# TIME AND ECONOMICS

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One of the major characteristics of modern economics - a characteristic which distinguishes it from old style economics - is its emphasis on time and space. This does not mean that the early economists were ignorant of the importance of of these two concepts but rather that they failed to analyse the effects of time and space in a systematic and coherent manner.

The emphasis at different levels of economic analysis of contemporary economists on the spatio-temporal characteristics of phenomena has resulted in many important transformations in method, approach, concepts and subject matter in the science of economics. These changes are, indeed, so extensive that they have not only altered economics itself but have also influenced its relationship with other disciplines in the human and social sciences. A complete analysis of such changes is too extensive an undertaking for the present paper and the problems of space, economic space, geographical and regional economics and planning will be dealt with on another occasion. Our present intention is to discuss the introduction of the dimension of time into the science of economics.

Barre, in his book *La periode dans l'analyse economique*[1] begins with a quotation from St. Augustine who writes, in the sixteenth chapter of the *Confessions:* "What then is time? If no one asks of me, I know, if I wish to explain to him who asks, I know not."

The concept of time, despite all the discussions and controversy it has created among thinkers and philosophers

of all times, still has no single definition. *Petit Larousse* (1968) defines it "as a measure of the duration of phenomena", and the *Dā'rat ol-ma'āref-e Fārsi* writes "According to general belief and common sense, time is something which moves towards the future. Events and changes in things occur in time, and it is through the happening of change that we become aware of time and we measure it."

Keeping in mind these two definitions, it can be concluded that the purpose of analysing the effect of the time dimension on economic phenomena, is in reality but a study the duration of economic phenomena. However the influence of time in economics cannot be solely defined as such a study, since on different levels of economic reality, and according to varying approaches, the mode and manner of duration changes. And this has led economists to analyse the relationship between economic concepts and time, and to distinguish and define types of times in economics.

According to Jean Lhomme,[2] various levels and relationships can be specified when we consider economic concepts in relation to time: some concepts have an organic and others a functional relationship with time. Concepts such as credit, investment, savings, economic fluctuations, progress and development cannot be conceived in separation from the reality of time. The granting of credit takes place at one time and its repayment at another; an essential condition for investment is a period of time between the outlay of capital and the receipt of profits. Further explanation of the relation of time to economic fluctuations, conditions,development and progress is not necessary. According to Lhomme "these concepts themselves are time."

Certain other economic concepts (capital, income,labour money etc.) may be considered apart from time by abstraction. And if these concepts were to have a relationship with time, it would be derived from their functions. "These concepts instead of being time themselves, are placed in time".[3]

The fact that certain economic concepts are time itself and still others are "in time", again brings up the problem of the definition of time, and whether in all cases there is one absolute and unique notion of time or several different ones. The ideas of the future, the past, and between them

the slippery, changeable present, are the first effort of man's mind to grasp the variety of time. Human knowledge has made even more important strides in this respect. Thus, the sociologist speaks of the various types of "temporality",[4] and the historian also makes in his discipline distinctions in time and divides his field into "microhistory" and macrohistory".[5] Not only under the influence of other social sciences, but also due to the necessity of expanding its various branches, economics has introduced several types of time.

The usual view is that the economists only aim in studying time is the dynamic analysis of economic phenomena,yet further attention demonstrates that the efforts of the economists in this respect are much more complex and extensive, and so varied as to make generalization impossible.

The German Historical School, in studying the historical dimension of economic phenomena, tried to clarify the mode of the evolution of economic systems and determine the law of their movement. This resulted in the admission of a type of socio-historical time to the economic analysis of this school, a type of time which is a measure of the life and death of economic systems and which is summarized in the periodization of history. Each period of history is the outcome of a set of economic and social characteristics; with the disappearence of this set a new one emerges which is the beginning of another period in the economic evolution of society.

The periodization proposed by the historical school facilitates not only the study of the duration and evolution of economic phenomena, but also of their connection with other aspects of social life; and this, to a large extent contributes to the richness and depth of the approach of the followers of this school. However its main shortcoming is its lack of attention to the dynamism of phenomena and this leads to a tendency to condense realities into moulds which must fit the reality of every society and determine its future course.

Another origin of the concept of time in economic analysis is the theory of economic crises and fluctuations

which studies the causes of changes in economic activities during time. Thus, Joseph Schumpeter speaks of three types of variables in his *Business Cycles*[6] the consideration of which should introduce three types of time into economic analysis. These three time variables are used by Samuelson for the classification of his dynamic system[7] and by Gilles Gaston Granger[8] as the basis of his classification of economic time.

The first of the time variables used by Schumpeter is the theoretical variable which in Samuelson's vocabulary is designated as causal or non-historical. Theoretical time is used in the theoretical reasoning of abstract economics; it is a time that is empty, without history, without beginning or end. In this sense time is only a characteristic of the system and nothing more.[9] The role of time in price curves is an example of this type of time; price and demand change during time, and the curves show it. However, the determining factor for prices is not time but the quantity of supply and demand. Another example is the role of causal time in profit-interest calculations: system changes during a certain period of time are derived from its primary conditions and the period of time that has passed since the establishment of these conditions. It is with this meaning in mind that Samuelson borrows the term causal from the mathematicians who consider those systems causal whose initial conditions are sufficient for the determination of their subsequent states. Theoretical or causal time is a mechanical time, and many examples of its use may be found in the work of the school of Walross.

Another time variable is the stochastic variable. Theoretical time has a relationship with other variables such as the relationship between function and derivative. Each change in a variable is followed by a change in time,but the characteristic of the stochastic variable is that it does not have a functional relationship with other variables. During each moment of causal time only one event can occur.For example, for every amount there is only one price. The stochastic concept expresses the truth that for every amount there may be several prices between which only one can be realized. During each moment the various probable prices only depend upon the amount of demand at that moment, and

this is the reason why this time is considered to be similar to that type of probability process that we can find in Markoff's chain.

Historical time is the time in which economic phenomena realize themselves and is thus the opposite of causal time. This time is filled with events and has a beginning and an end. Each moment differs from other moments, and the contents of every moment depend on the contents of all the previous moments. Taking again the example of demand and price: historical time is is the time in which prices actualize.Yet each price and each quantity are determined by laws which change during causal time. Thus it can be concluded that successive prices are each determined by a particular set of theoretical laws which can be different from the laws of the following moment. "This property of belonging at different times to different systems, or of representing different theoretical normals is the outstanding fact about historical variables which determines their nature."[10]

These divisions of time in economics clearly show that the time series which are the basis for the study of change in economic activities, give information which is only true for a specific moment; and during each moment they follow a special set of theoretical laws. This further demonstrates that these three concepts of time are not the only ones current in economics. With further study of the mode of organization of activities and the approach of economic subjects one may still become aware of other types of time in economics.

The three periods proposed by Alfred Marshall (long-term, medium term and short-term) are the most well known temporal classification of economic activities. In economic activity certain factors undergo change at a much faster rate and therefore during a shorter period of time, while other factors take much longer to evolve. In this way according to their speed of change, and the time they require for change, economic factors may be classified as variables and determinants. "So one obtains, in considering, for example, stocks as a unique variable and in adding successively to the variables, production, employment, equipment, technology and population, more or less long periods. It can be seen that in these varying perspectives, time does not vary only

as a measure: two different periods are, in fact, two different totalities."[11]

The discussion of the manner in which economic activities are positioned in time is a subject which has especially interested the Swedes. Gunnar Myrdal with his demonstration of the role of the two concepts of *ex-post* and *ex-ante* in the creation of monetary equilibrium, and Erik Lindhal with his emphasis on the effect of the anticipation effect in economic activities shows other forms of time intervention in economics.[12] But without doubt Erik Lundberg's theory of sequence analysis is the major contribution of the Swedish school to the concept of time.

Lundberg begins his famous book, *Studies in the Theory of Economic Expansion*[13] (1937) with the following sentence. "The usual purpose of all economic theory is to analyse changes in economic life with respect to time."[14]

It is obvious that economic life is inconceivable without change, yet what Lundberg means by change is not the type of change brought about by the external factors, but that which arises from the internal mechanism of economic organizations. It is impossible to grasp change outside the realm of time, and Lundberg's efforts are directed towards the elaboration of a dynamic theory for the analysis of all aspects of development in a closed economy. He states that the methods used for this purpose are usually based on one of the various meanings of equilibrium and goes on to show the shortcomings and advantages of these analyses, and takes as his object the investigation of "... the conditions of a determinate sequence in time of economic changes..."[15] in a dynamic economic system. "We must consider how the changes created by the development during one period of time influence that of the next period. A complete sequence analysis requires that the situation during each perioed be explained wholly on the basis of the evolution during previous periods. Finally it aims to illuminate the dynamic character inherent in the total economic system."[16] Sequence analysis begins with the consideration that economic phenomena do not change simultaneously, and in the process of change of each we can see time differences. Therefore the relation between these phenomena is a dynamic one.

> "These dynamic relations, such as the connection of time between income and spending, between input and output, between a change in receipts and the corresponding change of production activity,are abstracted from the reaction patterns of individual producers and consumers and designated as typical, representative or average. From these radical simplifications the sequence analysis is started.At the beginning of a given period certain plans are formed and certain decisions as to production,payments etc. are made. These plans contain the relations between the expected values of the variables, being defined *ex ante facto*. The interaction between the executed decisions determines certain results during the period.These *ex post* values of receipts, investments, savings, etc. will generally differ from the expected values, and after a certain time-lag,... cause new plans and decisions, which give rise to new results during the following..."[17] period, etc.

But the comprehensive analysis of all aspects of economic development exposes a series of questions regarding "... the choice of variables, types of reactions, and above all the timing of events."[18]

Sequence analysis studies a series of economic changes during a period of time, and this is why the timing of the facts and the choice of a unit of time gains decisive importance. Lundberg calls this unit of time, unit-period and defines it as that part of time in which various economic events take place in various moments. Therefore the decision to use the unit-period results in a choice of a time framework for analysis, a framework which contains the sequence of facts under consideration.

The selection of unit-period depends on the subject under investigation, and "The length of time will depend upon a number of circumstances such as the size of the initial changes, periods of contract, production period etc."[19]

The unit-period must have a specific length so as to be harmonious with the general categories introduced as variables in our analysis.

"For example, an analysis of the influence of investments in durable constructions upon a development may be formulated by selecting the relatively long time of construction as a unit- period. The investments planned at the beginning of a period are accomplished at the end of the unit-period. The volume of investments, together with the other factors of the system, will determine the results of the period, e.g. in the form of profits and losses. With regard to the increase of the existing supply of construction goods and certain expectations derived from the realized profits or losses, new investment plans, etc. will be made for the next period and so on. If, however, the producers of consumption goods, for example, react more quickly than the producers of construction goods, the sequence of analysis formulated might lead to erroneous results. Within the long construction period the producers of consumption goods might change their plans with respect to realized returns which were unexpected at the beginning of that period. A changed activity and a changed output of consumption goods taking place within the selected period must give other results and cause other plans to be made at the beginning of the following period. In order to take account of the possible changes in the plans and operations of the producers of consumption goods the unit-period must evidently be shortened in accordance with the shorter production period required for consumption goods. Again, however, other changes of relevance to the analysis must take place within this shorter unit-period. If the receipts of the firms turn out to be greater than expected during the period, this will not entail a change in production plans before the end of the period. Other, unlooked for, changes might occur. However, the unexpected increase in receipts may be used for purchasing securities, thus causing an increase in prices and a fall in the long term rate of interest. If this change in the interest rate has an important bearing on the plans and operations of the producers, and is not regarded as caused by exogenous forces but is to be explained

in the sequence analysis, the unit-period has to be made still shorter.

These considerations show the relativity of the concept of the unit-period. It is selected in relation to the problem at hand and defined in terms of the operations in question. The unit period, therefore, is not directly related to clock time, but is defined as some sort of operational time."20

Lundberg admits that the concept of time used in his analysis is of the same type of time used by Marshall in his long and short period analysis.[21] He also states that "We want to have a fairly complete picture of the working of the total economic system in a sequence of changes."[22] This picture is drawn in the form of a table which presents all the basic information about the analysis of determined sequences in condensed form, and through which the movement and evolution of a series of economic variables during a certain operational period may be observed.[23]

In the final chapter of his book, Lundberg modestly admits that there must be many criticisms of sequence analysis, for example the assumption of the constancy of the reaction of producers and consumers during a specific period of time. He finally adds that in fact the characteristics and behaviour of economic actors undergo change within a certain period.[24]

The question of economic actors and their approach to time was discussed more profoundly and extensively by another group of economists. Passing over the Austrian economists, who in their analysis of marginal utility included the time-approach of economic actors, and like Bohm - Bawerk, based their theories of interest rate or production period directly upon time itself, we should consider those approaches which with the aid of methods of phenomenology and modern psychology have tried to give a more comprehensive and profound definition to the concept of time. However, the comprehension and evaluation of approaches used by economists such as G.L. Shackle and Barre would be difficult to grasp without a consideration of some of the basic theories of twentieth century philosophy.

Up to the time of Bergson, in continuation of the traditions of Aristotelian logic, most philosophers considered the notion of time, like that of place, as a quantity. Bergson, however, made a distinction between time and duration. He considered time to be a quantity which serves to measure life events as a product of mans mind; and duration to be a quality and the form in which succession takes in man's consciousness.[25] The life of the consciousness has two phases according to whether its relation to time is direct or indirect. If the states of consciousness are taken by themselves, they have no relationship to quantity; these states are pure quality, being so mixed in each other that it is impossible to discuss whether they are unity or plurality. This duration is an immediate data of consciousness. According to Bergson this type of time is duration or subjective time. The other concept of time measures the distance between two or more phenomena and consequently is meaningless without a consideration of space. This time is called objective time.[26]

In making the distinction between time and duration, Bergson gives the following example: Let us assume that point A moves on an infinite straight line. If the point had consciousness, it could perceive the change and succession of its states. But what would be the form of this succession? If point A could be above the line on which it is moving and perceive several of its points besides each other,its change would be in the form of a line; in other words it would comprehend time through space. However, if point A were ignorant of the notion of space, its image of the changes happening to itself would be a qualitative image consisting of a successive chain of quality changes, without any distinction between the changes. According to Bergson, time or objective time, like all other quantities, is characterized by homogeneity, while duration or subjective time is pure non-homogeneity. Therefore, Bergson's efforts results in the clarification of time in a strict sense (subjective time or duration) as it arises in Man's consciousness. Shackle, in his study of time in economics also proposes the same goal.[27]

According to Shackle, the origin of many difficulties in economic analysis lie in the problem of time.[28]If we consider economic activity, we realize that it consists of two distinct types of exchange: exchange of various commodities

simultaneously (exchange of butter against eggs, exchange of meat against bread etc.,) or the exchange of one or more commodities at different times. It is in this situation that the economic actor exchanges a certain amount of goods at present, with a certain amount of the same commodity in the future (in a month, or several months or years). The comprehension of these types of exchange is impossible without special consideration of the notion of time. Exchange in the future or unsimultaneous exchange is directly connected with the prediction and expectation of economic subjects and so with their approach to time.

Time in simultaneous exchange is objective and in non-simultaneous exchange it is subjective. If the economy were static, lack of simultaneity would not be important; the future would be nothing but a repetition of the past. But evolution and change mean that the future differs from the past. And it is with this reality in mind that economic subjects determine their course of action.

Shackle's concept of time finds the same qualities as Bergson's subjective time or duration; each moment of it is unique separate and isolated without homogeneity. Shackle calls this moment the moment-in-being. In each moment-in being, the imagination of the economic subject points a particular picture of the future; a future filled with hypothetical and imaginary events and their imagined and hypothetical outcomes. In creation of this picture of the future, that series of past events which the subjects in moment-in-being have in their minds is the effective factor. The moment-in-being is the exclusive mental standard of the past and the future. Expectation of the future, and memory, are part of the essence of the moment-in-being.

Economic time arises from the succession of moments-in-being which are changing and becoming during each moment under the influence of future expectations and the memory of past events: thus no two moments are comparable, and in each moment the economic subject cannot, like the *homo economicus* of the classical economists, choose rationally between several probable factors. In the moment-in-being, choice does not exist. Rather there is a decision to be made, a decision based on an expectation of the future and a memory of the past. Therefore the economic actor leaves the world of

probability or objective time (where, during each moment, there is a probability that several events will occur) and steps into the world of possibility (where only one event can take place during each moment).

The first conclusion that Shackle draws from this analysis is the rejection of the notion of rationality in economics. The other conclusion is that the behaviour of the economic subject is determined at each specific moment and in this respect nothing is predetermined. Consequently economic activity is based upon an indeterminate principle. And this indeterminateness makes uncertainty one of the basic problems of economic activity.

In the last analysis Shackle arrives at a clarification of the psychological behaviour of the economic subject and this view reminds us of the conclusions reached by economic psychologists.[29]

Shackle's views are subject to criticism. Above all, this approach to time can be attacked in the same way as Bergson's concepts of time and duration.[30] The moment-in-being, in the same way as Bergson's subjective time, does not correspond to reality. The world of moment-in-being is a world of separate isolated individuals who are free of the obligations of society and social life; that is, it is a world of people who do not exist.

Raymond Barre[31] is another economist who has been especially concerned with the definition of time. He has tried to put forward a more comprehensive interpretation of time through a synthesis of the accounts of various economic schools on the subject. His studies are based on Bergson's ideas and the distinction between subjective and objective time. The time of economic analysis presents a constant tension between objective and subjective time, the abstract and the concrete; and without taking this into consideration,its comprehension is impossible. In economics time either appears as another dimension which, with the aid of space,provides a framework for the analysis of economic activities,or it is located in the structure of economic activity,in which case it is inherent in economic life itself. According to Barre, the concept of period, which in the first instance necessitates a sort of duration and stability and order of

economic phenomena, can be a means of analysis of time, and time measurement in analysis.[32]

In considering dimensional and structural time Barre proposes the two concepts of cadre-period and delay-period. The cadre-period is a period which determines the temporal limit of economic analysis. Time in this period, in the same way as Bergson's concept of objective time is characterized by homogeneity.

Barre means by delay the duration of an economic phenomenon during time[33] and delay period is a concept whose object is to consider the duration of phenomena and the consequences of that duration. In this case time can no longer be distinguished from economic reality, since they are mixed together, and each economic reality has a time different from the time of others. Delay-period is an economic interpretation of Bergson's concept of subjective time and as such it is non-homogeneous. Barre is aware of the shortcomigs of his proposed concepts: cadre-period cannot shed any light on the continuity and succession of economic life and its recurrent change and continuous evolution. As this concept tends to convert the non-homogeneity and complexity of economic life to an arbitrary and abstract uniformity it is rather imperfect. However, states Barre, it seems impossible for the economist to study economic phenomena out of the framework of the cadre-period due to shortcomings in the availability of statistics and other information and techniques, and also the limitations of the human mind. But he must try to link these periods, and avoid sacrificing the structure of time to the time framework.

However, the time-structure which is studied with the aid of the delay-period has its faults: the delay should be studied both at the level of economic activity of micro and macro units, and in terms of the passage from the first to the second level. All this is impossible without the aid of certain assumptions which are both arbitrary and unreal (simultaneity in projects of economic subjects, the necessity of accepting that individual projects are integrated into national projects). On the level of macro-economics, delay-period tries to adopt those periods which have a similar nature with varying durability and time spans. Consequently in the last analysis the delay-period becomes nothing but an

average of different delay periods.

According to Barre, these two types of time may be unified through dynamic economic models; however, since static or dynamic economic research is mainly abstract and theoretical it neither considers economic structures and their changes, nor the organization and evolution of activities, this unification is also theoretical and abstract. Thus the time that economics uses in its analysis is a time which is inherent in economic activities and it does not take into consideration the historical or social aspects of the period during the cadre-period or delay-period. Consequently it isolates economic activity from all other related activities and it fails to consider the reciprocal relationships which exists between social, economic and historical phenomena.[34]

In order to compensate for this shortcoming Barre considers the elaboration of a theory of economic evolution to be essential.[35] Such a theory would furnish the sociological and historical characteristics necessary to an abstract analysis of economics. So the final solution of the problem of time can be found in history.

Barre's efforts in this respect yield few results: the distinction between delay-period and cadre-period as such does not solve any of the economists riddles. These should be resolved through the use of dynamic economic models; and in order to avoid the abstraction of these models, he should also consider historical and sociological realities. How and by what method? Barre does not discuss this point any further.

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Some of the most important attempts of economists to relate time and economics have been outlined briefly. In order to resolve this problem some economists have paid attention to the approach of economic subjects to time and others have studied how time intervenes in economic activities. The major deficiency of both approaches is that they try to analyse the subjects apart from their activities and vice versa, and they fail to consider the dialectical relationship that governs both. Man and his creations are not outside time and space; and this is the source of all the complexity that

faces those who try to analyse social reality, or one of its aspects, economic reality.

Economic reality, like any other social reality,is constantly undergoing change. In the economic world nothing is fixed and everyone and everything have their limited lifespan. According to biological laws and technical rules human beings and the instruments of their labour are doomed to wear and tear. The very problems created by the passage of time (the young and old in manpower, the amortization of work instruments and their modernization) are the first temporal form of economic reality.

Consciousness of these changes and their momentum occurs through observation. Not only can observation not take place outside time, in most cases it has a specific time framework; changes in phenomena are measured by statistics according to their characteristics, annually, mensually or daily. National income and the balance of payments are calculated on an annual basis, while fluctuations in prices and wages are measured either mensually or on a day-to-day basis. This latent time used in observation also shows another form of the effect of time on economics.

Men are not content with the observation of changes alone; rather they try to interfere and effect changes in events by controlling and organizing their activities. Many factors contribute to this act of organization (religious, social, economic, administrative) and each introduce a variety of time into the world of economic activity. Social and administrative logic demand that labour and other activities should not take place during all months of the year; administrative undertakings and obligations require that certain activities take place during a specific time. The effects of social traditions and religious beliefs upon the timing of phenomena is too apparent to be discussed further. The final conclusion is that the concentration of activities is not the same during all moments, and economic-wise all days and weeks are not equal.

Time's intervention in the organization of activities does not stop here. Men use time as a unit of measurement for a number of activities, and when discussing wheat

production, the wages of labourers or factory capacity, they speak of annual production, monthly wages or annual capacity. Furthermore, the past and the future also have an influence on economic activity. Men try to organize and co-ordinate their economic and social lives by considering that which has already passed and in anticipation of the future. It is in this manner that today, together with the popularity of the planners and prevalence of planning in various sectors of social activity, the plan time of projects presented in the form of an imaginative and probable time, influences the manner of the appearance of various social and economic phenomena.

Economic activity is born within the cradle of time. Yet this very cradle of time is not free of the influence of present time, since it is a result of the evaluation of the past by the subject and the anticipation of time's future course. And those evaluations are neither the same in all states and at all times nor are they free from the influence of subjective factors. Society is filled with antagonisms and contradictions, and the conception of time of various conflicting groups is different. Each individual, according to his situation in the production process, has a varying concept of time, and measures changes accordingly. Each class evaluates the past according to its own beliefs, and plans the future on the basis of its personal assumptions. Some point to a prosperous future, lament ancient times, and fear the destitute, immediate past. Another class has another vision of time and another estimation of what has been, is and will be. Thus the two groups do not organize their social and economic activities uniformly.

This lack of uniformity is not solely a result of subjective factors, rather its main causes are objective factors (working tools, technical methods of production etc.) In traditional agriculture likewise, changes are slow and the particular unit of time used conforms to this. The industrial world is subject to a more rapid change and the temporal approach of its subjects corresponds to this speed. Thus, time is not identical in all sectors of the economy, and the multiplicity of activities and modes of production bring about a variety of time.

Economic activities can neither be separated from each

other, nor can they be isolated from other social activities. The interdependence of various activities poses the problem of the interaction of the measures of time used in every branch of activity. Now, which of the two units (the time of slow change in agriculture, or the time of the rapid change in industry) is valid for use in macro-economic analysis?The relation between various economic and social units where each has a different interpretation of time according to its traditions, customs, and special techniques, places more emphasis on the interaction of different times: foreign trade, together with the expansion of commodities and value brings the various economic times face to face. Importers are forced to incorporate the time units used in the countries of origin of merchandise into their own activities. The Gregorian calender which is the calender used by the top industrial nations, because of their important position in the international economy, has become the calender of that economy and has therefore been introduced into non-industrial nations.

As we have seen above, the forms of time are quite varied in economic activities (time as a unit of measurement, the subjective time of anticipation and forecasts, the time of administrative, social and religious activities ... and time resulting from the interaction of the temporal approaches of groups, activities and units). And it is with a consideration of these varied forms that the analytical and research work of economists can be endowed with profundity. To achieve this perfection the economist must transcend the artifical limits separating social sciences and incorporate the insights of other disciplines into his findings.

Today this necessity is felt more than ever before and the current success of border-line sciences and the multidisciplinary analyses carried out by economists is one of the efforts to satisfy it. It is only within such a general framework that any real light may be shed on the relation between time and economics: the durability of economic phenomena is inseparable from that of other phenomena, and it is only through isolation or abstraction that they can be distinguished from each other and the slippery border between the exogeneous and endogenous can be defined. No doubt in scientific research, abstraction and isolation are imperative; yet in order to derive any useful conclusions a constant bridge must be made between the world of abstraction

and the world of reality. It is in this respect that economic changes and the duration of economic phenomena appear as one of the forms of the change of social reality. And it is their study that has brought about the present importance of economic history and economic sociology.

Realities are born in a specific society which itself is undergoing a particular historical process. Economic sociology studies the reasons behind the multiplicity and variety in economic systems, while economic history aims to trace the evolution and transformation of economic activities during time.

This time is historical time. A time born of the composition of different temporal approaches, a time in which growth, development and progress take place, and which is a measure of economic and social transformations. The study of economic reality from this point of view is the study of economic history and it is due to this very fact that the attention of contemporary economists is steadily shifting to this area. Here not only is time in the economy studied but also economics in time.

## Notes

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17. *Ibid.*, p.48-49.
18. *Ibid.*, p.46.
19. The problem of selection of unit period was discussed by others before Lundberg. Among the Swedish economists Lindhal was particularly interested in this concept. According to Lindhal since in every moment there are new projects and new decisions, the length of unit-period should be very brief so as to be able to encompass all these changes and evolutions. He further states that economic movement is composed of a series of continuous disequilibrium; in order to understand this, the mode of creation of every disequilibrium should be studied. On the other hand, every disequilibrium is a result of decisions and projects made at the beginning of every period. Therefore, Lindhal divides economic processes into very brief periods and places particular emphasis on the beginning of each period, or the moment at which decisions and projects appear. In every period the conditions remain constant. The consequence is that this approach divides economic dynamic processes into a series of static situations (see Seligman *Op.cit.*, p. 595). Hicks in his book *Value and Capital* defines another concept of unit-period called week and says: "I shall define week as that period of time during which variations in prices can be neglected." (*Ibid.*, p. 132) In Hicks' system of analysis the three concepts week, and project, and anticipation are of major importance. The use of the concept of week allows us "... to treat a process of change as consisting of a series of temporary equilibria; this enables us to use equilibrium analysis in the dynamic field. By using the plan, we become

able to bring out the relation between actions devoted to present ends, and those actions which are devoted to to the future ... By the device of definite expectations we are enabled ... to determine the dependence of plans on current prices and expected prices." (*Ibid.*, p.127). Many similarities exist between the ideas of Lindhal and Hicks. The former begins with a dynamic and concludes with a series of static situations; the latter starts from a fixed equilibrium and reaches a type of comparative equilibrium.

20. Lundberg, *Op.cit.*, p.49-50.
21. *Ibid.*, p.50, Note 1.
22. *Ibid.*, p.51.
23. For an example of this type of table see: Piatier A., *Statistique et observation.* Paris, P.U.F. 1961.
24. Lundberg, *Op.cit.*, p.243.
25. The notion of time is also discussed in Islamic philosophy and logic under the category of quantity; it also appears under the Mata (when) category which is one of the nine categories of the Attribute. Various thinkers have different theories about the subject, some confirmed and others reject the concept of time. Imam Fakhr e-Din Rāzi's (543-606) views in this respect are interesting, he maintained that time as movement has two meanings: Firstly it is an external existence which corresponds to movement, and secondly an illusive matter which does not exist enternally. For a resume of the theories and ideas of Islamic thinkers about time, see: al-Tahanovi, (Muhammad-Ali al-Faruqi), *Kashāff estelāhat ol-funun*; Āyati, Mohammad Ebrahim, *Maqulāt va āra marbut be ān*, Malekshāhi, Hassan *Harakat va estifāye aqsam -e ān.*
26. See: Bergson, Henri, *Essai sur les donnees immediates de la conscience.* 22nd Ed. Paris, Alcan 1924, pp.57-106 et 174 SS.
27. See; Shackle, G.L.S., *Time in Economics*, Holland, North Holland Publishing Company, 1967. p.115.
    A short resume of Shackle's ideas may be found in Seligman, *Op.cit.*, (pp.526-535) and Bondon *Op.cit.* (pp.10-11, 70-90).
28. See: Shackle, G.L.S., [ed.] *A New Prospect of Economics* Liverpool University Press, 1966, pp.155.
29. George Katona, in his famous book, *Psychological Analysis of Economic Behavior* (New York, McGraw Hill, 1963)

writes: "We have at all times a time perspective. The time perspective extends backward as well as forward." The decisions made by economic subjects are based upon their prediction of the future, and the events of the past and foresight of the future affects their anticipations. Through his psychological analyses, Katona demonstrates that new anticipations which involve new decisions are not current. These decisions are based on information and facts which are not subject to drastic change, thus, every moment's decision is a repetition of the past. However, if anticipations change, these changes are radical and important. In addition all anticipations change simultaneously and in the same direction. (p.52)

30. Jean Piaget (in *Le devéloppement de la notion de temps chez l'enfant* - Paris, P.U.F., 1946) studied the appearance of the concept of time among children through a series of tests, in order to prove that contrary to Bergson views, man's knowledge of time is not a present knowledge and time and "... space constitute an indissociable whole," "space... is the totality of relationships established between the entities we perceive and conceive. (p.2) "... time constitutes a co-ordination of movement with different speeds ... until the idea of speed is not acquired in an operative form, that is to say as a relationship between a space passed (or a work completed) and that common dimension of all speeds which is precisely time, the temporal order fuses itself with the spatial order and duration with the road traversed." (p.269) In this structural approach "space is sufficient to co-ordinate simultaneous positions, but with the intervention of displacements, these changes of position provoke to the same extent distinct spatial states, which are also successive, and the co-ordination of these states is time itself. Space is an instant photograph taken from time, and time is space in movement, and these two, in their reunion, constitute all the relations that characterize things and their displacement." (p.2)
31. Barre, Raymond, *Op.cit.*
32. *Ibid.*, p.23.
33. *Ibid.*, p.68.
34. *Ibid.*, pp.209-10.
35. *Ibid.*, p.210.