

The theory of the firm
In the approach of
The Out-of-Equilibrium processes of change

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I. INTRODUCTION

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One of the most recently and promising Neo-Austrian improvement is the *Out-of-equilibrium processes on change* (OEPC). In this essay, we try to evaluate the advances and limits of OEPC from an heterodox microeconomics viewpoint.

The theory of *Out-of-equilibrium process on change* is a little unknown and as long as the neo-Austrian theory to a lot of economists and too many heterodox economists is great extent similar to mainstream, even for some of them, who are more affable, is a mysterious theory.

In this working paper, we attempt to show that OEPC has important contributions to the firm's heterodox microeconomics analysis: this approach introduces a dynamic analysis because of the time notion, the structural change and roll of money. In addition, we hold that this theory is not in line to mainstream.

The Austrian tradition in economics was characterized because it preserved the classical concept of production as a process in time; it means the capital theory. Böhm-Bawerk is reckoned as one leaders of. What it economist "did was to take the classical concept of capital, and to marry it with the theory of individual choice which he got from Menger" at this point to Hicks, "the 'Austrians' were not a peculiar sect, out of the main stream; they were in the main stream; it was the others who were out of it" (Hicks, 1973, p. 12) In other more traditional side Marshall and Pigou embraced the utility theory, at the time they forgotten the capital theory. But however the interest in this issue was preserved.

The Neo-Austrian theory leading in economics by J. Hicks, has one of the most important contribution in the analysis of the restructuring process of production in a time horizon. In *Time and Capital*, Hicks reintroduced the production process in a temporal and dynamic analysis, focusing in the *Traverse* processes that overcome the traditional static

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microeconomics frame, but remaining in the equilibrium approach because his assumption of Full Performance.

Nevertheless there is an ambiguity in his *Traverse* theory because the notion of processes of change is not at all compatible with the supposition of full coordination and employment. These assumptions give back Hicks's contribution close to the mainstream viewpoint. It means that the *Traverse* remains in an equilibrium path.

The *Out-of-equilibrium processes of change* developed by Amendola and Gaffard, recovered the production processes analysis and the *Traverse*, in the Neo-Austrian tradition, but without supposing full employment and perfect coordination, and reintroducing the crucial role of money. The result was a dynamic heterodox analysis that pushes the *Traverse* idea from the equilibrium framework to out-of-equilibrium path.

The time concept is essential in these new heterodox analysis, changing our view from the ex-post to the ex-ante outlook, that entail to understand that the economic and environment issues are processes that come up from the past, but most important is that the future is being constructed today.

At the end of this paper we recognize the contribution of the Out-of-equilibrium processes of change, at the same time we are suggesting that the achievements of this new heterodox approach are limited by them definition of full vertical integration of the production process.

In order to demonstrate our statements, we are going to develop a comparative analysis between the mainstream microeconomics theory of the firm vs OEPC approach. In the

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OEPC and in general in Neo-Austrian theory, nevertheless, there isn't a formal or explicit theory of the firm, it is implicit in their analysis then we try to obtain some idea for a microeconomics analysis of the firm in this approach.

This essay has four parts: the first introduces the OEPC theory. The second part underlining some general ideas as: the time concept (from the forward to backward), the relation market and firm, the coordination and complementarily, and the time and money.

The third part introduces the comparative microeconomics analysis between Neo-classical and OEPC theories following the next topics: The traverse, the OEPC, costs, viability condition, prices and profits, money and interest rate.

In the fourth part, we present the OEPC theory's contributions and limits; finally we arrive to ours conclusions.

II. TEORÍA DINÁMICA DE LA PRODUCCIÓN: LA TRAVERSA

To the Austrian economists, the economic growth and creation of national wealth is the characteristic most important of any economy, and the firm plays an important role in that process. But with the neoclassical viewpoint it has been lost.

J. **Schumpeter** was one of the authors that analyzed the economic development, he proposed the idea of "creative destruction", and after while **Geogesco Reegle** was the first in introducing the idea that the process of production process is different to the process of production.

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The task of explaining the economic growth required offer and explanation of the capital, one way is analyzing the genesis and creation of capital. This problem is analyzed for what is called the *Austrian theory of capital*, the fundamental idea is that the capital is a found, and not a stock.

In the neoclassical production function the production capacity is given, indeed it couldn't be endogenized. And the economic growth only could be explained by external factors, as they do.

From the mainstream and others approaches as the technological trajectories (Dosi 1982), they beginning from the same crucial hypothesis: the “given” resources. “ ... is that the resources ... existing in their own right and are hence separated from the technology that they contribute to bringing about... resources, ... are defined in the end must logically pre-existing them.”

To have a better understanding of economic growth and increasing of national wealth –and all this analysis- first of all is necessary to change our analytical viewpoint: from the traditional ex-post view point to an ex-ante historical perspective.

Time: from the *ex post* to *ex ante* view point:

One of the most important contribution made by the neo-Austrian school is in the methodological field: The dynamic analysis requires change from the traditional *ex-post* viewpoint (which is dominant in the general economic analysis) to an *ex-ante* perspective.

For instance, in the traditional ex post analysis of production, there is a ‘crucial hypothesis’ that suppose technology or technological trajectories “are seen as existing on their own right and are hence separated from the technology that they contribute to bringing about ...

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Resources, in terms of which both technology and environment are defined in the end, must logically pre-exist them”. OEPC p.29

Change of perspective from the *ex post* to *ex ante* viewpoint means “considering nothing as given ... Qualitative change interpreted as ‘creation’ of altogether new productive options, not the adoption or development of something already essentially defined, comes into focus.”

OEPC p. 30 “In an *ex ante* perspective, ... qualitative change is essentially a learning process...” OEPC p. 31. And the dynamic analysis means: Growth... Learning... and creation of resources.

In the traditional version, ex-post view point, see the technology and the production process as a production function which suppose the firm has been already constructed, so we have the traditional function as $Y = f(K, L)$. Instead, from the ex-ante viewpoint is necessary the construction of capital and appropriate labor to deal with. And it supposes take the time as historical one. In this way the production process definition implies foreground viewpoint.

The alternative way is changing perspective, “ from the ex-post to an ex-ante viewpoint...- which implies consider- Qualitative change interpreted as ‘creation’ of altogether new productive option, not the adoption or development of something already essentially defined, comes into focus.” “Innovation is the typical example of qualitative change originating within a process that takes place sequentially, a process through which a new productive option.. is actually structure and , as we shall see, yet further options are envisaged. A process of construction of new forms of production which will only take on precise definition along

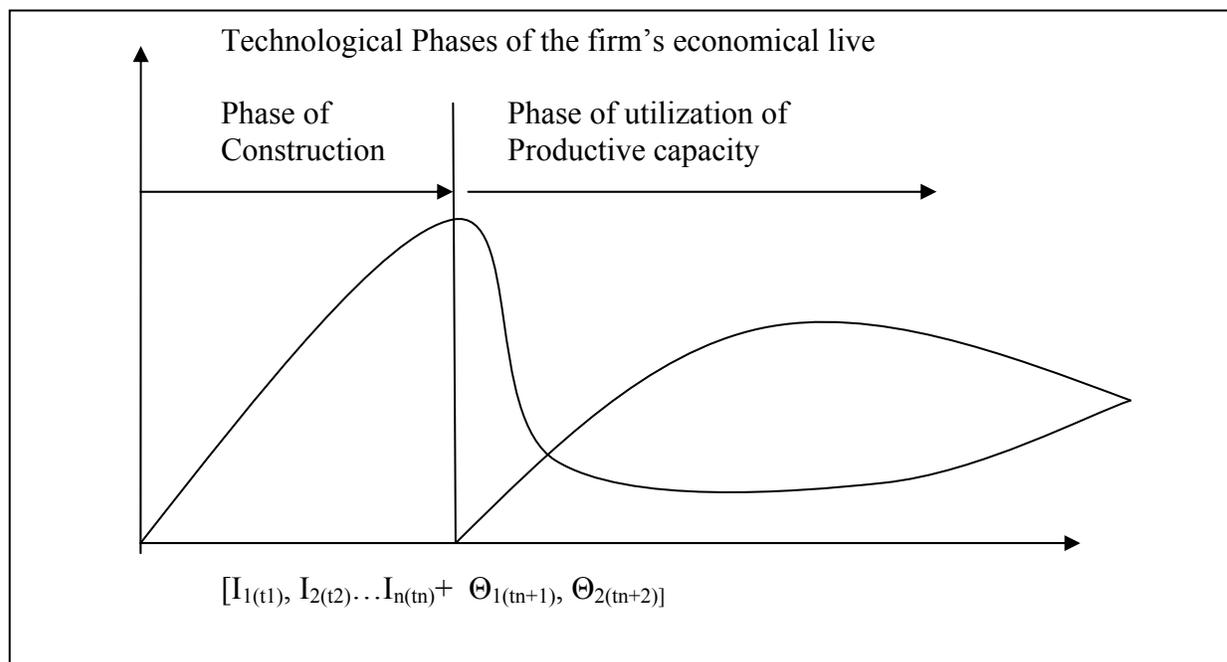
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the way, also implies the appearance of a new kind of output... The process of change is what brings about –resources and technology -, and a new and different environment together with them.” (Amendola y Gaffard, 1998) Under this perspective the neo-Austrian economist carry on their production model.

The production model:

For neo-Austrian economists, the firm organizes a productive process as scheme by which a flow of inputs is converted into a flow of outputs. From the historical analytical viewpoint, the process of production supposes two different but complementary processes: 1. The phase of construction or *construction period*, and 2. the utilization of productive capacity or *running-in period*. In this first step the inputs and outputs can be made homogeneous by taking them in value terms (measured in money). And any of them has a distinctive time-shape or time-profile, as is shown in figure 1.

Figure 1. General time-shapes of inputs and outputs values



It can be represented, in real time, as:

$I_i =$ input

$Y =$ output

$[0, t]$

$[I_i(t), i(t)]$

$[I_1(t_1), I_2(t_2) \dots I_n(t_n) + \Theta_{1(t_{n+1})}, \Theta_{2(t_{n+2})}]$

The first observation, when we consider the time, is that the values of inputs and outputs flows are separated in temporal horizon. Then the traditional maximization process couldn't be applied. The usual optimization remains a tool for very static models. Instead is necessary a *condition of viability* for each firm which must be compatible to the dynamic analysis.

The necessary condition is that the economic process should yield at least the market rate of interest, but considering the futures changes that must be expressed as the discount value formula: the capitalized value of the output flow must be at least a great as the capitalized value of the flow of inputs in others words the capitalized value or discounted value of the flow of net outputs must be non-negative.

It is a necessary condition but not a sufficient, because such process doesn't go for ever. When the process end at certain time (ω) is necessary to have the next firm rule about the capital value: "At every point, during the duration of the process, the capital values must be positive". Hicks (1973), p.18. By this way is possible drawing the proper *capital value curve* of each process.

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Other result is that the interest rate has a negative relation to the capital value profile, which is expressed in the next theorem:

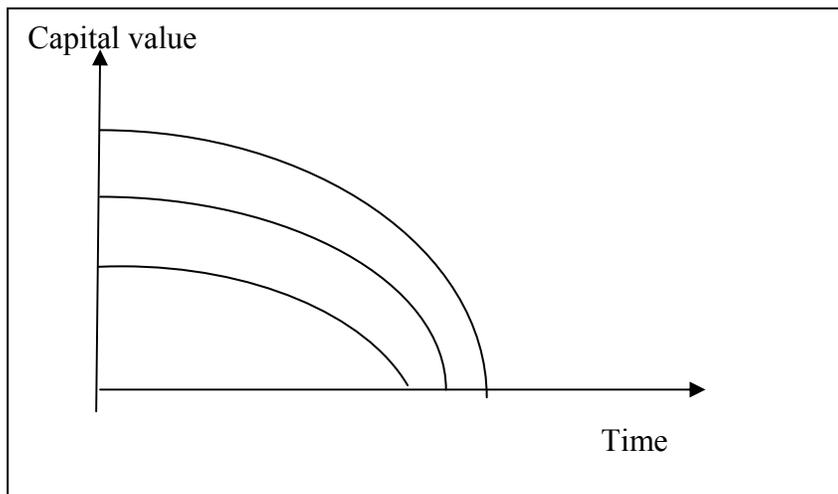
“... a fall in the rate of interest will raise the capital value curve of any process –will raise it throughout- while a rise in the rate of interest will lower it...” Hicks (1973), p.19.

Now because each process yields its own interest rate, which is called the internal rate of return,(IRR) we arrive to the *viability condition* which says:

The process is viable if the IRR is greater than the market rate of interest,

We can imagine a market or an industry –or in the all economy- a map of different capital value curves that satisfies the viability condition. And theses curves can also be used to show the *capital value invested* in the process. (see figure 2)

Figure 2



Hicks use this knowledge to explaining what the topic most important is for him: The economic dynamic when a shock moves the economy from one steady state to other one, which he called the *Traverse*.

In fact the problem in which we are interested in the same way as long as Hicks is: "... the determination of the path of our model economy (the Full Performance or maintainable path) when the economy is not in a steady state." Hick, 1973, p. 81.

The *Traverse* could be explained as: beginnings from an economy which is in a steady state, under an 'old' technique, an 'invention' is introduced. The new technique is adopted for new processes, but the old processes are continued, so long as it is profitable for them to be continued... This is the kind of sequence, involving changes in wages and interest, in production and in employment, which we have to work out". Hicks, 1973, p. 81

J. Hicks says that: "there will prove to be a tendency to equilibrium; so that our sequence can properly be considered as a *Traverse* from one steady state to another..." Hick, 1973, p. 81

The profile of Full Employment path.

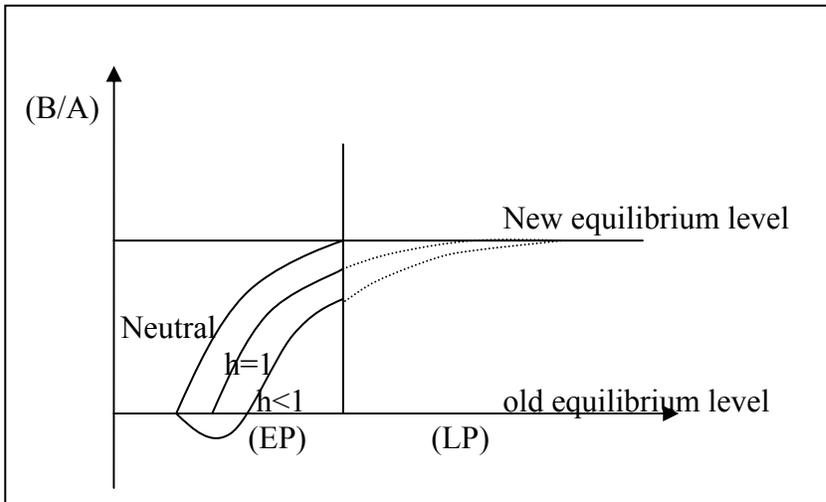
Beginning from a steady state under an old technique, and suppose that at time 0: a) a new and more profitable technique is introduced, b) the wage is flexible, and, c) employment is constrained to move as full employment of a labor supply which increases at this given growth rate. He got that the course of output is fully determined by the techniques and the Full Employment condition. (Hick, 1973, pag.100)

In this profile, the scarce factor is the labour. In the year 0 the new technique is introduced thanks that labor that would have made the old machines is transferred to making the new.

And the product expansion is limited by the total supply of labour.

In a neutral case, in which there is no bias, $h=H$; there is the same proportional cost saving in each sector, and the only result is that in period I, has an increase in final output, due to the increase in output capacity of the period 0. In period 2 should repeat the same story.

When all of the old machines have been replaced, there will then be not further increase in output, relatively to the reference path; the system will in fact have settled into a new steady state equilibrium. As we can see in the next figure, in this neutral case, the rate of increase falls of gradually, so that there is a smooth transition to the new steady state. (Hick, 1973, p. 102)



When is considered a forward bias, in year 0 is produced the new machines with new technology, in year 1 the production generated by the new machines, with new technology

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require less labour work, it imply there is 'technological unemployment'. In this case, the displaced labor must be transferred to construction, then the labor force that is engaged in construction must be raised. At this point doesn't have unemployment.

But the consequence will appear in year 2: there are more new machines, and it will damp down the primary effect. To Hicks this unemployment could be compensated by new employment on fresh processes, and in this way is justified to have full employment. The conclusion is that the Traverse has place in a path of full employment.

Hicks (1973) did not interest in the processes a micro-level instead his work was in the hall economy. But from the profile studied, we can not say that exist some firms (may be one leader) that introduce the innovations, so his approach has been made taking the representative firm.

In such case, it looks that in year 0 every one of the firms are introducing at the same time new technology and the effects in the next year is similar for all of them. If we don't have one or several leader firms that could profitable for them by introducing new technology, then after this shock we would not have any structural change. The economy grows up in stationary state without structural change.

In year 1, each firm with new technology is more productive and part of the labor force is translated to construction phase, but in the year 2 the process give place clearly to the technological unemployment. Such labor is not absorbed by the existing firms, and then is necessary new enterprises which demand for labor warranty the full employment. But in Hicks view, the new firms don't mean changes in the economic structure.

In this point is that the Amendola's contribution is important, he proposes that the traverse is in fact a structural change and out of equilibrium, and not how Hicks said in full performance as we see next.

III. Structural Change; from traverse to out-of-equilibrium processes of change

One of the most important contribution of the neo-Austrian representation made by Hicks (1973) is focus the attention on the process of production. As Amendola and Gaffard recognizing: "What makes *Capital and Time* an essential step forward in economic dynamics is to put production back to the centre of the stage. Adjustments, changes in a simple word 'dynamics' are a matter of production." AyG FTOEPC p.252. In this way Hicks goes far away from the mainstream traditional attention on the market, but at the same time draws his limits.

In other words:

"The great step forward of *Capital and Time* is the analysis of production (and technology) in terms of a fully integrated representation of the process of production. Its limit is to have conducted this analysis within the context of Traverse, where equilibrium and disequilibrium coexist and stability gets mixed up with effective adjustment. Only minor although interesting refinements are possible as long as we remain within this context." A and G FTtAEPC p. 254.

out-of-the-way

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For the economists of OEPC the production that is behind of the neo-Austrian theory is correct, and their approach remain similar to the theory developed by Hicks in *Capital and Time* (1973). Even more than that, Hicks goes out-of-the-way that the neoclassical theory has been used to represent the production process, and this means fundamental metamorphosis: “The neo-Austrian representation of the process of production is not just an alternative representation of this process. **It is a radical change of perspective** that make it possible the interpret the phenomenon of production in a different way with respect to the standard one, returning to it its specific character”. P. 249 (MA y JLG en FT to OEPC).

The next steep in Hicks thought was developing the Traverse theory; it has a dynamic nature along the time. This idea contrast, and is against to the static traditional neoclassical viewpoint. But what did not see Hicks, was that the character of economic change (the Traversa) put it in the out of equilibrium processes. The technological change implies a process of restructuring of productive capacity, and it caring out *loss of coordination* over time giving place a process out of equilibrium. “The increasing in productivity is, in this way, outcomes of a process of qualitative change in technology, organization, knowledge, which is coming up step by step, and not because intrinsic features of the production function, or exogenous factors.” (MA y JLG en FT to OEPC).

At this point, for A and G, if the Hicks analysis on the Traverse is a steep forward, nevertheless it has certain “lack of analytical consistency”. The study of such inconsistencies brings them to propose their theory of structural change in the out-of-equilibrium processes, in the neo-Austrian framework. Their considerations to Hicks theory are the next:

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1. From perfect coordination to Lost of coordination. Hicks proposed an economic system characterized by the full coordination in production and markets: process of construction and utilization, goods and services, labor, and financial system. But such idea is not clear in a world with structural change.

For instance, the supposition that the production is perfectly synchronized obscured the important transition problems behind of the phase of construction and utilization of productive capacity, such dissociation in time of inputs from outputs, and of costs from proceeds that characterize the processes determines important coordination problems which not support the perfect coordination idea. A and G FTtAEPC p. 253.

2. Ricardo's machinery effect appears as result of technological changes "rather than being limited to the case of forward biased changes, as maintained by Hicks." A and G FTtAEPC p. 253.

3. The assumption of Full Performance in Hicks model implies that "in the barter economy considered by Hicks (...), all the output no absorbed by consumption out of wages paid to workers engaged on existing production processes (...), or by consumption of other kinds, is in fact used to start new production processes embodying the new technology...Full performance, on the other hand, also implies flow equilibrium in each period, both in the sense that final output is totally absorbed by existing demand and in the sense that investment is equal to *ex ante* saving...In this context there are no co-ordination problems." A and G FTtAEPC p. 253.

4. Labor market disequilibrium. The Hicks's supposition of "Full Performance only concerns demand and supply of final output; there is nothing of the sort on the labour market, where unemployment appears as result of the distinction between

investment at cost and investment on capacity. Thus equilibrium on the one market coexists with disequilibrium on the other. ...”A and G FTtAEPC p. 253.

5. The money central roll. To Hicks the money doesn't matter, for him in fact “production is the real root of the problem, with or without money”. A and G FTtAEPC p. 254. Such Hicks's conclusion is result of his assumption of Full Performance and perfect coordination and his lack of consistency.

However, if we are interested in a structural change where the time is important, such processes “takes place by definition out of equilibrium”, and as soon as is “removal of all ambiguity and –we are- passing from traverse to a full out-of-equilibrium context...” the money appears as an essential ingredient of the analysis of out-of-equilibrium processes of change. A and G FTtAEPC p. 254.

Without Full Performance assumption, when occurs a shock as technological modification occurs a change in the balance between processes in the phase of construction and process in the phase of utilization of productive capacity, which is no longer harmonized over time coming up cumulative causation or erratic fluctuation. The coordination is lost. At this point the existence of money allows the co-ordination which could be solved along the time. The lost of coordination means dissociation of investment from ex ante saving, and of demand from supply shown the importance of money.

By other hand, the problem of viability arises when is considered the dissociation in time of costs and proceeds. The money appears as fundamental for dealing with the coordination problem between the phase of construction and the utilization one. As A. and G. says:

“A bridge over time must then be launched to link the phases of construction and utilization of productive capacity –no longer harmonized over time- and money does it. A financial constraint then emerges which, in a truly sequential context, appears as the relevant link over time between financial and productive assets, and hence between financial decisions and real choices.” A and G FTtAEPC p. 256.

In conclusion, as in the real world appears, for A and G the money is very important to reestablish the coordination process and the system viability.

6. Supply and demand discordance. Considering that there are two phases, the production capacity produced in the first phase, which is irreversible, gives place a sub-utilization problem of such productive capacity. Because in the first stage all of installation and productive infrastructure is created, in the second period the production process takes place. Then the production in the short run depends of the firm's selling. There is not way to sure full employment of production capacity.

In theoretical terms the two phases mentioned give place to sub-utilization of production capacity. And two additional problems for the general equilibrium appear: a. technical indivisibility, and b. the unemployment in a succession of time.

The result of removal all those ambiguities let A and G build a theoretical proposal for the structural change which is not in the equilibrium framework.

Out-of-Equilibrium

The equilibrium in the Traverse means a path of perfect coordination between the next tree markets: capital, goods and services, and labor. Hicks, in his Traverse supposed plenty coordination. Instead the out-of-equilibrium processes of change appears when the coordination is cut because an innovation, or monetary policy, or other factor which creates an imbalance or fault of coordination. For A and G this is the general case.

“A first and general meaning of being ‘out of equilibrium’ is that a change in the balance of processes of production in different stages of their life is under way ... -and the- structure is continuously modified...” “This ... happens whenever a qualitative change is contemplated...” OEPC P.24

For instance “a change of the technique in use necessary implies a change in the age structure of productive capacity and hence a dissociation of inputs from outputs and costs from proceeds. We are in fact here clearly in an ‘out-of-equilibrium’...” OEPC p. 25.

In equilibrium, there is a perfect synchronized of cost (wL) and proceeds (B) both can be depend of the scale of activity of productive capacity. Then, as traditional neoclassical theory do, is possible to focus only on the second phase corresponding to current final output (the ‘utilization’ moment) and write:

$$C=C[X^u(t)], \quad R:R[X^u(t)]$$

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But, in the neo-Austrian school it is not correct, before using the productive capacity is indispensable carry up such resources. The consequence of have in consideration, the production of machinery and equipments is that investment and consumption, and supply and demand, are not longer harmonized over time.

Then the cost function will then be: $C = C[X^c(t), X^u(t)]$

And the proceeds function will become: $R = R[X^u(t)]$ OUPC p. 24

The traditional process of optimization is meaningless. The viability condition is the natural option. In other hand, focus our attention in the first phase; the firm activity is constrained by two resources: available financial resources, and labor supply. The first is important to financing the construction process and the second in order to produce such process.

The construction nature of production process in the sense that no produce any good and service and then any income, require financial resources in order to concrete the investment. In this sense we found a financial constraint. The firm's growth is constrained by available financial resources. But the important point here is that we are out of equilibrium and is clear the needed by money.

The structural change

The out-of-equilibrium path is the result of technological change, and it means that economy structure evolves particularly changing the productive relations inside of such structure.

For Hicks in the "year 2(mentioned before) the result of one innovation at the year zero, is the coming up of new enterprises, but without structural change. To A and G, when a new firm appear because it coming to substituting an older one, or is just new in the industry. This new

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enterprise (because it's new technology) changes the older relations with providers, competitors, and consumers, modifying all the relation in its industry and the all economy, it means structural change.

In synthesis, the new technology means changes in the structure relations, as well as the "time structure of the production process" and with it a process of structural change. In synthesis, the theoretical frame to studying the dynamic process in economy is the approach of out-of-equilibrium process of change.

IV. Conclusions and considerations to the Out-of-equilibrium approach

IV.1. Reconsidering the Full vertical integration of the production process.

The neo-Austrian theory in the approach the out-of-equilibrium of processes of change developed by A and G has a strong consequence that may be the authors didn't realized, and touch the merely nature of the characterization of production processes, it means the reconsideration of the Full vertical integration of the production process (FVIPP) thesis.

In the spirit of this theory we have the classical interest of the processes of growth and wealth creation, and in order to face this challenge they proposes a framework characterized by the Full vertical integration of the process of production, (FVIPP).

FVIPP mean a process of production supported by firms that has an insulated or individualist performance. The global economic process is result of a mathematical addition of a lot of firms that are producing in isolated way. They are like islands in the sea. The only place in which has contact is in the market, before and after, they don't have any relation between them neither to the social institutions or other economic agents. The technological change and the growth could be appears as something exogenous. Instead innovation and

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technological change have their origin in the nature of the firm and the structural economic and social relation with the other firms and the entire economy.

For instance, even A and G recognized the innovations:

“As a matter of facts innovations do not arise as the result of the independent actions of single innovating firms but as the result of interactions across several firms and institutions: ‘[i]t is the microdiversity of behaviours and the interaction processes in specific market and innovation system contexts that define the transformation process from which growth is a consequence’.

(Metcalfe 2001, p. 582, quoted by A and G FTtAEPC p. 258)

The process of growth implies consider, for instance in microeconomics terms, the complex relations of competition and collaboration between firms, the economic network relation around each firm, how it is created, maintained and transformed as well as the firm introduce technological changes and evolve along the time.

The same observation is valid at the time that we introducing the social and institution environment in which each firm is growing up. It looks necessary certain production scheme where the enterprise could be open in a complex relation to its environment. Where, the firms could have feedback to others firms and its environment. And in this redefinition the role of money must have too critical importance.

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