Uncertainty, entrepreneurship, innovation, Some almost neglected features of the economic process (*)

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Abstract The paper discusses the dynamic competition process of the economy and the role and meaning of its main features as represented by entrepreneurship, innovation, uncertainty and their relations. A critical review aimed at clarifying the shortcomings of economics in the matter is set out and a particular consideration is dedicated to the schools of thought that have provided the most fruitful insights on dynamic competition. Some main reason of the partial failure of those schools is considered and the way to remedy it analysed.

Keywords: Growth and development, Entrepreneurship, Dynamic competition, Uncertainty, Bounded rationality

Introduction

This essay discusses some misunderstandings that afflict economics, in an attempt to contribute to their clarification. They refer to three important aspects of the economy that are tightly linked each other: uncertainty, entrepreneurship and innovation, as well the notion of dynamic competition. These aspects are inconsistent with the analytical apparatus of mainstream economics that, in fact, has produced completely delusive results despite the use of sophisticated techniques and procedure.

The situation is made worse by the fact that various branches of heterodox economics, animated by a strong and growing dissatisfaction toward mainstream economics, have not offered a satisfactory treatment of the three aspects. A major cause of this arises from some equivocations on the notion of uncertainty.

A study of this matter must meet a complex and encroaching intellectual apparatus that has been built over time on methodological bases that, although fashionable, are substantially misleading. This will oblige us to make some reference to method, but that will be limited to what is absolutely indispensable.

The essay is articulated as follows:

Section I exposes some considerations on method. Section II gives a simple and concise

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representation of dynamic competition as expressing the interaction between uncertainty, entrepreneurship and innovation, while Section III looks at uncertainty more deeply. This will allow us to outline the foundations of our development. Section IV is a critical review showing that all branches of economics are afflicted by serious misunderstandings on dynamic competition to such an extent that it is expelled from the analysis. Section V discusses two theoretical approaches that provide the premises for a satisfactory treatment of dynamic competition and shows a missing ring, represented by the postulate of non-measurability of uncertainty, that prevents the necessary clarification of the matter. Section VI maintains that the insistence of heterodox economics on bounded rationality, polemically with the Neoclassical theory of perfect knowledge, has accentuated the difficulty to formalise dynamic competition and caused various equivocations on decision-making. Section VII exposes some consideration on institutions, with reference to the theory of the firm. Finally, Section VIII discusses various ways of measuring uncertainty.

1. Some consideration on method: a clarifying example

The reader of this essay may ask himself the reason why, if our focus on the importance of dynamic competition and specifically a measure of uncertainty is right, economists have dedicated so little attention to the matter. To answer this, a brief treatment on method is indispensable.

Economic and social thought makes a large use of both the method of logical-formal sciences based on the criterion of abstract rationality, and the method of natural sciences that bases the control of theories on the accurate observation of the considered phenomena, with a growing prevalence of the second methodology. Both methods seem to be far from satisfying the needs of social thought: the first one because the study of social phenomena bases itself on the considered reality; the second, because it cannot be referred to social reality, being the observation principle simply based on the acceptance of the existing situation and the postulate of repetitivity of observed phenomena.

The persistent acceleration of social change has determined a growing consciousness of economists and other social students both of the erroneousness of the postulate of repetitivity (and mere acceptance of the given situation) and of the importance to consider appropriately the reality. Unfortunately, this realization has led to a lack of comparability due to the denial of the feasibility of methodological rules that make possible the confrontation among students and the control of theoretical hypotheses. As a consequence, many social students proceed freely, so an inconclusive and sterile pluralism is born, i.e. with a variety of incompatible positions unable to interact.

These quick considerations on method also show the reason why economists disregard the question of the measurability of uncertainty. On the one side, radical uncertainty contradicts the
postulate of the repetition of phenomena, implied by observationist method, thus making itself unacceptable by observationist students; a frequent and easy way to set aside uncertainty consists in the use of abstract rationality method, and or in referring uncertainty to known subjective or objective distributions of probability, as is typical of the economics of perfect knowledge. On the other side, heterodox economics, in its criticism to mainstream economics that strongly insists on uncertainty and the connected notion of bounded rationality, has been conquered by the idea of non-measurability of uncertainty.

To complete this analysis, it is necessary to refer the main methodological considerations that induce us to insist on some current misunderstandings on uncertainty, innovation and entrepreneurship. Unlike the natural sciences, social sciences concern a reality that is generated by man. This is obvious. What is not so obvious is the implication that social sciences, in order to properly investigate this reality, must introduce better ways to organize social relations, their institutional pillars, and combine coherently being and doing.

It seems to us that the investigation on the organizational form of society may usefully start from some basic aspects of the considered reality and deduce their implications, which can be derived from the character of the existing general conditions of development. In fact, those basic aspects require some organizational forms of the social and economic system coherent with them, the absence of which would weakness the competitiveness and sustainability of economic order. Uncertainty and the connected phenomena of innovation and entrepreneurship represent some of those organizational premises and features.

A case that well clarifies the question is Keynesian economics. This point may be deduced through the methodological procedure we have just sketched, but this possibility has not been pointed out by the numerous debates on Keynesian teaching. Precisely, the core of Keynes’ teaching can be deduced through the following passages:

- A main aspect of the general conditions of development of our age is endogenous uncertainty caused by dynamic competition increasingly based on innovation.
- Uncertainty and the state of expectations imply, mainly through their influence on investment, that effective demand relative to production be either insufficient or in excess and hence reduce output or stimulate inflation.
- It follows that the control of effective demand is a main “organizational requirement” of modern economies.
- This implies some important programmatic, normative and institutional prescriptions, such as re-distributive policies, welfare State, fiscal and monetary policies and deficit spending.
As we can see, Keynesian theory starts from an important feature of the modern general conditions of development, that is uncertainty, and deduces some implications. Unfortunately, Keynesian teaching limits itself to that aspect and postulates other questionable hypotheses but ignoring, among other things, development traps. Moreover, it limits itself to macroeconomics, omitting the important microeconomic aspects of modern economies linked to uncertainty, mainly entrepreneurship and innovation.

The analysis that will follow emphasizes these crucial aspects of modern dynamic economies, that is entrepreneurship, innovation and uncertainty, their relationship and implications. The functional and organizational requirements implied by these phenomena are not deterministic entities, automatically engendered by the economic process; they may be absent or badly reflected within the social system and specific attention may be needed to remedy this deficiency.

2. Dynamic competition and economic development.

Economic phenomena, resulting from some actions and decisions taken independently by a plurality of agents, assume in general different and often opposite contents from expected results. It is mistaken to think this fracture (between actions and results) may be remedied through a centralised system of decision-making. In fact, centralization makes sense only in a stationary society; it cannot face creative and innovative events that imply a qualitative jump with respect to the previous situation. Centralization of decision-making is inconsistent with a world of beings endowed with limited capabilities but able to evolve. It tends to suppress novelties as it is almost impotent towards them and hence suffocates innovation and creativity, pushing economic systems toward a stationary state. Advancement in knowledge as well as in material and spiritual conditions proceeds by trial and error, through a plurality of intuitions, decisions and initiatives in competition each others. This requires the building of institutions able to stimulate personal qualities, especially creativity, to evaluate the achieved results through efficient criteria of responsibility and efficiency, to facilitate the linkages among the plurality of decisions. Note that at the basis of these organizational requirements there is the limitation of knowledge, that is, uncertainty.

A qualitative and decisive jump in human history took place when the economy began to display an extraordinary ability to stimulate and govern innovation and took a central stage in social system. The modern age started at that point. All seems to indicate that economic system will preserve this strategic position, even if flanked in the future by some other social subsystems. In fact, the economy is well equipped to operate in the presence of uncertainty and stimulate exploration and innovation or, in other words, to govern and feed the dynamism of social process. It has developed an efficient mechanism of coordination of individual initiatives that, in addition,
strongly stimulates innovation, gets information on the tendencies at work and is clever in evaluating the degree of appropriateness of decision-making and to adjust this as needed. Such mechanism is represented by the competition in the market and the search for profit: a mechanism nourished by trial and error, that automatically warrants the adjustment to unpredictable events and attributes with inflexibility the responsibility for success and failure.

The economy has also developed the key agent of such mechanism, the entrepreneur, which meets and stimulates uncertainty with the purpose to make profit.

It is our hope that the brief description has shown some key elements for the representation of the dynamic competition process. Entrepreneurial arbitrage, aimed at getting profit from market disequilibria, acts as the “invisible hand” that warrants the coordination over time and space of individual initiatives, in particular demand and supply. Such adjustment process tends to erase profit opportunities deriving from “errors” and market disequilibria. Therefore, if entrepreneurs limited themselves to arbitrage, profit would result very low. But entrepreneur can recreate disequilibria and profit opportunities through innovation; thus even scarcely creative entrepreneurs can profit both through imitation of innovations and because it recreates spaces for arbitrage.

The described innovation-adaptation mechanism is not limited to the economy but constitutes a basic expression of social-historical processes and hence is an important analytical tool for the interpretation of those processes. But it is the economy that exhibits the best and more efficient innovation-adaptation mechanism; it is suitable to be formalized and investigated in quantitative terms. The mechanism can be synthesized as follows: The starting point of the dynamic process is innovation that tends to intensify as a consequence of entrepreneurial arbitrage and the related reduction in uncertainty; in fact, an approach toward a stationary state reduces the opportunities of arbitrage, thus stimulating the introduction of novelties. In turn, innovation causes the rise of disequilibria and hence uncertainty that discourage further innovation both directly and due to the advent of new profit opportunities through arbitrage. And so on, with an incessant disequilibrating-equilibrating process pushed by the adaptive and innovative search, discovery and creation of profit opportunities.

This is the main form of competition characterizing modern economies; it is hinged on entrepreneurial innovative and adaptive action directed to take advantage from existing opportunities and to create new ones, and results from the interaction between entrepreneurship, innovation and uncertainty. This dynamic competition is the basic mechanism of economic development, and would be impossible in the absence of uncertainty (or the limitation of knowledge). It is a competition that completely differs from that usually represented through the

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1 See A. Fusari (1996a)
2 A specification of a model of dynamic competition is in A. Fusari (2005b), that also exposes some simulations.
inclination of demand and supply curves: in fact, it causes day by day changes in those curves, creates new ones, influences costs, quality of products, etc.

A misunderstanding of economics is the omission or fragmentation of the analysis of “dynamic competition”. The usual theoretical treatment of production based on the notion of production function expresses the dimensions and the seriousness of such omission. The production function approach is apparently in accordance with evidence, and it would be so in a stationary economy. In incorporating a production function in dynamic analysis, various and sophisticated modifications of that function have been developed including human capital and exogenous or endogenous technical progress. But no satisfactory results have been achieved along this line. A production function is useful if it is limited to costs specification, but other elements, in addition to costs, influence production. These can be taken into account only through the help of the notion of dynamic competition.


This section will specifically consider the delicate question of uncertainty, which is at the heart of this essay. The probability that, in the throwing of a well balanced die, a determined face appears is undoubtedly 1/6 and expresses probabilistic certainty. Insurance allows to transform into costs the high losses caused by these casual events. This objective probability does not involve capabilities and does not express uncertainty; it is the same for everybody. On the contrary, uncertainty involves capabilities; some people have better knowledge than others; somebody is clever to scent wind and to adapt himself to new events, while some others are not. It may be objected that subjective distributions of probability are not identical for everybody and involve capability. But they presume that decision-maker knows the probabilities of the considered events; instead, uncertainty is an expression of the degree of ignorance. Speaking of expectations, we shall see better that subjective probability has nothing to do with uncertainty, even if an eventual measure of uncertainty should help to define subjective probability or expectations. **Radical (or true) uncertainty simply expresses the degree of ignorance, or the lack of knowledge.**

A growing number of students define uncertainty each aleatory phenomenon that cannot be included in the notion of probability. They also maintain that uncertainty is impossible to measure and hence to be insured. This notion of uncertainty, apparently simple and clear, implies serious errors and confusions on measurability and insurability. Some clarifications are, therefore, indispensable.
In deciding on future events, an entrepreneur must formulate expectations. Some of the corresponding probability distribution will be well defined and the properties of the distribution either known or able to be specified to sufficiently good accuracy; others will not and will be more or even highly subjective. It is very important to measure the degree of reliability of the expectations to which does not correspond a well defined probability distribution and hence probabilistic certainty. The degree of variability, i.e. the dispersion of expectations, expresses uncertainty. It is senseless to deny the possibility of measuring uncertainty; as a matter of fact, entrepreneurs must pay a great attention to get such measure. Expectations lacking in a measure of their reliability may result very deceitful.

It is important to underline that the question of insurability has not relevance in discussing uncertainty. Probably all possible events are insurable at a price; whether or not insurance is used depends on the cost and the assessment of the effect of having or not having it. Insurance companies may dislike to treat very high degrees of uncertainty; but this has nothing to do with the possibility of measuring uncertainty that, in fact, is supposed to be very high. It is well known that various hazardous events are insured notwithstanding they cannot be expressed through probability distributions allowing a precise measure of the risk corresponding to them. Insurance does not strictly need probability calculus and in fact it was practised much before such calculus was invented. Fire risks or theft and shipwreck risks are roughly classified to make possible their consolidation. Their insurance is not based on some accurate probability calculation; nevertheless, it is made convenient by its low cost relatively to the damages that the occurrence of those events would cause.

On the contrary, it does not make sense to insure the casual events concerning dynamic competition among firms, notwithstanding the entrepreneur takes a great care to measure the variability of expectations (or uncertainty), as just seen. It may be imagined the imposition by law of an insurance at the advantage of the creditors of the firms incurred in bankruptcy, but not an insurance aimed at avoiding bankruptcy, that will contradict dynamic competition, as we shall see soon. The insurance of firms’ losses is made senseless not by the impossibility of measuring business uncertainty but the peculiar content of the dynamic competition process. As we know, this process is made active by the search for profit opportunities, that is the tendency to use entrepreneurial skills to get profits. But insurance against firms’ losses tends to erase profit and implies the renunciation to entrepreneurial role making the entrepreneur similar to a foolhardy gambler: to cover insurance costs, he would look for inconsiderate opportunities of profit and this would cause the rise of insurance costs, distort entrepreneurial function and hence push out of the market such gambler.
In conclusion, the non insurability of firms’ results is not a consequence of the impossibility of measuring uncertainty, but of the fact that business need the competence, i.e. the judgment, intuition and responsibility of decision-maker in facing uncertainty. The insurance of firm’s losses would distort the role and use of those indispensable skills; so that these false entrepreneurs would be defeated by the competition of more genuine entrepreneurship.

Economics and empirical research attempt to remedy the supposed non measurability of uncertainty through the estimation of expectations. But, even if uncertainty implies expectations, the estimation of these ones is a completely different matter from the measure of the degree of uncertainty. Expectation, and the notion of subjective probability (i.e. the degree of confidence that an agent attributes to the fact that some event may happen) expresses hope, more or less well founded, while uncertainty simply indicates a limitation of knowledge, so that its measure simply gives the degree of ignorance. Expectation is, in a certain sense, a pretension of knowledge, while uncertainty is an expression of cognitive impotence. In sum, uncertainty expresses an affliction caused by the limitation of knowledge while, on the contrary, expectation is a trial to penetrate the fog of cognitive vagueness, a way to react to uncertainty. Due to these differences, the effects of uncertainty on economic variables are different from those of expectations; the two take different roles in the economic process. We shall see that a way of measuring uncertainty is offered by the changes of opinions of firms. But this volatility of expectations is just the opposite of expectations since expresses their violation.

Economics has proposed some analytical expressions to estimate expectations: static expectations, adaptive expectations, rational expectations. These expressions give some arbitrary and over simplified formalizations. The study of their accuracy, for instance a sensitivity analysis of the effect changes or errors in the parameters of those expressions, is referable to uncertainty. Expectations probably represent the most important aspect of entrepreneurship; their content results on entrepreneurial coupe d’œil, intuition, talent and experience, so that each entrepreneur has his proper expectations. Uncertainty is another thing; it has to do with the variability of results and it can (and must) be measured. We shall see that the postulate of the non-measurability of uncertainty causes great equivocations and deprives economists of an indispensable variable to represent the economic process with realism.

4. Some equivocations and omissions of economics

1 Economics has usually disregarded uncertainty. In particular, mainstream economics has grown as a theory of perfect knowledge. Coherently with this assumption, it has taken care to include only casual events expressing probabilistic certainty, i.e. well specified probability
distributions. While it does not consider uncertainty, entrepreneurship, innovation or, in other words, dynamic competition.

F.H. Knight was the first economist that insisted on the notion of uncertainty; he intended to designate with this term chance not implying some known probability distribution and hence non insurable and non transformable into costs. This author insistently underlines that both profit and entrepreneurial function are the result of non measurable uncertainty. That non measurability is the leit-motif of his main work. He writes: «We restrict the use of the term ‘uncertainty’ to non quantitative cases. It is this “effective” uncertainty, not risk, as we said, that constitutes the base for a correct theory of profit and gives account of the divergences between effective and theoretical competition… The essential principle of perfect competition that warrants, in principle, the results toward which effective competition “tends”, is the absence of uncertainty (in the true sense of non measurable uncertainty)». And so on.

We have seen that one main task of the entrepreneur is to get a measure of the degree of uncertainty of expectations. Moreover, we shall see that it is in general quite easy to measure uncertainty by industry and size of firms. Knight insists on the uniqueness of the events representing uncertainty. But a lot of events normally insured are unique. A theft and a fire are unique events; their grouping by homogeneous classes is always rather forced. A road accident is unique as connected to the ability of the driver. Notwithstanding, those events are, as a rule, insured.

Knight writes in a note: «If in a particular case uncertainty is measurable, it can be substantially eliminated by grouping and consolidating a number of cases enough large to warrant certainty with respect to the all group». But in the previous section we have seen that firms’ results are not insured because the entrepreneur must be charged with the final responsibility of decision-making to be induced to decide accurately. It seems to us very important to insist on the falsity of Knight’s postulate of non-measurability of uncertainty since it has caused great equivocations in economic thought, as we shall see later more in detail. For this point may be clarified, it must be connected to the notion of dynamic competition that, as we know, has uncertainty at the centre stage. More precisely, it is necessary to make clear that it is not the non measurability of uncertainty that causes dynamic competition and prevents insurance; the opposite is true: dynamic competition is the central feature of the economic process and the engine of economic growth and development, which stimulates uncertainty and makes senseless the insurance of firms’ results.

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3 See F. H. Knight (1960), pp. 18 and 19
4 See A. Fusari (2006)
5 See F. H. Knight (1960), p. 165
Knight does not treat the phenomenon of dynamic competition. At the basis of this omission there is a methodological misunderstanding, which is surprising in an author that dedicated a great attention to method. Precisely, he confuses abstraction, necessary to any theoretical development, with the method of abstract rationality typical of logical-formal sciences that uses postulates abstracting from reality that, as such, may upset the content of reality and lead to absurd formulations. Knight treats the theory of perfect knowledge (pure economics) without seeing that the idea of perfect knowledge implies a total distortion of reality. This author introduces the notion of uncertainty only to mitigate the hypothesis of omniscience, while accurately ignoring the crucial phenomenon of dynamic competition as this is inconsistent with Neoclassical approach. He states that the removal of the hypothesis of perfect knowledge implies only some non substantial difference with respect to the Neoclassical model of omniscience, and that such difference is expressed by the appearance of profit and losses. In sum, he limits himself to operate in a Neoclassical context. His insistence on uncertainty represents an analytical advancement; but he refuses to see the irremediable fracture that uncertainty introduces with respect to Neoclassical theory, mainly through the correlated phenomenon of dynamic competition. In effect, Knight’s contribution is aimed at conferring a realistic look to Neoclassical economics; in this way, he gets honours and avoids to be considered an heretical. We shall see that it is frequent among Neoclassical students the ability to confer to their decisively unrealistic approach some realistic look through superficial manipulations.

2. But reality cannot be suppressed. In fact, the phenomenon of uncertainty soon regained a first order position in economics with Keynes’ macroeconomic analysis. This author concentrated on the links among uncertainty, money, long term expectations and the connected volatility of investment and proved, on this basis, the phenomenon of the deficiency or excess of effective demand. This led him to show the importance to manage demand for facing the ghost of uncertainty. Second world war, which caused an enormous expansion of public expenditure, offered a precious opportunity to prove the usefulness of that theory and the associated economic policies. Neoclassical students quickly integrated Keynes’ teaching in their theories, in particular through the Hicksian IS-LM approach that accepts the idea of the non neutrality of money. But at the micro level persisted the hegemony of the Walrasian theory of general equilibrium, with its pretension to rigorously represent the whole economic system in all details. That persistence was strongly supported by Knight’s teaching on uncertainty. Precisely, the exclusion from microeconomics of all the crucial features of modern economies represented by uncertainty, entrepreneurship and innovation, was considered, on the basis of Knight’s teaching, as an admissible simplification
instead of an unacceptable distortion of reality. The confusion afflicting the method of social thought preserved by substantial criticism the majestic futility of Walrasian theoretical approach. As far as we know, nobody has insisted with the due energy on the basic mistake of general equilibrium models, that is, their inspiration to the method of abstract rationality, typical of logical-formal sciences: a method that leads to deduce, from purely nominalist postulates, some precise but useless and totally misleading consequences.

Neoricardian criticism has limited itself to show the inconsistency of Neoclassical aggregate function of production, but has not affected the substance of Walrasian micro economics. Indeed, Neoricardian animosity against Neoclassical economics could not do more since it shared the basic Neoclassical methodology, that is, the method of abstract rationality, thus purging theory from uncertainty, entrepreneurship, innovation and hence dynamic competition, exactly like mainstream economics. In effect, Neoricardian students have formalized nothing more than a simple linear system of prices by industry. This, together with its dual counterpart represented by output equations, gives a general equilibrium model specified at the industry level and hence much more limited than Neoclassical one. Its usefulness only concerns the statistical field.

The above reference to general equilibrium models cannot omit a consideration on von Neumann’s system, representing another estimated application of the abstract rationality method. Von Neumann substitutes, to Neoclassical unreal hypotheses, some others no less unreal (the absence of scarce resources, strictly subsistence wages, equal rates of growth by industry); on this basis and using the duality relation between output and prices, he calculates a vector of prices that, being associated to the highest possible rate of growth, are considered some best efficiency parameters.

All these general models of the economy share a basic lack: the absence of dynamic competition and the corresponding triad, that is, uncertainty, innovation and entrepreneurship. Their attraction only depends on being some brilliant mathematical toys. The fact that the models of perfect knowledge and stationary motion are coherent both with the prevailing method based on observation (and the connected hypothesis of repetition of events) and the method of abstract rationality has helped their acceptance. But both methods are non appropriate to social reality. The acceptance, by the main economic schools, of the above senseless methodologies has impeded a fruitful debate and the necessary revision.

As is well known, the controversies between Classical and Neoclassical schools of thought were mainly centred on the problem of economic value and exploitation, and precisely the relations between prices and income distribution. But they did not achieve some important advancement in knowledge. What is worse, in such a field dominated by resentments and class conflicts, theoretical
equivocations have caused dramatic consequences in practice. In particular, Marxism has associated to the fight against exploitation an extreme struggle against the entrepreneur and the market made plausible by the diffuse misconception of the phenomenon of uncertainty. Let us insist on this vicissitude constituting an important example of the absurdities that may be generated by human minds, even the sharpest ones, if deviated by methodological misunderstandings.

3. The Marxian interpretation of social and historical process offers, notwithstanding some serious errors\(^6\), a superb theoretic monument if confronted to the analytical poverty of the models sketched above. Marx draw an analysis of capitalism magnifying the role of the market and bourgeoisie for the building of modern world. Such interpretation could have favoured the development of a realistic and fecund economic theory; but, on the contrary, it has propitiated a real theoretic and operational disaster. What the reasons of that?

Marx, as an economist, was strongly influenced by Classical thought; but much more by Ricardian than Smithian thought. In particular, Marx insisted on the value-labour theory and hence indicated the market and entrepreneur as some major causes of the troubles of society. He concluded, therefore, that it is necessary to erase those institutions, as a condition to erase exploitation\(^7\). Marx’s Das Kapital shows some rare presence of the deepening characterizing the superb Marxian interpretation of history, more frequent in the second and third book of that work, where the sterility of Ricardian influence becomes well evident. He ignores the problem of the concrete organization of socialist systems that commits to the “imagination of history”, coherently with his method swinging between naturalism and Hegelism. A social order deprived by the entrepreneur and the market is obliged to be a centralized social system, like “real socialism”, and hence only suitable to a stationary society, that is antecedent to the stage of modern dynamic society.

If Marx’s economics had been more influenced by this author’s historical analysis of capitalism than by the specifications of Classical economists, probably it would have perceived the necessity, in modern dynamic societies, of the market and the entrepreneurial role (even if not necessarily in the form of the capitalist entrepreneur). All that should have appeared obvious to a student of historical process of Marx’s stature. What the reason of his misunderstandings on the matter? Certainly the arid Ricardo’s teaching was not enough to confuse Marx. The roots of this author’s mistakes are in his method that consists in a mixture of Darwin and Hegel’s teaching, which is

\(^6\) See A. Fusari (1996a)
\(^7\) The generic attribution of production to labour is pointless since production largely results from human creativity. Other thing is the statement that the fruits of the natural lottery of talents must be for the benefit of the whole society, but paying attention to not obstruct creativeness.
disastrous for the analysis of social reality mainly because both these authors identify, for different reasons, real with rational despite the importance of reducing, in social reality, the distance between real and rational. Marx considered society in Darwinian terms, that is, as resulting from spontaneous evolution; at the same time, he considered, like Hegel, evolution as able to proceed with rationality and evolve toward the Paradise on Earth. This position forbade Marx to think in terms of organization of social systems, i.e. to investigate on the institutional pillars requested by the general conditions of development typical of each historical age. In particular, this prevented him to understand the importance of the entrepreneur and the institutional implications of uncertainty.

Mainstream economics, which has not been invested by the Marxian-Darwinian-Hegelian methodological wave, has largely used, as previously seen, the method of abstract rationality. Sometimes those methodologies operate simultaneously, as it is witnessed by the Neoricardian mixtures between Marxism and abstract rationalism, as well as by the mixture between naturalism and abstract rationality frequent in Neoclassical thought.

In this theoretic landscape, the hypothesis of perfect knowledge and Neoclassical economics could consolidate their hegemony without difficulty at a point that the controversy on market socialism occurred between the two world wars found almost natural to base itself on that hypothesis. But the ability of Neoclassical theoretical approach to incorporate both centralization, as in Barone’s essay on “The ministry of production in collectivist State”, and decentralization, as in Lange-Lerner-Taylor’s decentralised socialism where a simple rule for decision-making substitutes entrepreneurial role, is a spy of the total unrealism of the approach. In fact, such a surprising possibility of generalization of the model derives from the fact that it ignores the crucial phenomena of entrepreneurship, uncertainty and innovation, that is the dynamic competition process; so that it has nothing to do with reality. It is, therefore, not surprising that the debate on market socialism gave up in favour of the more realistic and useful Keynesian policies that made possible “socialdemocratic compromise”. Some posthumous resurrection of Barone’s teaching took place in the sixties and fed the Soviet Union’s illusion to warrant the efficiency of its centralized economy simply using optimisation models.

Finally, the total failure of real socialism made clear that its main vice consisted in the denial of some crucial necessities of modern dynamic economies, mainly the entrepreneur and market; it became clear that it was improper and foolish to oppose the two in the name of social justice, and that such opposition had given rise to a system of domination worse than the capitalist one. Unfortunately, the roots of wrong institutions cannot be rapidly extirpated; dominating interests always act as fierce defenders of them.
4. The analyses on market forms, mainly perfect and monopolistic competition and monopoly, added no clarification on the omissions and misunderstandings discussed above, in particular on the triad uncertainty, entrepreneurship and innovation and the notion of dynamic competition. Those static analyses was based on the shape of demand-supply curves, even if with some exception in the studies of oligopoly. But it is easy to see that the earthquake caused by dynamic competition destroys the graphical bases of those theories on market forms. Dynamic competition implies, among other things, different prices for identical goods or, more precisely, that one source of profit is the skill to get advantageous prices. Besides, dynamic competition implies monopoly prices on new goods, for the duration of the degree of the monopoly deriving from novelities.

Of course, price variations in a competitive market are caused by the disequilibria between demand and supply that drive to the coordination of both. But what factors causes the variation of the supply and demand curves? This is the true problem, impossible to solve if the notion of dynamic competition and its components represented by uncertainty, entrepreneurship and innovation are ignored.8

Post-Keynesian economics has extended Keynesian macroeconomics to industry level, thus driving economic theory to a higher degree of realism. But it does not consider microeconomic level and hence dynamic competition. The Post-Keynesian attempts to combine Keynes, Marx and Ricardo’s teaching have caused some strong equivocations as a result of the omission of that crucial problem.

The vivacious criticism addressed to the Walrasian notion of equilibrium9 has not offered some formulation able to remedy the lacks of mainstream economics. Today the fragmentation of economics in a variety of schools of thought unable to interact dominates the scene. Such fragmented and confuse theoretical context has prevented some important intuitions that we shall see soon to express useful synergies. In this theoretical landscape, Neoclassical economics has been able to preserve the fascination deriving from its pretension to give a detailed and coherent representation of economic system. Various students of this school of thought have been clever to mask its unrealism, both at the macro level, for instance through the models of endogenous growth and the IS-LM approach; and at the micro level, for instance, R. W. Clower’s removal of the Walrasian hypothesis that transactions take place at equilibrium prices, which has stimulated a proliferation of studies on the so called “non Walrasian equilibria”. A development even more

8 For more details, see A. Fusari (2005b).
9 Kaldor wrote: «In effect, the theory of (general) equilibrium has reached a stage of development characterized by the fact that pure theorists have succeeded (even if unconsciously) to prove the impossibility that the implications of that theory are empirically true». See N. Kaldor, The irrelevance of the theory of economic equilibrium, in M. D’Antonio, 1975, p.77
elegant and innocuous was provided by D. Patinkin by introducing money in the Walrasian model of general equilibrium, so that eliminating (but only apparently) the breakage between the monetary and real aspects without violating the idea of the neutrality of money. For their part, von Neumann and Zeuthen’s contributions warranted the existence of economically meaningful solutions (non-negative output and prices) of equilibrium models. For their part, the theorists of rational expectations have managed to specify a surreptitious form of perfect knowledge in spite of uncertainty.

So, the Neoclassical theory of omniscience, even if based on some absurd postulates and method, has succeeded in reinforcing its hegemony through astute patchworks and with the help of the errors of opponents. It must be recognized, however, that among all schools of economic thought, the Neoclassical one is distinguished by an admirable coherence. It has been a gymnasium of theoretical skills that may offer some important contribution as soon as a methodology more appropriate to economic reality will be defined.

Now consider some formulations that may offer useful elements to build an economic theory able to bring on the scene the great absent: dynamic competition, to be placed at the centre stage of economics.

5. Some important advancements. The lacking ring that prevents to link the two faces of dynamic competition

As previously seen, Keynes provided, at the macro level, a precious deepening on the question of uncertainty. But, under other aspects, such phenomenon has been misunderstood or neglected, mainly due to the influence of Knight’s analysis that pretended to intend the consideration of uncertainty just as a refinement of the economics of perfect knowledge. Nevertheless, the problem of uncertainty was not late to impose again its strength and knew some considerable deepening by G.L.S Shackle and P. Davidson. They insisted on: crucial decisions and experiments; the world of order and inspiration; essential novelties and creative events; ergodicity and non ergodicity of processes, subjective and objective uncertainty. But it is a merit of neoAustrian economics the attribution of a decisive importance to the limits of knowledge and to trial and error processes. The students of this school of thought have insistently underlined the links between entrepreneurship and uncertainty and the role of the market as a mechanism of information and discovery. In particular, they have insisted in representing economic competition as a result of entrepreneurial activity directed to take benefit of profit opportunities engendered by disequilibria, errors in decision making and the accidents making economic life uneven. But neoAustrians are responsible of some unilateral exaggerations, in particular Hayek, who based an apologia of
spontaneous order on the limits of knowledge. This author forgets that just the condemn of man to advance by trial and error implies that it is important to find the ways of reducing as much as possible the number of errors, mainly through interventionism and the building of some organizational forms suitable to dynamic reality.

Probably the most enlightening teachings on uncertainty of neoAustrian economics are due to I. Kirzner’s work, mainly his development on “market process”. He delineates a realistic and effective, even if incomplete, representation of the process of economic competition based on entrepreneurial alertness in taking profit from the opportunities offered by economic reality and the inevitable failures of forecasting. Unfortunately, Kirzner’s analysis explains only one half of the process of dynamic competition, the one concerning adaptive entrepreneurial action directed to take advantage of the existing profit opportunities that, as we saw, tends to erase profit. Kirzner neglects entrepreneurship directed to create new profit opportunities through innovation. Indeed, he makes some attempts to remedy this lack by dividing entrepreneurial process in two components: entrepreneurial short run competition and entrepreneurial discovery concerning long run. But Kirzner limits himself to emphasize discovery, not the creation of new opportunities. He substantially ignores entrepreneurial action that engenders uncertainty and disequilibria, thus giving rise to arbitrage and market process. In sum, Kirzner disregards to specify the dynamic aspect of competition process and ‘endogenous’ uncertainty.

A promising way to remedy this shortcoming and try to complete the representation of the dynamic competition process may consist in flanking Kirzner’s market process to the Schumpeterian “creative destruction”. Unfortunately, neoAustrian and Schumpeterian teachings remain two separated branches of investigation, notwithstanding their strong complementarity. They make two opposite errors: the substantial absence of consideration for innovation, which is typical of neoAustrians, and the substantial Schumpeterian absence of consideration of uncertainty. In particular, this author does not attribute any importance to endogenous uncertainty, that is produced by the economic system, notwithstanding such endogenity clearly springs off his notion of “creative destruction”. This omission has determined the most surprising Schumpeterian error: the forecasting of the exhaustion of entrepreneurial function and the advent of socialism through big business. The error was repeated by J. K. Galbraith in “the new industrial state” that

10 Kirzner writes: «To understand development it is necessary to understand the entrepreneurial process whereby opportunities that where hitherto existent but unseen become opportunities seen and exploited» See I. M. Kirzner (1985), p. 74.

11 Schumpeter very much admired the Walrasian model of general equilibrium «Magna Charta of economics…enormous research program… the base of the best work of our time». See J. A. Schumpeter 1972, pp. 482 and 556

12 Schumpeter writes: «The giant industrial unit, perfectly bureaucratised… supplants the entrepreneur». See J.A. Schumpeter (1977), p. 130
diagnosed the convergence between capitalism and socialism through managerial firm. A superficial consideration of uncertainty would have been sufficient to show the authors the great obstacle that such phenomenon opposes to centralization of decision-making.

It is surprising that the above two approaches have not been unified so that to supply a proper theoretical analysis of the great absent: dynamic competition. The lacking ring that has prevented an effective and persuasive representation of dynamic competition process, starting from the above neoAustrian and Schumpeterian contributions, is represented by the exclusion from economics of a variable expressing the dimension of true or radical uncertainty. In fact, the representation of the interaction between innovation and adaptation requires the expression of the endogenous variations of the level of uncertainty. *Those variations cause: the rise of entrepreneurial adaptive action when uncertainty (and disequilibria) grow together with the connected profit opportunities; the rise of innovation when uncertainty (and disequilibria) decrease, since this decrease will make easier to innovate and will oblige to create profit opportunities through innovation. So that the reference to the level of uncertainty is necessary to may unify neoAustrian and Schumpeterian competition and, in this way, give a more complete and coherent formulation of the dynamic competition process.*

The mistaken Knight’s postulate of non measurability of uncertainty, retained by economists with a surprising superficiality, has obstructed such development. For a better evidence of the persistent separation in economics of the two branches of dynamic competition, innovation and adaptation, it may be useful to quote the opinion that Kirzner has recently expressed to me on the matter. He said: «I realize, of course, (and this was one of the purposes of my “Creativity and/or alertness” paper) that there are differences between the kinds of innovation Schumpeter had in mind, and the entrepreneurial “discoveries” which I had insisted were the steps in the process by which Schumpeter’s “imitators” tend to bring about equilibrium… I am reminded of Samuelson’s imagery of the Schumpeterian process as similar to a violin string that has been plucked into vibration (by innovation), subsequently returning to its quiescent state (through the imitators) – except that you postulate that the very quiescence of this state stimulates further innovation, etc. etc…You imply that a reduction of uncertainty stimulates the rate of Schumpeterian innovation. I have not yet seen any reasoning firmly leading to this conclusion. You seem to take it as obvious». It simply is an expression of the search for profit and is crucial for the specification of dynamic competition as given by the interaction of innovation and adaptation: when uncertainty and the adaptive opportunities of profit are low, there will be a stimulus to create opportunities of profit through innovation, easier to introduce in the presence of low uncertainty.

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13 Galbraith says. «Nothing is today more interesting than to see that the entity previously known as capitalist firm and that previously known as socialist firm begin to resemble under the oligarchic direction of technostructure» See J. K. Galbraith 1968, p. 343
It is surprising the persistent lack of consideration on dynamic competition. This seems to be a result of the absence of a method of social theory appropriate to the basic character of social reality. Such lack condemns economics to offer confusing teachings. These darken even the most obvious and elementary problems through complicated and misleading formulations, with everybody claiming to be right in his own way. Next section will consider some equivocations that affect the strong opposition of heterodox economics to the economics of perfect knowledge.

6. The exaggerated success of the notion of bounded rationality and the associated attack to optimisation

The aversion to economics of perfect knowledge has grown with the acceleration of economic dynamics and hence the rise of uncertainty. In such situation, the notion of “bounded rationality” has come to light and has known a rapid success due to its usefulness in opposing Neoclassical perfect rationality. Unfortunately, that notion is undermined by numerous equivocations that need to be clarified.

Human rationality is always bounded since man is not omniscient. In every field of life, man is forced to go ahead by trial and error. In the study of nature, human bounded rationality is particularly evident being that reality not the work of man and hence difficult to understand. The difficulty of understanding social reality is different since it is darkened by the fact that it is a result of the interaction of a lot of human actions and creative events. This difficulty is better expressed by the term uncertainty or limited knowledge than by the expression bounded rationality. In effect, human skills and rationality are always bounded by definition, i.e. due to the limits of human knowledge. An interesting definition may consist in the notion of “cognitive rationality” that underlines the learning process determined by the use of human rationality. This process requires a measure of the degree of uncertainty, indispensable to express the formation and use of entrepreneurial skills, these being capabilities to meet uncertainty, and to define the constraints of cognitive process, as we shall see soon.

The notion of bounded rationality has promoted some useful deepening on cognitive processes, in conjunction with M. Polanyi’s research on “tacit knowledge”. Unfortunately, that notion does not take into account the dynamic competition process, notwithstanding this represents the backbone of the economic process in the presence of limited knowledge. What is more surprising in the economics of bounded rationality is that it does not seem to understand the crucial importance of considering the level (and hence a measure) of the factor on which the limits of rationality depend, that is, the degree of uncertainty. This omission suffocates the potentiality of this branch of heterodox economics and prevents, as just seen with reference to neoAustrian and Schumpeterian
teachings, to formalize the phenomenon of dynamic competition. It seems, therefore, sensible to ask to the growing number of students insisting on the notion of bounded rationality: what prevents you to see the importance of a measure of the factor expressing the limitation of rationality, that is the level of uncertainty? The economists that insist on bounded rationality disregard the question of the accuracy of expectations. But their negligence for a measure of the volatility or variability of expectations is a surprising omission. This volatility is, at the same time, perfectly coherent with the notion of bounded rationality and gives a possible measure of the degree of uncertainty.

The galaxy of theories constituting the so called “heterodox economics” expresses an enormous analytical fragmentation that prevents to unify efforts and results. One of the few aspects shared by heterodox students is the disputation with mainstream economics. But this convergence seems to be afflicted by exaggerations and equivocations. In particular, the disputation has obscured, mainly through some abuse of the expression of ‘bounded rationality’, the important fact that man is obliged, by his interests and competition, to use at the best his rational skills, just like Neoclassic optimisation maintains. It has been erroneously assumed that optimisation presumes omniscience, what would imply that Pontriagin and Kantorovic’s work is pointless. Kirzner has written: «Where the circumstances of decision are believed to be certainly known to the decision-maker, we can “predict” what form that decision will take merely by identifying the optimum course of action relevant to the known circumstances. Now this “mechanical” interpretation of decision-making would be entirely acceptable for a world of perfect knowledge and prediction».

This assimilation of optimisation to Neoclassical economics seems to be mistaken. Optimisation does not require perfect knowledge; it only is a tool for decision-making that often is more rational than others. Perhaps it would be much more useful to hinge the polemics against Neoclassical thought on the notion of uncertainty than on that of bounded rationality. The father of bounded rationality, H. Simon, opposed to optimisation the principle of “satisfying behaviour”. But this principle is vague and can be variously interpreted, mainly with reference to the levels of aspiration and satisfaction. For their part, Nelson and Winter write: «Orthodoxy treats the skilful behaviour of the businessman as maximising choice and “choice” carries connotations of “deliberation”. We, on the other hand, emphasize the automaticity of skilful behaviour and the suppression of choice that this involves. Formal orthodox theory, on the other hand, does not rate solutions as maximising because they are better than some other observed solutions, but because they are the best feasible solutions».

All seems to show that the hostility against optimisation is mainly due to two prejudices: First, the habit to connect optimisation principle to the hypothesis of omniscience, that is, perfect

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14 See I. M. Kirzner (1973), pp. 33 and 37
15 See Nelson and Winter (1982), p. 94
knowledge; but such principle simply is a mathematical tool that does not need that hypothesis. Second, the postulate of non measurability of uncertainty, that is the denial of the possibility to define a variable expressing the degree of limitation of knowledge; this denial prevents the possibility to formalize an optimisation model including uncertainty, the availability of entrepreneurial skills and the tension in the use of these. In fact, to define the above availability and tension, a measure of the degree of uncertainty is needed.

Firms are forced by competition, more than other subjects, to act rationally as much as possible. Therefore, firms’ competition drives to optimisation. This means that it is not wise an aprioristic refusal of optimisation, this being able to supply better rationality criteria than other decision-making tools. All that is quite simple and evident. The main reason obscuring this banal evidence is (let repeat) the conviction that uncertainty is something impalpable and, as such, inconsistent with optimisation: a conviction that induces to intend this decision-making technique as only referable to the absurd hypothesis of perfect information.

The result is that, while Neoclassical economists tend to strongly exaggerate human knowledge on the basis of the hypothesis of perfect knowledge, their opponents make an opposite exaggeration: the postulate of non measurability of uncertainty induces them to refuse the possibility to get some important knowledge.

7. An ambivalence of economic and institutional evolutionary thought. Entrepreneurial skills and decisional routines

The notion of evolution strongly characterizes the modern economic thought and the analysis of institutions, in connection with the limits of knowledge or radical uncertainty. But the use by economics of the evolutionary metaphor of biology is afflicted by an ambivalence. From the one side, Hayek and neoAustrians underline the limitation of knowledge as a support to the idea that economic process and the evolution of institutions are based on spontaneous behaviour. As a consequence, they strongly dislike “organisation”, to which oppose “spontaneous order”, and hence incline to neglect the problem of the firm. On the contrary, institutional students emphasize organization and use the notion of uncertainty to explain institutions and hence the firm.

It may be useful, for the understanding of these aspects, some consideration on Nelson and Winter’s contribution\textsuperscript{16}. The development of these authors is mainly based on the Schumpeterian work; this has prevented, for the reasons indicated in Section V, to adequately represent dynamic competition process, which should be at the centre stage of heterodox economics. Nelson and

\textsuperscript{16} See Nelson and Winter (1982)
Winter’s analysis shows, however, some differences with respect to Schumpeter that is opportune to underline.

Evolutionary economics does not neglect uncertainty; even if it incorporates this one in the notion of bounded rationality and considers unquestionable the postulate of non-measurability of uncertainty. Unfortunately, this postulate and the consequent setting aside of optimisation principle engender a vague theoretic atmosphere. The main remedy of evolutionary economics to that vagueness is the notion of ‘decisional routines’, that intends to provide a solid conceptual basis to decision-making; at the point that some evolutionary economists have assimilated decisional routines to biological genes. Here it appears again the methodological inappropriateness of the postulated non measurability of uncertainty. In fact, as a consequence of that postulate, entrepreneurial function has been separated from uncertainty and represented through the notion of routine.

The various developments on routines do not provide stringent empirical and conceptual formulations; they presume some very simple decisional rules emphasizing the automaticity of decision-making. Nelson and Winter intend routines as organizational memory, as a form of tacit knowledge in M. Polanyi’s sense. They consider routines as the most important storage of organizational knowledge. The firm’s behaviour should be explained through the used routines and approximately it should be expected that in the future the firm will behave similarly to the past, being the change in routines obstructed by the consequent fracture of equilibria and organizational compromises. However, innovation in the rules of decision-making is considered possible and important.

It must be pointed out that the notion of routine has nothing to do with entrepreneurship. This one mainly is a skill to meet uncertainty, while routine means repetition and hence implies bureaucratic skills. Heterodox analyses have dedicated a good deal of work to organizational skills, but they say very little on entrepreneurship. Entrepreneurial decisions, mainly the most important of them, do not follow any precise rule. The various branches of heterodox economics, in trying to reduce the indeterminacy deriving from the notion of bounded rationality and the postulate of non measurability of uncertainty through the notion of routine, forget the flexibility and versatility of entrepreneurship. M. Egidi and A. Narduzzo have empirically shown that the use of routines that was effective in the past may cause systematic decisional errors. It is our opinion that the analytical indeterminacy of entrepreneurial decisions cannot be faced through the reference to some precise decisional rules; it requires to venture upon uncertainty, representing the sea where entrepreneurship acts. More precisely, it is important to define some criteria allowing to measure

17 See Beker (2001)
the level of uncertainty and its variations, so that to provide both a more solid basis to decision-making and some analytical developments on the formation and the use of entrepreneurial skills, on innovation, disequilibria, adaptation, in brief, on the dynamic competition process.

It must be noted, however, that the growing attention dedicated to uncertainty and to the limits of knowledge has stimulated, among evolutionary students and in opposition to spontaneist evolutionism, some interesting development on organization, mainly in the field of the firm. We saw that uncertainty requires some peculiar institutional forms. Well, the firm has been indicated, by the economists of “transaction costs”, as an organizational necessity since it reduces uncertainty due to those costs by substituting hierarchical command mechanisms to the market. This theory is important; but it explains less than supposed, mainly on the firm dimension. In fact, the increase in firms’ size, while for the one side reduces the proportion of market transactions, and hence uncertainty caused by the incompleteness of contracts, for the other, the connected bureaucratisation of decision-making reduces the capabilities to face unknown. Of course, it is possible to remedy that inconvenience through decentralised organizational forms. But this possibility is opposed by the inevitable centralization of last instance responsibility. Besides, the strategies devoted to reduce uncertainty are weakened by the fact that entrepreneurial innovation engenders uncertainty.

The dimensions of the firm seem mainly influenced by the quality and quantity of available entrepreneurial skills and uncertainty, which determine respectively the potentialities of those skills and their demand. In conclusion, the best way to treat radical or true uncertainty seems to introduce explicitly this one into the models for decision-making so that to estimate its impact on strategic choices and some other important variables, instead of setting uncertainty aside on the basis of the hypothesis that it cannot be measured.

Neoclassical students, clever to scent wind and manage to improve the realism of their theories, have suggested to introduce in optimisation models the saving of the skill to face uncertainty. But this idea and the others concerning uncertainty need a variable expressing the level of this one, a possibility denied by the postulate of non measurability of uncertainty. Such postulate seems to represent a main obstacle for building an economic theory able to conjugate uncertainty, entrepreneurship and innovation and to define the way uncertainty influences (and is influenced by) entrepreneurship and innovation. The representation of the dynamic competition process and economic development requires the abolition of that postulate. There exists a tight link between entrepreneurial skill and uncertainty; in fact, in the absence of this one, there would be no need for entrepreneurship; dynamic competition shows that the entrepreneur meets uncertainty, but also generates uncertainty through innovation.
Entrepreneurial capabilities are mainly a result of “tacit knowledge” (learning by doing, by watching, by using) and of innate skills. These capabilities vary, therefore, with experience. It follows that, even if one main characteristic of them is versatility, the operational experience confers to skills some degree of specialization that restricts their field of competence.

8. The problem of econometrics and the definition of a measure of uncertainty

In the last fifty years, various sophisticated econometric methods have been developed that sometimes use some impressing mathematical techniques. It is surprising to see that those methods never fully clarify, as far as we know, to what economical and social phenomena they may profitably be referred. A dominating presupposition is that those methodologies are founded on some universally valid assumptions. But the opposite is true.

In general, econometric estimations may be referred only to the past or, more precisely, to the considered observation period, not to the future. However, some limited application to the future can appear justified if there exists some reason to think that the considered phenomena are long lasting. But how to prove this property of phenomena? An important way to do that may consist in controlling if they result from the existing general conditions of development. In this case, the high durability characterising those conditions should warrant a parallel durability of the corresponding phenomena, these being an expression of organizational necessities of social system determined and imposed by the existing reality for reasons of coherence and efficiency. Well, dynamic competition and its constituent triad, that is, uncertainty, entrepreneurship and innovation, are basic durable aspects of modern dynamic economies. Even if the parameters resulting from the corresponding estimation may vary over time, those variations do not destroy the explanatory power of the estimated relations.

As is well known, uncertainty displays some very important effects on irrevocable choices and hence on investment. In order to improve the explanation of investment, some studies\(^\text{18}\) have proposed to specify the laws (or costs) of learning in getting information if decisions are postponed, so that to may estimate the convenience of postponing the decisions to invest. But the hypotheses concerning those laws and costs are, in general, scarcely realistic. Uncertainty discourages investment in a different and more direct way. Precisely, high uncertainty suggests the postponement of investment for at least two reasons: the waiting for a more serene atmosphere and the increase in the use of entrepreneurial skills in ordinary activities, requested by the increase in turbulences. This makes the degree of uncertainty an important explanatory variable of investment.

\(^{18}\) See R. S. Pindyck (1991), and A. Ulph and D. Ulph, (1994)
Unfortunately, econometric estimations using some proper indicators of the degree of uncertainty are rare.

To grasp the ghost of uncertainty, more than one quantitative indicator of this variable must be defined. We have specified and experimented three criteria of measure. One has been derived from the EU-ISAE surveys and consists in the measure of the variability over time of the answers, i.e. the volatility of the opinions (concerning the expectations on delivery orders, production, prices, cost of financing and liquidity assets.) of each firm of the sample. Another indicator has been provided through the inclusion of an apposite question on uncertainty in an ISAE survey for some recent quarterlies; another measure of uncertainty could be derived from the deviations between expectations and results in the EU-ISAE surveys. A peculiar indicator of uncertainty may be given by the standard deviation of profit rates across firms; in fact, in the absence of uncertainty and of institutional monopolies, profit (and hence its standard deviation across firms) would be zero: differentials in capabilities and the associated profits are conceivable only in the presence of limits to knowledge (true uncertainty); for this reason, the variance of profit rates across firms may be intended as an expression of the limits of knowledge and hence of uncertainty. This indicator is particularly suitable to the representation of dynamic competition process and business cycle.

Some other indicators of uncertainty may consist in the specification, by surveys, of a min-max range of expectations, with the distance between the minimum and maximum expectation that may be considered as an expression of the degree of uncertainty. Also the standard deviation (i.e. the distribution about the means) of foresights may be interpreted as a measure of uncertainty.

**Conclusion**

This research points out that one deficiency of economic thought is the lack of consideration of dynamic competition processes through entrepreneurship, innovation and uncertainty. Only three schools of thought have dedicated some useful considerations to the phenomenon.

Two of them, neoAustrian and Schumpeterian, are strongly complementary: the first one emphasises uncertainty and entrepreneurship, but almost ignores innovation, while the second emphasises entrepreneurial role and innovation but neglects uncertainty. These omissions prevent the two schools of thought adequately developing the notion of dynamic competition. We have seen that the assumption of non-measurability of uncertainty, which is explicit in neoAustrians (Kirzner’s “fog of uncertainty”) and implicit in Schumpeter, prevents an adequate treatment of the formation and use of entrepreneurship and the innovation-adaptation cyclical process. This makes

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19 See A. Fusari (2005b)
an explanation of innovation difficult. Moreover, the assumption of non-measurability of uncertainty and the emphasis on the limits of knowledge have caused the mistaken conviction that the maximisation principle is only applicable to Neoclassical economics of perfect knowledge.

The equivocations on the matter are shared by heterodox economics which insists on the notion of “bounded rationality”. Indeed, this notion has amplified the misunderstandings provoked by the assumption of non-measurability of uncertainty. This is clearly evident in evolutionary economics, the third school of thought that includes some aspects of dynamic competition and is centred, following Schumpeterian thought, on innovation, but with reference to the limits of knowledge as expressed in ‘bounded rationality’. Unfortunately, such notion is rather ambiguous: human rationality is always bounded, but this does not deny that decision-making must make an effort to use reason at its best, through an optimisation approach. Nevertheless, heterodox economics rejects optimisation, even if in a less drastic way than neoAustrian thought.

One major aspect of evolutionary economics is an attempt to remedy the theoretical vacuity arising from the assumption of non-measurability of uncertainty through the notion of “decisional routines”. But this notion is far from clear. In particular, it refers to a kind of skill that has nothing to do with entrepreneurship since it postulates repetitive, bureaucratic decision-making, while a main characteristic of entrepreneurial skills is versatility and flexibility. Hence, evolutionary economics is afflicted by various misunderstandings on dynamic competition, even if for theoretical reasons partly different from neoAustrian and Schumpeterian ones.

In sum, the crucial phenomenon represented by dynamic competition, when is not disregarded altogether, treated in a partial and misleading way without properly considering entrepreneurship, uncertainty and innovation. This essay tried to remedy these drawbacks and proposes, in the last section, measures of the degree of true uncertainty, or the limitation of knowledge.
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