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THE ROLE OF COMPETITION IN THE TECHNO-ECONOMIC PARADIGM ON THE MARKET

ABSTRACT: *Two different forms of competition theories can be distinguished: theories that emphasize the equilibrating forces created by competition, and those emphasizing the disequilibrating forces. This difference can be attributed, to the differences regarding the functioning of the market economy: the basic problem here is whether competition should be understood as a static state or a dynamic process. This study aims to analyse the dynamic competition theories by J. A. Schumpeter and neo-Schumpeterians which focus on the dynamic role played by competition through creating disequilibria, endogenous structural change and social transformation as a distinguishing characteristic of the market system.*

In the first section, after examining the static, neoclassical competition theory, Schumpeter's theory, which is based on the notion of "creative destruction", will be discussed. In the second section, the long term fluctuations based on the creative gales of the destruction concept will be examined in the framework of the techno-economic paradigm.

KEY WORDS: *Dynamic Competition, Neo-Schumpeterians, Techno-Economic Paradigm, Technological and Structural Change.*

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INTRODUCTION

Competition theories in general can be classified under two headings: static and dynamic. In static competition theories, economic decisions such as pricing, capital accumulation, and distribution are examined with reference to the structure of the market, and all changes which depend on time are excluded from the analysis. The term "static" here refers broadly to the stability of all economic forces. Since these forces are taken as givens, the remaining problem becomes how prices and quantities of goods are determined within the sphere of exchange. The basic notions that are included in static competition theories are perfect competition, monopolistic competition, and structure of competition. In these theories, the fundamental role of competition is to determine how the economy can reach the exact equilibrium point (Schumpeter ((1946) 1989c, p.199). Dynamic competition theories, by contrast, emphasize the process of competition, and focus on such variables as technological improvements and innovation, changes in the size of firms, and new market products (Amitava Krishna Dutt, 1987). Thus one can say that, in dynamic competition theories, competition itself changes the structure of the economy and economic rules (Gaay Fortman, 1966, p.40).

While in static competition theories technology is taken as a given, in dynamic theories, technological change plays a crucial role in the competitive process. In other words, static competition theories take equilibrium as its basic problematic, whereas dynamic competition theories focus on dis-equilibrating forces (Semmler, 1981) Even if the equilibrating role of competition has been emphasized time and time again since Adam Smith, it is clear that the primary aim of every entrepreneur is to maximize his or her profits in the market system (Richardson, 1975). This is achieved mainly through the introduction of technological change and innovation. However, when technological change and innovation are included in the analyses, competition gains a dynamic character that casts doubt on the notion of 'stability'. This thesis is maintained by Schumpeter and neo-Schumpeterians among others. The aim of this paper is to assess the respective theory of Schumpeter in relation to the notion of competition as a dynamic process. With this aim in mind, after examining the neoclassical perfect competition theory as an instance of static competition theories, the dynamic approaches of Schumpeterian competition theories and neo- Schumpeterians will be discussed in the second and third sections, respectively.

TOWARDS EQUILIBRIUM AND NEOCLASSICAL STATIC COMPETITION THEORY

Perfect competition is widely recognized as an instance of the static competition theories. The basic assumptions of perfect competition are as follows: The price and the quantity of production factors are a given. The number of firms in an industry is infinite. Every firm can reach perfect knowledge of market decisions. All products are homogeneous and there is free entry to markets (Hunt 1992, p.304-306). The aim of any firm is to maximize its profits under the condition of given prices. Because of this function the firm can be identified as a tool whose main function is merely to drive the market to the equilibrium point (McNulty, 1967, p.397).

Although neoclassical economists emphasize the principle of maximization of profit, what is gained at this equilibrium point is only the "normal" profit (Akyüz, 1977, p.149). Equilibrium can be identified as a "state of rest" (Ertürk, 1996, p.373-374). Moreover, since there are an infinite number of firms, each of which is producing the same good, the entrepreneur seems merely an organizer whose main function is to produce homogenous goods at given prices (Eatwell, 1982, p.217). Because of this function, all innovative actions of the entrepreneur, and thus economic change, are excluded from the analysis of neoclassical competition. In an unchanging and profitless economy the notion of perfect competition can be identified as a broad abstraction only (Chipman 1971, p.341-344).

By contrast, in the theories of Schumpeter and the neo-Schumpeterians competition is not only based on the innovative force of the entrepreneur but is an endogenous factor in the economy, causing structural change. In order to demonstrate this one can begin with Schumpeter's notion of creative destruction.

THE NOTION OF CREATIVE DESTRUCTION AND SCHUMPETER'S DYNAMIC COMPETITION THEORY

According to Schumpeter, "capitalism is by nature a form or method of economic change and not only never is but never can be stationary" (Schumpeter, 1943, p.81). Because of this characteristic of capitalism, Schumpeter defines it as an evolutionary system that changes, and its change alters the data of economic action. Therefore the role of competition in changing the structure has to be analysed. Schumpeter uses a biological term, "mutation", to refer to this structural change: for him, industrial mutation incessantly revolutionizes the economic structure by destroying the old one and creating a new one. This process of

"creative destruction" can be seen as the essential factor underlying the working of capitalism and Schumpeter's understanding of competition (Schumpeter, 1943, p.82-83 and O'Dennell, 1975, p. 210-211). In short, creative destruction refers particularly to qualitative changes in the structure of a system.

In order to understand this structural change, we need to examine Schumpeter's concept of "economic development" and its relationship to competition. Schumpeter's notion of development is a distinct phenomenon observed in circular flow or in the tendency towards equilibrium. According to Schumpeter, "development is spontaneous and discontinuous change in the channels of the flow, disturbance of equilibrium, which forever alters and displaces the equilibrium state previously existing" (Schumpeter, 1926, p.64). These spontaneous and discontinuous changes in the channels of circular flow and disturbance of the centre of equilibrium appear in the sphere of production. In order to produce other goods or the same goods by different methods, producers need to use production forces differently (Schumpeter ((1932) 2005).

Schumpeter defines "new combinations" or innovations by referring to the notion of development: "development in our sense is then defined by the carrying out of new combinations" (Schumpeter, 1926, p.66). New combinations include, among other things, introduction of a new good, a new method of production, new source of supply of raw materials, the opening of a new market, and the carrying out of a new organization of any industry. These factors result in changes in the structure of systems which are carried out by entrepreneurs, whose "creative responses" bring about these kinds of structural change (Schumpeter, (1947) 1989d, p.222). The fundamental property of a creative response is that it shapes the long-run decisions of entrepreneurs and causes social and economic change. We can say that the creative response of an entrepreneur itself is the product of a historical process.

Schumpeter argues that capitalism is an evolutionary process due to its changing social and economic dimensions. Because of this changing character it causes instability in all social and economic institutions (Schumpeter, (1928) 1989a, p.48**).** According to him, capitalism is a revolutionary system and destroys the old structure by creating new ones (Schumpeter, 1943, p.84). Therefore Schumpeter maintains that creative destruction is an integral aspect of the capitalist system.

Schumpeter recognizes that change in capitalism is not an instant occurrence because every mutable element of transformation takes considerable time. Since capitalism itself is an evolutionary process, analysis of its specific parts, as in

neoclassical competition theory, cannot be enough to clarify the details of this organic process. According to Schumpeter the problem is not how capitalism administers the existing structure, but how it creates and destroys this very structure. In traditional understanding competition is a determinant of quantity under given market prices. But, in capitalist reality, competition requires the introduction of a new commodity, a new technology, a new source of supply, and new types of organization, which are all carried out by entrepreneurs (Howells, 2003, p.1-2).

Traditional theory examines stationary or steadily growing economies. Under perfect competition all scarce resources are allocated optimally. This static analysis takes into consideration a given period of time. Hence, it can be proposed that all factors such as prices and quantities are timeless. We need to observe quantities belonging to different points in time. Schumpeter argues that, once equilibrium is destroyed, establishing a new equilibrium is not an automatic process, as the perfect competition approach claims. Once equilibrium is destroyed, return to the old equilibrium point is impossible (Schumpeter, (1949) 1989e).

Perfect competition assumes the existence of free entry into every industry, as a necessary condition for optimal resource allocation. This free entry assumption is sensible when the economic world consists of a limited number of industries, producing the same products by traditional methods. However, free entry is not possible in industries where new products are produced, and where new methods are introduced in a dynamic atmosphere (Kaldor, 1972, p.1239). As has already been pointed out when analysing the Marxian notion of competition, competition brings about changes in the method of production. Perfect competition excludes the idea of development by assuming that technological changes are a given. Schumpeter criticizes perfect competition because of this static structure (Fagerberg, 2003, p.129).

Another important characteristic of perfect competition is the existence of flexible prices. When prices increase in a sector the profits rise, and hence firms shift their production to this sector (Schumpeter, (1934) 1989b) Thus, the increased profit level returns to the previous level because of the increase in production. When the economy reaches static equilibrium, firms gain normal profit. However, at the same time traditional theory assumes that firms aim to maximize their profit. This assumption seems to be inconsistent with the normal profit concept. For profit maximization firms should be seeking new technologies or new technological advantages. Traditional theory takes not only prices but also technology as a given. According to Schumpeter (1943), because of the deficiencies mentioned

above a perfectly competitive economy cannot introduce innovations which lead to the creative destruction process. In other words, perfect competition ignores important features of capitalist reality, such as innovation.

Schumpeter emphasized that innovative actions that lead to technological changes signify the evolutionary character of capitalism. Because of this point of view Schumpeter emphasized the entrepreneur and his/her creative actions or responses. Development means introducing new combinations (new techniques, new goods, new organizations, new raw materials, new markets) to the economy. As mentioned above, in dynamic competition theories, decisions are made within the process of competition, which places emphasis on such variables as technological improvement, change in size of firm, new market products, and so on.

To summarize, the fundamental characteristics of the Schumpeterian competition concept are as follows. First of all, he pays more attention to the production sphere of the economy and the dynamic character of capitalism. Second, he wants to analyse the long-run development and organic evolution of the system. Third, social relations are as important as economic relations: in fact economic and social relations are inseparable in Schumpeter's analysis. And, last but not least, competition changes the production method and introduces new goods and techniques. This competition is dynamic, and the system is unstable.

THE TECHNO-ECONOMIC PARADIGM AND COMPETITION

Neo-Schumpeterian economists following Schumpeter have analysed the effect of technological change and innovation on social transformation. They have examined the dynamics of innovation from individual technological changes through the clusters and systems of technological revolutions (Perez 2009). In this context it is possible to say that Neo-Schumpeterian's perception of competition parallels that of Schumpeterians.

Neoclassical theory takes technology as a given factor, and technical progress is generally defined in terms of the production possibilities curve: technological improvement is defined by shifts in the production possibility curve. However, both in Schumpeter and the neo-Schumpeterians, the features of the technology affect the socio-economic structure, and they have both used technology as a variable factor. This relation is defined as a driving force of social transformation, which is the result of "long waves" of economic development, as stated by

Schumpeter. "Long waves" are not only an economic phenomenon; they affect the whole system and they distress the entire structure of society.

Schumpeter put technological change and entrepreneurship at the centre of economic development. He saw technology as an endogenous factor and he interpreted it together with institutional and social structure. He emphasized the importance of entrepreneurs and he explained the role of innovation in social change and the cyclicality of the system Perez (2009). Schumpeter (1939) led neo-Schumpeterian economists to conceptualize the concept of "long waves" of economic development in terms of technological paradigms.

Leading neo-Schumpeterian economists, such as Giovanni Dosi (1982, 1988, and 1990), Richard Nelson and Sidney Winter (1982), Dosi and Luigi Orsenigo (1988), Christopher Freeman and Perez (1988) and Perez (1998), defined some basic concepts related to technology. These concepts are "technological paradigm", "technological trajectory", "technological regime" and "techno-economic paradigm". Every possible definition of technology or technological change is related to innovation. Innovation should be understood in both economic and socio-institutional contexts. It has an essentially dynamic nature and is represented by a trajectory or paradigm which shows the rhythm and the direction of change in a given technology.

Technological developments have often been followed by "natural trajectory" (Nelson and Winter, 1982, p.258; Nelson, 1994, p.139). Nelson and Winter proposed that technological advance is cumulative, in that today's technological advances tend to proceed from yesterday's, with today's in turn becoming the basis for tomorrow's. This dynamic of technological development is defined as the "technological regime" (Nelson and Winter, 1982, p.258 and Nelson 1994, p.139). Dosi (1988) calls this cognitive structure a "technological paradigm", which determines technological opportunities for further innovation. The technological opportunities induced by innovation will constitute dynamic competition between industries.

Figure 1: Trajectory of an individual technology (Perez 2004, 2009)

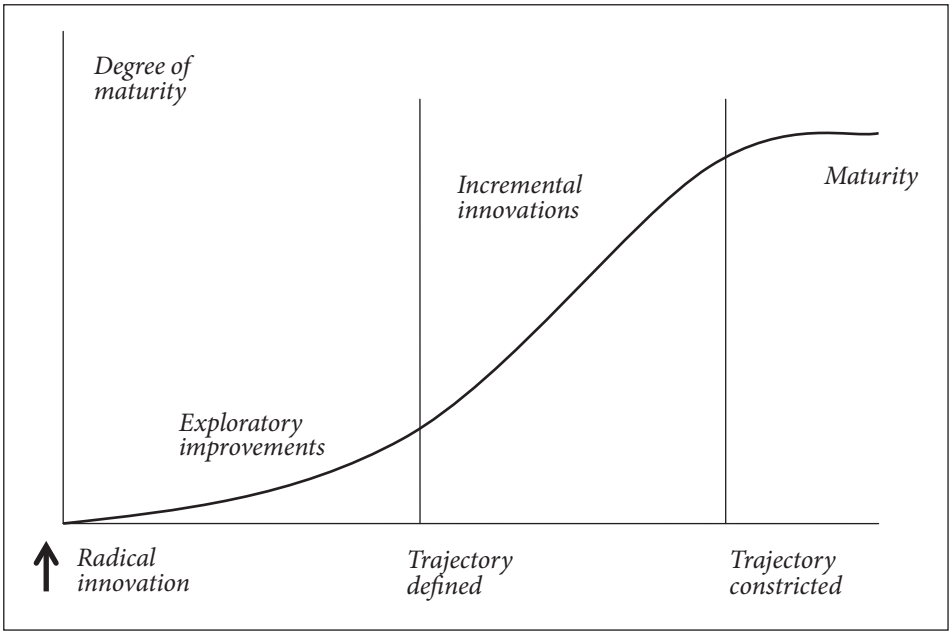

Figure 1 illustrates the evolution of an individual technology. "Radical innovations are introduced in a relatively primitive version and, once market acceptance is achieved, they are subjected to series of incremental innovations following the changing rhythm of a logistic curve. Changes occur slowly at first" (Perez, 2009, p.2) Trajectory or paradigm concepts emphasize the importance of incremental innovations in the growth path following each radical innovation. Radical innovations are important in social change. They determine new investments and competition between industries, but expansion depends on incremental innovations. Technological competition causes healthy variety (Cantwell and Santangelo 2000).

According to Gerhard Mensch (1975), basic innovations occur because of stagnation due to the out-dated economic routines used by old industries. Stagnation in these industries is due to the exhaustion of improvement possibilities in old technologies. Stagnation is the signal that the old paradigm is neither sufficient nor efficient in solving the new problems that emerge from ever-evolving societal and economic needs (Keklik, 2003, p.24). Such a situation creates the need for a new scientific research programme. A technological paradigm defines the needs to be fulfilled by the scientific principles that are utilized for the task: "in other words a technological paradigm can be defined as a pattern for solution of selected

techno-economic problems based on highly selected principles derived from the natural science" (Dosi 1988,224). In short, technological paradigms determine technological opportunities for further innovation.

A technological paradigm channels technological search efforts in a certain direction, defining a certain trajectory. Thus, the path of technological progress traverses economic and technological trade offs defined by a paradigm (Nelson and Winter, 1982); (Keklik, 2003, p.24)

Freeman and Perez (1988, p.45-47) divided innovation into four categories:

1. Incremental innovation. This innovation occurs more or less continuously in any industry, although at differing rates in different industries and different countries depending on the combination of demand pressures, socio-cultural factors, and technological opportunities and trajectories. Although this type of innovation provides productivity growth, no single incremental innovation has dramatic effects on the socio-economic structure.
2. Radical innovation. These are discontinuous events and in recent times are usually the result of a deliberate research and development activity in an enterprise, university, etc. Radical innovations are unevenly distributed over sectors and over time. Whenever they occur they are important as a potential springboard for new growth markets and for surges of new investment-associated booms. They may often involve a combined product, process, and organizational innovation. They bring about structural change, but in terms of aggregate economic impact they are relatively small and localized, unless they result in a cluster of radical innovations linked together to create new industries and services.
3. Changes in the technology system. These changes in technology effect several branches of the economy as well as giving rise to entirely new sectors. They are based on a combination of radical and incremental innovations, together with organizational managerial innovations affecting more than one firm.
4. Changes in the techno-economic paradigm (technological revolutions). Some changes in technology systems are so far-reaching in their effects that they have a major influence on the behaviour of the social-economic structure. A change of this type carries within it many clusters of radical and incremental innovation. A vital characteristic of this fourth type of technical change is that it has pervasive effects throughout the whole economy and social structure. Schumpeter's "long cycles" and "creative gales of destruction" reflect the techno-economic paradigm. The techno-economic paradigm dramatically changes the social-economic structure as well as changing the institutional framework.

The concept of the techno-economic paradigm is much broader than that of clusters of innovation. Each new paradigm not only changes the economic sphere but also the institutional context and even the culture (including literature, human consciousness etc.) New rules and regulations are likely to be required (Perez 2009) and (Dosi 1982). Consequently, technological innovation is best understood by holistic approaches.

TECHNOLOGICAL REVOLUTIONS AND TECHNO-ECONOMIC PARADIGMS

Individual innovations are related to technology systems and are also interconnected in technological revolutions. Therefore a technological revolution can be defined as a set of interrelated radical breakthroughs. Technological revolution is generally random; there were five successive revolutions[1] between 1770 and 2000. A technological revolution develops society and spreads around the world. The process of the diffusion of each technological revolution and its techno-economic paradigm constitutes the successive transformation (Perez 2009). The concept of technological revolution is clearly related to Schumpeter's "long waves". It is known that Schumpeter defined such waves as technological revolutions. Schumpeter's radical innovation is similar to technological revolution. Schumpeter focused on explaining the process of the diffusion of each technological revolution and its transformative effects on all aspects of the economy and society. In short, there is causality between radical innovation and long waves. This causal relationship results in social transformation. In addition, each techno-economic paradigm results in creative competition between industries and leads to new investment.

It is the techno-economic paradigm that multiplies the impact across the economy, and eventually also modifies the socio-institutional structure. The period of transition from paradigm to paradigm is defined by deep structural changes in the economy, and such changes require an equally profound transformation of the whole institutional and social framework (Freeman and Perez, 1988, p.59). "The onset of prolonged recessionary trends indicates the increasing degree of mismatch between the new techno-economic paradigm and the old socio-institutional framework" (Freeman and Perez, 1988, p.59).

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1 Five successive technological revolutions, 1770's to 2000s: first, the industrial revolution; second, the age of steam and railways; third, the age of steel, electricity, and heavy engineering; fourth, the age of oil, automobiles and mass production; fifth, the age of information and telecommunications (Perez 2009)

Within the neo-Schumpeterian line of inquiry, innovation is part of this important area, including its dynamic nature, its clustering, and its interrelations. Studies of innovation have shown that radical innovation is a mutation, but is path-dependent and interdependent with other innovations clustered in systems, which are in turn interconnected in revolutions (Ceserrato, 1996). Hence, this type of innovation is generally discontinuous and causes structural changes in both the economy and society. In every paradigm change the social and institutional structures change dramatically. At the same time every paradigm change creates a new dynamic competitive environment between industries.

CONCLUSION

In order to demonstrate equilibrium, classical economists assume that real wages, technical conditions of production, and total product are givens. Under these conditions market prices fluctuate around the production prices. When equilibrium in the economy is achieved, all profit rates become equal in all sectors of the economy. Under the conditions of dynamic structure, conflicts, struggles, and changes are inevitable. Schumpeter examines this dynamic or evolutionary character of capitalism. He takes into account the entrepreneur and his/her innovative actions in his notion of creative destruction. The creative actions of the entrepreneur not only change prices but also destroy old structures and create new ones.

In short, in Schumpeter competition-causing innovations change the structure of production. When the production method changes, competition takes a dynamic role and causes structural changes in the economy.

The social results of this kind of structural change are important and painful. Schumpeter's "creative destruction" and techno-economic paradigm process effect not only economic structure but also social and institutional structures. During crises, the degree of structural change that occurs is reflected in social anxiety. Unemployment is the first result of the social cost that results due to paradigm change. In this first stage of transformation societies are more reserved and become more conservative (Schlesinger and Phillips 1959). Moreover, distribution of wealth is re-established during crises. As Schumpeter maintained in his creative destruction concept, in capitalist societies every crisis presents itself at the same time as the process of capital restructuring.

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