways.

When we place ourselves in an *ex ante* perspective, only rather vague options for building-up something new appear to the firms which are or might become involved in a process of innovation. Such options acquire increasingly definite features only as the process of exploration and experimentation takes place and sunk costs are met. In any case, in order to proceed in the construction of innovative options, the involved firms have to set up organizational strategies aimed at re-shaping through time the relationships of which the environment is made, "because during the process of transformation the borders defining the environment itself cannot exist since the innovation consists exactly in the fact that some of the elements previously external to the activity performed by the firm are now made internal to its strategy, in accordance with the changes actually taking place in the process of production" (Amendola and Bruno 1990 p. 420).

On the other hand the intertemporal co-ordination, required to carry out the above-mentioned strategy, involves several agents. However, the way the co-ordination of activities may be planned, at least in principle, and organized in the case of an outcome which is well specified *ex ante*, highly differs from the way the co-ordination of activities may be set up in the case of the creation of innovation. Consider the case of the inter-firm co-operative agreements, which are needed when the problem is that of "the matching, both qualitative and quantitative, of individual enterprise plans" (Richardson 1972, p.98). The possibility of co-ordinating plans is actually open only at the condition that some fairly detailed knowledge about what should be planned does exist already within the cluster of companies that are deciding to co-operate. This might occur either in the case of the development or in that of the adoption of already existing innovations, but it cannot occur by definition in the case of firms that decide to co-operate in order to find out the way of setting up an innovation in the sense of creation of technology.

If firms decide to co-operate for the creation of innovation, therefore, the content of the agreement must be else than the planning of the activities regarded as actual pieces of production along an established time schedule. It cannot but be (a) the intention to establish a long-run co-operation in certain ‘directions’ for not precisely specified ‘common aims’, (b) the generic and specific resources they decide to put in common, at the purpose of engaging them in the innovative effort (and thus rendering them even more specific), (c) the rules and the procedures according to which to take future decisions ‘on the way’, and finally (d) the rules and the procedures concerning the exploitation of the commonly produced outcome (Bruno and De Lellis 1992, Bruno 2004⁸).

On the other hand the more the setting up of an activity requires specific inputs, the more the involved agent is obliged to (a) take care and plan the time scheduling of his undertaking; (b) establish reliable and specific relationships with the agents from whom he wants to obtain the desired inputs; (c) meet the costs and face the risks which are connected to (a) and (b). And the more specific some, or many of the involved inputs are (up to the point of being new and unique, as in the case of absolute innovations), the more (d) the relationships with the other agents have to be personal, non anonymous (as basically are, instead, the pure market transactions)⁹; (e) the object of such relationships must be the establishment of co-operative *activities* (as opposed to simple ‘acts’) the aim of which is the setting up of an environment for common learning (see in this direction Ciborra 1991).

The normative implications also concern the organizational patterns. A shift of the attention from how economic structures and systems *are and function* to *how do they change and why* also implies a shift of the focus from competitive relations¹⁰ to co-operative ones, which are of interest from the viewpoint of the processes aimed at constructing them through time, efforts and investments.

Furthermore, the attention should be shifted from the *organizational patterns* to the *processes of ‘organising’*, that is, to the activities that concern the organizational structuring of the relationships among the firms and within them. This implies that finding out what the optimal boundaries of the firm are - which is the crucial issue in modern industrial organization theory - is not what really matters. As also stressed by Richardson “established positions are constantly under pressure not merely because of autonomous changes in taste and technique but also by virtue of the fact that at any

8. Both substantiate the hints by Hayek 1946,1968.

9. This was well perceived by Richardson (1960). When the environment is large relatively to a single agent who decides to invest and the inputs are not specific, pure anonymous market transaction would be sufficient. If the magnitude of the devised investment is high relatively to the environment, as it happens in underdeveloped countries or areas and for investments presenting important indivisibilities, the relationships, which need to be established, tend to be unavoidably more personal. But even in a well developed environment, when the inputs must be specific and/or the magnitude of the orders is relatively large, explicit and direct co-ordination and co-operation will be likely to be needed or preferred.

point of time there will exist unexploited opportunities for the division of labour and the consequent regrouping of activities. For, according to Smith's theory of economic development, industrial structures will be in constant need of adaptation; the very process of adaptation, by increasing productivity and therefore market size, ensures that the adaptation is no longer appropriate to the opportunities it has itself created" (1975, p. 358). Thus what matters from an analytical as well as a business viewpoint, is not to know what the optimal organization of industry is but how this organization changes and why.

Of crucial importance, in this context, are the human resources: how are they formed before hiring and on the job, how are they cared and motivated within the companies industrial relations, which kind of hiring strategy is adopted by the firms. Once again the problem is far away from the standard optimality criteria: optimality requires that a firm has exactly the labour required for carrying on its present productive tasks with no excess both in its quantity and quality. But a firm that behaves optimally in this sense, which has no human resources whose skills and knowledge are above and beyond its present needs *is blind: the firm cannot perceive the options for innovation, it cannot cultivate and develop them, it has difficulty to establish constructive relationships with other firms* which could become the complementary partners of the development of the envisaged innovation. This observation has implications not only for the firms and their strategies, but also for governments, since high quality human resources are generated by a continuum of back-stages, which involve universities and the research network at large, and which require much in advance financial resources and care.

6. Economic policy implications

The analytical framework sketched out also helps to understand the methodological flaws of the traditional theories of economic policy, be them of the Paretian or of the Tinbergen type ¹¹.

Again, Richardson gives the hint. As he puts it "the Pareto optimum is conceived in terms of the categories of centrally planned allocation on the basis of full knowledge" (1960, p. 43). Now, in a context of incomplete information, efficiency cannot be considered by reference to a Paretian situation, that is, by reference to equilibrium with full co-ordination. It should be considered with reference to the process of adjustment. As a matter of fact those who consider perfect competition as a benchmark and those who advocate central planning have much in common. Both believe that it is

10. Which are instead the focus of standard economic theory and that become interesting from a dynamic and transformation point of view only in so far as *a change of the competitive rules* is concerned.

11. In the Paretian tradition the public intervention is aimed at reaching a Pareto-efficient solution, given the distribution of individual endowments, or, for those who believe in the possibility of deriving or of having a Social Welfare Function, *the Pareto-efficient and most equitable solution*; such solutions amount to the

always possible to obtain the right structure of information and ignore how the relevant information may be acquired, how the optimal state of affairs is to be brought about and what are the institutional and market arrangements required for the task. Thus while from a normative viewpoint the reference to Pareto optimum implies to look for the *specific* incentives that are a good substitute for perfect information, the normative implication of Richardson (and ours) viewpoint is that what matters is to promote the *general* rules that allow the firms to acquire the relevant information step by step.

But there is a deeper difference of perspective in the background. The traditional theory of economic policy has been established with reference to a world made of what we might call 'parametric optimizers'. By this we mean that the individual agents, as well as their aggregations, self-determine their behaviours through the solution of some problem of maximum (minimum), operated upon a set of functions whose general shape is uniform for the same kind of agents and whose parameters depend on the systemic forces and on the institutional set-up. In such a world, the policy instruments consist in a change of some of the parameters, which also implies a change - whose direction is known and whose intensity may usually be estimated - in the optimal solution adopted by each of the relevant agents. The so-called decision-makers are thus pure automata, which give basically mechanical responses to appropriate stimuli (Bruno 1993).

The out-of-equilibrium process outlined in this paper admits instead a plurality of dynamic paths. This implies that the system, though heavily bounded by its inner dynamic structure, is still open to a plurality of possible strategies on the side of the actors, who not only *play within the system*, but also contribute in *shaping its patterns*, while building up the productive capacity, while setting up cumulative systems of rules and relationships, while learning. This immediately suggests that there is a wide room for policy actions.

It is interesting to stress some of the most important consequences of the above outlined change of perspective:

- i) no mechanical correspondence between policy actions and individuals' responses can be established, as it happens under traditional schemes based upon optimization hypotheses;
- ii) there are asymmetries of information not only among private actors, but also among institutions and between private actors and institutions (comprising governments, national and local, and government agencies);
- iii) various forms of informational exchange may, and usually do take place, and have to be regarded as the key factor of the new economic policy.

maximum satisfaction of consumers' preferences. In the Tinbergen tradition, instead, the public action is aimed

The last point is paramount. As a matter of fact the common everyday perception is that the economic agents' interaction does not bring about chaotic results, so long as the decision-makers are characterized by roughly stable patterns of behaviour and/or as long as a fair amount of co-ordination takes place, through various forms of cognitive exchange. It is true, in fact, that if synchronous decisions undertaken by different subjects are shaped not only independently, but under conditions of reciprocal ignorance, this would hardly produce the regularities we observe in our societies; but the point is exactly this, that in our societies, under normal circumstances, *some form of co-ordination among the subjects has been created in advance* e through long lasting cumulative but somehow differentiated processes ¹².

The adoption of routines, the compliance to rules and customs, communicative action, the sharing of expectations about the behaviour of the system, the use of signalling (encompassing the announcement of policies), explicit communication, the search for explicit agreements, are all mechanisms (or strategies) producing some degree of co-ordination, which confer order and stability to the environment and reduce the uncertainty or the risks and costs associated to it (North 2005).

It is finally worth spending a few words on the issue of monopolistic features. Richardson has been among the few to acknowledge that various forms of inter-firm agreements might play a crucial role in the fostering of development and innovation. According to him the entrepreneurs can obtain the required market information only if it exists a variety of restraints. These restraints, by definition, restrict freedom but provide secure expectations that allow the firms to commit themselves to irreversible investments. Thus “they (...) constitute at worst a necessary evil” (1960, p. 69). Courage was needed to hold such a position in a world that is traditionally biased against oligopoly structures. As a matter of fact more attention should be paid to the fact that the attainment of extra profits constitutes the motivation (*ex ante*) and the reward (*ex post*) of previous efforts and costs for finding out new goods and/or new and less costly processes of production. The existence of such extra profits is thus the mechanism that induces the firms to continue to take risks and spend in research and development in order to introduce further innovation and to improve their competitive performance.

This should prescribe a selective attitude on the side of anti-trust authorities, which should be able to discriminate which are the actual features of oligopoly situations in single cases, abstaining from the application of exceedingly general rules, such as the traditional one, based on the actual existence of innumerable, powerless and fragmented firms. However, this calls for a change of analytical perspective along the lines pointed at in this paper. As a matter of fact “in the great contemporary discussion of monopoly policy, the contribution of economic science has been, in the end, rather

at optimising an exogenously given set of objectives.

12. This explains also why sudden changes may impair or destroy regularity.

disappointing; an important reason for this (...) may be the inadequacy of the basic conceptual instruments with which we endeavour to analyze the process of economic adjustment in competitive conditions” (Richardson 1960, p.71).

References

- Amendola M. (1991): ‘Liquidity, Flexibility and Processes of Economic Change’, in L.McKenzie and S. Zamagni eds. *Value and Capital Fifty Years Later* London: Macmillan.
- Amendola M., Bruno S. (1990): ‘The behaviour of the innovative firm: Relations to the environment’, *Research Policy* 19 (5): 419-433
- Amendola M., Gaffard J.L. (1988): *The Innovative Choice*, Oxford: Basil Blackwell.
- Amendola M., Gaffard J.L. (1992): "Intertemporal complementarity and money in an economy out of equilibrium", *Journal of Evolutionary Economics*, 2: 131-145
- Amendola M., Gaffard J.L. (1998): *Out of Equilibrium*, Oxford: Clarendon Press
- Amendola M., Froeschle C., Gaffard J.L. (1993): "Sustaining Structural Change; Malthus's Heritage", *Structural Change and Economic Dynamics*, 4 (1): 65-79
- Bruno, S. (1993): ‘The New Theoretical Limits of Laissez Faire’, Working Paper *Iside*, Università di Roma, La Sapienza.
- Bruno, S., De Lellis, A. (1992): ‘The Economics of ex-ante Co-ordination’, Working Paper *Iside*, Università di Roma, La Sapienza.
- Bruno, S. (2004), ‘La concorrenza come ‘viaggio esplorativo verso l’ignoto’: dai giochi di prezzo alle azioni sperimentali’, *Studi Economici*, 82
- Ciborra C.U. (1991): ‘Innovation Networks and Organisational Learning’ in Antonelli C. ed. *The Economics of Information Networks*, Amsterdam: North Holland.
- Hayek, von F. (1946), “The Meaning of Competition”, in *Individualism and Economic Order*, London and Henley, Routledge and Kegan Paul, 1949: 92-106
- Hayek, von F. (1968), “Competition as a Discovery Procedure”, in *New Studies in Philosophy, Politics, Economics and the History of Ideas*, London and Henley, Routledge and Kegan Paul, 1949: 23-34
- Hicks, J.R. (1965): *Capital and Growth*. Oxford: Clarendon Press.
- Hicks, J.R. (1970): ‘A Neo-Austrian Growth Theory’, *Economic Journal* , 80, 257-79
- Hicks, J.R. (1973): *Capital and Time*, Oxford: Clarendon Press (1974): *The Crisis in Keynesian Economics*, Oxford: Basil Blackwell
- Hicks, J.R. (1979) *Causality in Economics*, Oxford: Basil Blackwell
- Hicks, J.R. (1989): *A Market Theory of Money*, Oxford: Clarendon Press
- Richardson, G.B. (1960): *Information and Investment*, Oxford: Clarendon Press.

Richardson, G.B. (1972): 'The Organisation of Industry', *The Economic Journal*, 82: 883-896.

Richardson, G.B. (1975): 'Adam Smith on Competition and Increasing Returns', in A.S.Skinner and T.Wilson eds. *Essays on Adam Smith*, Oxford University Press.