

THE CONCEPTION OF INNOVATION ON THE CENTRAL THEORETICAL HUBS OF ECONOMIC THOUGHT

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ABSTRACT

Innovation seems to be one of the most critical concepts in economics discourse nowadays. However, the contribution of some of the central theoretical hubs to economic science concerning innovation is not always exploited systematically. Therefore, this article aims to present and analyze how some of the most prominent economists in the course of history have approached the issue, as well as to attempt to synthesize this knowledge. In particular, we examine the theoretical contributions of Adam Smith, Karl Marx, and Joseph Schumpeter, as well as some relatively recent theoretical approaches to innovation that appear to draw on the work of these theorists. The central conclusion of this study is that the conceptualization of innovation, either explicitly or implicitly, has deep theoretical roots while, in particular, the finding of the dynamic nature of the phenomenon of innovation seems to have been approached by most of the critical hubs of economic analysis.

Keywords: Innovation, Economic science, Adam Smith, Karl Marx, Joseph Schumpeter, Socioeconomic development, Socioeconomic dynamics

1. INTRODUCTION AND AIM

The concept of innovation nowadays seems to acquire a central place progressively in modern economic theory and analysis. As evolutionary economists, we think that innovation constitutes a “*central characteristic of modern capitalist economies, and that this fact ought to be built into the core of basic economic theory. Economies are always changing, new elements are always being introduced and old ones disappearing*” (Nelson, 2018, p. 3).

Nevertheless, it seems that, most often, the origins and the theoretical hubs that have examined innovation in the contexts of economic science are not as evident as someone would expect. It is an undeniable fact that the analysis of the economy as a system and, ultimately, as an evolutionary science initiates and unfolds by the works of the classical economists, and by Adam Smith predominantly. Undoubtedly, these first systematic attempts of classical economics share

at least one critical characteristic: they attempt to study the particular history that “gives birth to today’s facts” by making the future predictions possible. As Schumpeter (1954, p. 2) argued, to interpret the “*history of the intellectual efforts that men have made in order to understand economic phenomena*” is one of the most significant efforts an economist and social scientist can make.

Therefore, the present article aims to evaluate, by only approaching some of the principal theoretical hubs in economic science and, admittedly, the most discussed ones (primarily those of Smith, Marx, and Schumpeter), how innovation is conceptualized in the foundations of economics. Subsequently, it aims to present and understand, based on these founding “theses” of economics, how recent theoretical approaches contribute to the discussion of innovation.

Thus, to achieve the aim of presenting the concept of innovation in the theoretical hubs of economics and providing some of the recent critical contributions, this article builds upon the following steps:

- First, we present and analyze the theoretical perspective on newness proposed by Adam Smith
- Second, we evaluate the contribution to the “deterministic laws” of the development of capitalism by Karl Marx
- Third, we delve into the first and systematic contribution to exploring innovation by Joseph Schumpeter
- Fourth, we present recent contributions to innovation, such as the approach of national innovation systems, techno-economic paradigms, national competitiveness, and a systematic perception of innovation into global dynamics.
- Finally, we draw specific conclusions.

2. ADAM SMITH AND THE ERA OF FREEDOM

The classical political economy constitutes the foundation of the whole structure of modern economics. This stream of thought starts to develop during the age of enlightenment, where the Newtonian theory of “universal gravitation” has a profound intellectual and ideological influence. The Newtonian perception of the word begins to overcome the medieval belief gradually that a “divine power” should legitimize social consensus. For the first time in human history, in the context of classical economics, economic thought starts to overcome the pre-existing state-centered mercantilist perceptions and practices (Allen, 1970; Johnson, 1942): the first roots of the theory of socioeconomic development start to unfold.

For the founder of classical economics, A. Smith, the wealth of a nation corresponds to the number of goods produced that is based on two essential parameters: the total quantity of production factors and their productivity, for example, the actual ability and skillfulness with which these factors do their tasks. Smith's economic thought brings an entire philosophical breakthrough: the search for the individual interest strengthens the collective one and vice versa. In the "theory of moral sentiments," Smith (2005, p. 11) begins by stating that: "*How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it.*"

In this sense, the infamous passage that it "is not from the benevolence of the butcher the brewer, or the baker that we expect our dinner, but from their regard to their own interest" describes mostly this idea (Smith, 2005a, p. 19). If the butchers (or the bakers) do not do their best as producers, then their customers will choose to buy from their competitors. However, this condition requires always for the customer to have market alternatives, to be able to find other, more efficient suppliers. This motive, according to Smith (2005, p. 280), is also capable of overcoming governmental deficiencies, since the "*uninterrupted effort of every man to better his condition ... is frequently powerful enough to maintain the natural progress of things toward improvement, in spite both of the extravagance of government, and of the greatest errors of administration.*"

In this regard, Smith argues that pursuing individual gain in a world of free trade, free initiative, choice, and competition necessarily leads to the common good. In conditions of freedom, without obstacles, monopoly restrictions, and hierarchical coercion, the individual benefit necessarily converges with the social one. In Smith's conception, the mechanism of capitalism that produces wealth is composed of a "growth chain," which starts from the structural prerequisites of socioeconomic development, that is, a natural tendency for exchange, the institutional framework of free competition, and initial capital accumulation. Then, the market develops, the division and productivity of labor increases, leading to a continuous "virtuous cycle" of development. This cycle breaks at some point due to downward trends in profits and investments. This halt requires the economy to be opening up to new technologies and markets (innovation, in modern terminology) in order to re-enter the positive spiral of growth (Figure 1).

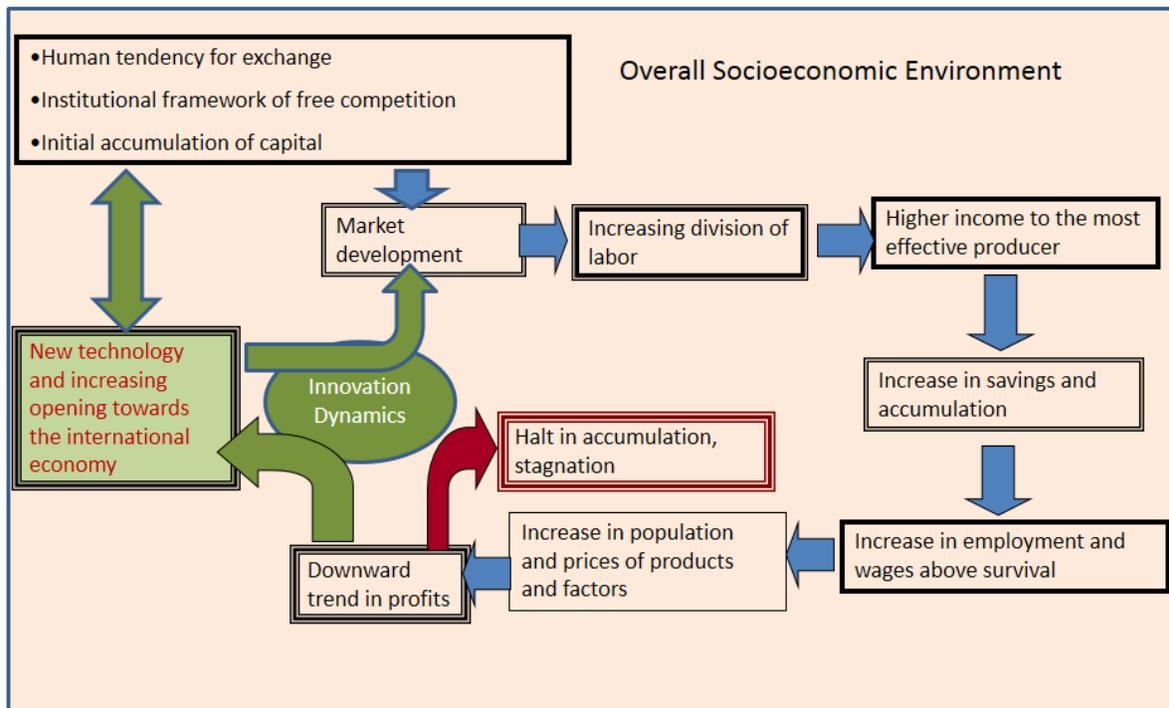


Fig. 1: The development of capitalism, according to Adam Smith. Based on Vlados (2017)

Smith’s analysis, therefore, is characterized by optimism since his theoretical interest lies in the possible and probable increasing returns in the capitalistic evolution. In particular, he perceives economic progress as a self-reproduced process, without necessarily ending in a stationary state; economic progress is a continuous socioeconomic cycle that revolves around and gets feedback from the dynamics of innovation. This element of his thought distinguishes Smith from his successors who remained relatively pessimistic about the increasing returns (such as Ricardo, Malthus, and Mill). According to Smith’s perspective, increasing returns dominate most industrial activities, while declining returns characterize the primary production exclusively. Given the fact that land is a factor of production of constant size, there is a breakpoint where the addition of new workers deprives the fertility of the soil. In Smith’s reasoning, increasing returns result from productivity growth, which is defined by the principle of the “division of labor.” This mechanism is rather simple: a higher division of labor leads to higher productivity and, consequently, more wealth. This division of labor allows for a particularly impressive increase in productive performance (Smith, 2005a, p. 13):

“This great increase of the quantity of work, which, in consequence of the division of labor, the same number of people are capable of performing, is owing to three different circumstances; first, to the increase of dexterity in every particular

workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many."

This scheme of the three factors that the division of labor increases can also lead to some ambiguities. How much can a repetitive routine job increase the ability of the worker? Why does the worker have to move from one task to another while he could be devoted to one job today and a different one tomorrow? Finally, to what extent can the invention of new machines come from this specialized and "repetitive" worker? None of the above seems sufficient to respond solely to the observed "explosion of productivity" (Robinson & Eatwell, 1973).

Therefore, it seems that the division of labor and specialization that Smith proposes can lead to the overall reorganization of the production process. The enormous increase in productivity ultimately comes from the overall, more efficient planning, organization, management, and control of the production process that Smith describes. In modern terminology, Smith's process is one of integrated managerial innovation. Besides, Smith also highlights that the size of the market determines the benefits of the division of labor. The larger the market, the more the social division of labor and occupations are promoted; consequently, higher productivity of labor means more wealth produced. In this sense, the benefits of the labor division may extend beyond the factory, the district, and the local area, and may even extend beyond the nation-state. It can cross national borders and thus become the basis for the international division of labor (Lim, 2017). In the international concept of Smith's approach, different national economies substitute the workers in the division of productive roles to end up with the international division of labor. This condition of pursuing higher productivity and profit can only make capitalism transcend the strict national context. In Smith's analysis, the only way for a national capitalist economy to avoid stagnation is foreign trade and the expanding international market, aided by the overall technological progress (Goodacre, 2010).

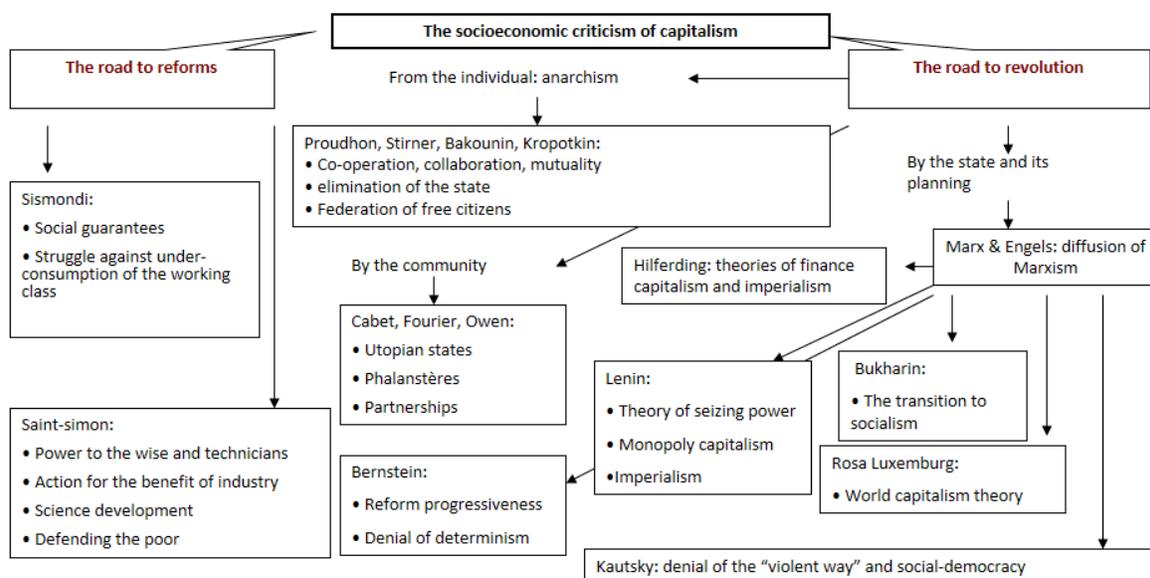
This scheme also is the basis for the theory of "absolute advantages," where Smith lays the foundations for understanding the benefits of international transactions (Schumacher, 2012). This theoretical proposition asserts that every national or individual producer becomes more productive through specialization and, therefore, it is generally beneficial to produce what "you can do better" and trade that in the market. Therefore, when they implement their productive specialization, all individuals of the local or international community can enjoy more and better products. On the country-level, this means that free international transactions ("Laissez-faire et laissez-passer") lead to the best possible usage of available resources because, otherwise, our world spends scarce productive capabilities carelessly. The following passage imprints Smith's

(2005, p. 366) conception on this issue: “By means of glasses, hot-beds, and hot-walls, very good grapes can be raised in Scotland, and very good wine, too, can be made of them, at about thirty times the expense for which at least equally good can be brought from foreign countries.”

In conclusion, an explanation for the foundations of the process of socioeconomic development and progress emerges for the first time in Smith’s work –what we call innovation nowadays. Smith introduces a spherical scheme of the production process, which is not only limited to the “technological” aspect of innovation, such as new machines but also discusses the “managerial” implications with the expanding division of labor and the “strategic” perspective with the conquering of new markets with free international trade. We can argue, therefore, that Smith’s work is the seminal work for innovation economics.

3. KARL MARX AND THE “GENERAL LAWS” OF THE DEVELOPMENT OF CAPITALISM

During the 19th century, various ideological-political currents of thought begin to develop that appear critical against the capitalist “mode of production” and socioeconomic development. They explore the weaknesses and contradictions of capitalism and argue that since capitalism is not the sole possible way of organizing the economic system, then a different system is probably attainable. In this context, the overall issue of socioeconomic development acquires gradually mixed, complex, and diverse philosophical, ideological, and political content (Figure 2).



**Fig. 2: The general contour of the critique of early capitalist development.
Based on Vladoš (2017)**

The central figure of this philosophical, political, and economic stream of theoretical thought and practice is Karl Marx. In essence, Marx deepens and reinforces the classical theory that “expansive internationalization” is a necessary condition for capitalism to exist. In a classical economics orientation, Marx asserts that there is no capitalism without international trade and that the tendency of capitalism to extend beyond the world market is inherent and necessary until the moment of its final collapse and the advent of socialism. Marx (1999, p. 163) underlines that the tendency of capitalism to create a world market is deeply rooted in the expansion of foreign trade:

“... the expansion of foreign trade, although the basis of the capitalist mode of production in its infancy, has become its own product, however, with the further progress of the capitalist mode of production, through the innate necessity of this mode of production, its need for an ever-expanding market.”

Marx (1999, p. 219) observes that “*it is not commerce in this case which revolutionizes industry, but industry which constantly revolutionizes commerce.*” At the same time, he asserts that the “export” of capitalist development to less-developed socioeconomic formations is imperative since “*The country that is more developed industrially only shows, to the less developed, the image of its own future*” (Marx, 1887, pp. 5–6). In an excerpt from the Manifesto, Marx and Engels (1969, p. 16) also write that “*The bourgeoisie, by the rapid improvement of all instruments of production, by the immensely facilitated means of communication, draws all, even the most barbarian, nations into civilization.*” In this sense, the “Marxism of Marx” is essentially a purely internationalist one—in contrast with many post-Marxian and neo-Marxian interpretations—since the global developmental perspective of capitalism is highlighted. As a necessary condition, the end of capitalism requires first an international deepening and process of “maturation” (Vlados, 2019a).

The Marxian and Engelian (Engels, 1873) analysis also identifies another critical aspect in the development of capitalism: a tight dialectical interconnection between the economic and the social sphere is the basis for the structure of capitalism (Figure 3).

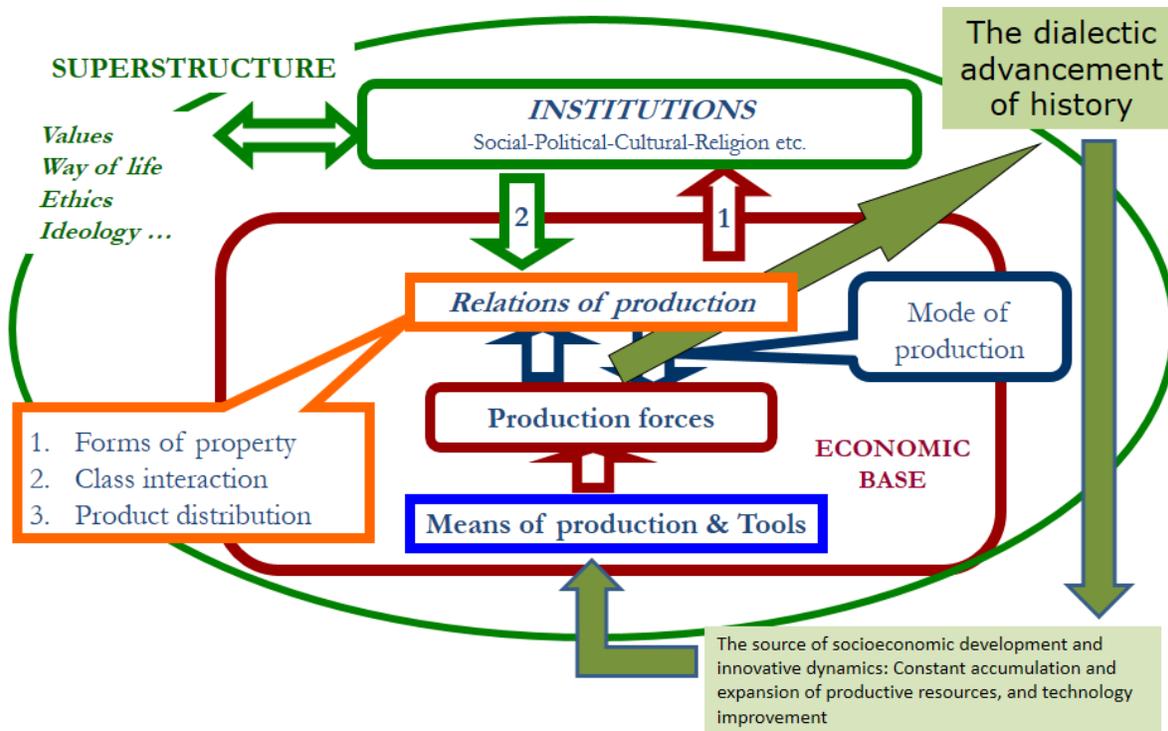


Fig. 3: Socioeconomic evolution and dialectical materialism. Based on Vladoš (2017)

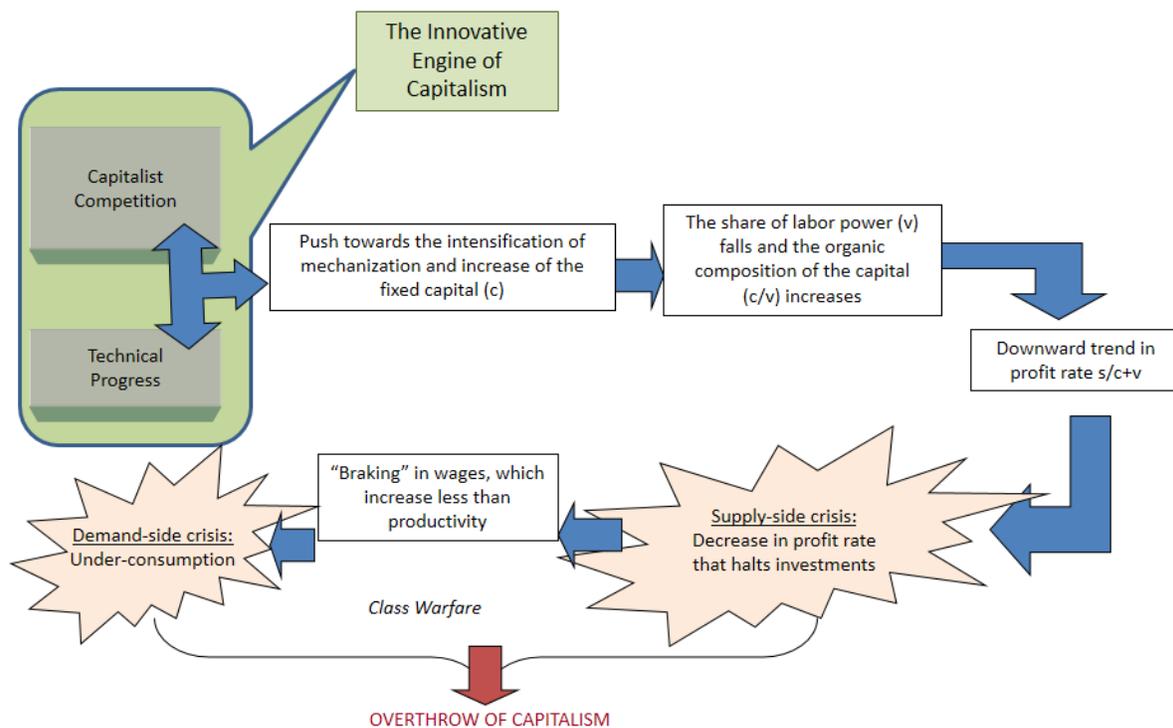
In the Marxian analytical perspective, the mode of production determines the overarching social structure that, in turn, defines the values, lifestyles, and cultures that set the developmental boundaries of the economic basis. These modes of production and social constructs co-evolve through endless dialectical conflicts, thereby creating new socioeconomic forms. At the developmental center of capitalism, Marx perceives deterministic productive forces in their historical development: these forces are the means of production. To this end, technological evolution lies at the center of socioeconomic development (Marx, 1955, p. 49): “*The hand-mill gives you society with the feudal lord; the steam-mill, society with the industrial capitalist.*” In the background, the source of socioeconomic development and innovative dynamics in Marx’s theoretical interpretation is found in the continuous accumulation and expansion of productive resources and the improvement of technology, a process defined by the overall dialectics of History.

Of course, Marx’s thinking is marked by the prediction of the “necessary” collapse of capitalism. As Marx (1996, p. 384) argues:

“The monopoly of capital becomes a fetter upon the mode of production, which has sprung up and flourished along with, and under it. Centralization of the

means of production and socialization of labor at last reach a point where they become incompatible with their capitalist integument. This integument is burst asunder. The knell of capitalist private property sounds. The expropriators are expropriated."

In the Marxian analysis, the usual reading of the crisis is sealed within a deterministic spirit: the collapse of capitalism appears as something historically prescribed and structurally unavoidable. In this explanatory chain, competition and technical progress push the intensification of mechanization and increase the fixed capital (c) in the production process. The share of the labor power (v) declines, and consequently, the organic composition of capital (c/v) increases. This condition leads to the inevitable downward trend in the profit rate (s/c+v). In this way, the supply-side crises take place, as the declining rate of profit hampers productive investment. At the same time, the “braking” in wages that increase less than productivity pushes for under-consumption and creates the substrate for demand-side crises as well (Figure 4).



**Fig. 4: The standard Marxian perspective on the crisis of capitalism.
Based on Vladoš (2017)**

Of course, historical developments do not validate the inevitable overthrow of capitalism. Today’s globalized capitalism continues to find ways of structural adjustment and regeneration,

preserving its innovative capacity and renewing its sources of profitability (Czarnitzki & Kraft, 2012). Is that although enough to nullify the overall Marxist rationale?

There are many fertile elements in the Marxian perspective. For example, Marx attaches significance to the place of labor in the continuous technological evolution of capitalism. For the real relationship between the machine and the worker, Marx (1973, p. 621) explains:

“The science which compels the inanimate limbs of the machinery, by their construction, to act purposefully, as an automaton, does not exist in the worker's consciousness, but rather acts upon him through the machine as an alien power, as the power of the machine itself.”

Therefore, does capitalism lead to the “alienation” of the worker? This question still ignites many controversies (Musto, 2010; Rey, 2012). Marx (1887, p. 239) himself was not that one-sided on the subject:

“modern industry, on the other hand, through its catastrophes imposes the necessity of recognizing, as a fundamental law of production, variation of work, consequently fitness of the laborer for varied work, consequently the greatest possible development of his varied aptitudes.”

Roth's (2010) study also helps to reveal the multiplicity of Marx's thought. After studying the collection of Marx's work, the author suggests that Marx was not so definitive about the future of capitalism. For example, it seems that Engels was the one to insert the sentence “*the rate of profit will fall in the long run*” in the third book of the Capital.

In conclusion, in the attempt to summarize important points from Marx's intricate work that relate to innovation, we can argue that the classical Marxist thinking offers a first dynamic and evolutionary approach to understand socioeconomic development. It also highlights the significance of structural unemployment that comes from the process of technological development. It also helps to clarify the dialectical relationship and co-identification between the technical (productive) and social (ideological) dimensions, which intertwine within the innovative evolution of any socioeconomic system. Finally, it seems that the Marxian thought was not that deterministic since it perceives that technical progress (a broadly defined innovation, in modern terminology) is an unavoidable condition in capitalism.

4. JOSEPH SCHUMPETER AND THE CREATIVE DESTRUCTION

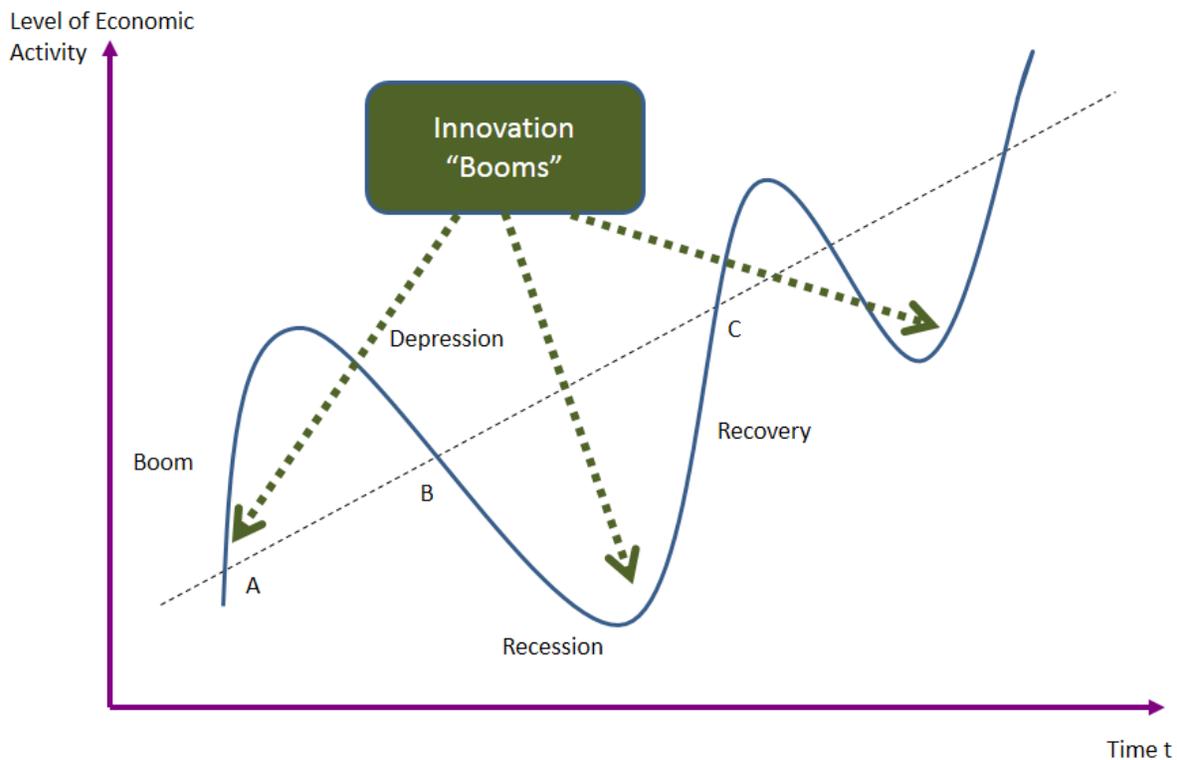
One of the leading economists of the early-mid twentieth century was Joseph Schumpeter. Schumpeter, who studied Marx's work (Andersen, 2009) extensively, explored the nature and

dynamics of innovation. Schumpeter's work analyzes specifically the dynamics of the continuous "revolution" of the capitalist economic structure as an endogenous evolutionary phenomenon. Schumpeter goes on to formulate a view of the dynamics of capitalist development that are in direct contrast to the neoclassical "equilibrium" simplifications. According to Schumpeter (1942, pp. 82–83), the *"evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment which changes and by its change alters the data of economic action ... The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates."*

In the Schumpeterian perspective, the capitalist enterprise produces changes and progress because it is compelled to find innovative ways in order to earn and retain profits. The difference between the Schumpeterian evolutionary perspective and the neoclassical economists' perspective is that Schumpeter treats uncertainty as a central interpretative aspect of economic development (Schumpeter, 1934). Accordingly, economic evolution is for Schumpeter discontinuous that disrupts equilibrium. Innovation, in particular, drives to a qualitative transformation and "creative destruction" where old modes of production are no longer capable of survival, thus leaving their place to new ones (Schumpeter, 1939).

In this context, the dialectical, of elevating character, evolution takes place in the economic system since cycles of prosperity and creative destruction co-evolve (Figure 5):

"The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation—if I may use that biological term—that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in" (Schumpeter, 1942, p. 83).



**Fig. 5: The dynamics of economic development, according to Schumpeter.
Based on Vladoš (2017)**

Schumpeter asserts that although the economy is heading to equilibrium periodically, this smooth course is not real development: economic development always happens through revolutionary changes and “booms” of innovation. Thus, he suggests that innovation is the impetus that keeps capitalism in constant movement deriving from the introduction of “new combinations” that generate and regenerate innovation flows and progress unstoppably. According to Schumpeter (1934, p. 117), innovation is:

“(1) The introduction of a new good — that is one with which consumers are not yet familiar — or of a new quality of a good. (2) The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. (3) The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before. (4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. (5) The

carrying out of the new organization of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position.”

For Schumpeter, the process of innovation revolutionizes the system structurally and causes subversive systemic imbalances; it is not a smooth and gradual transformation. Besides, innovations are not “*evenly distributed through time*” but “*appear, if at all, discontinuously in groups or swarms*” (Schumpeter, 1934, p. 223). In his perspective, several sectoral restructurings constantly recompose the overall cross-sectoral framework and determine the dynamics of the socioeconomic system (Figure 6).

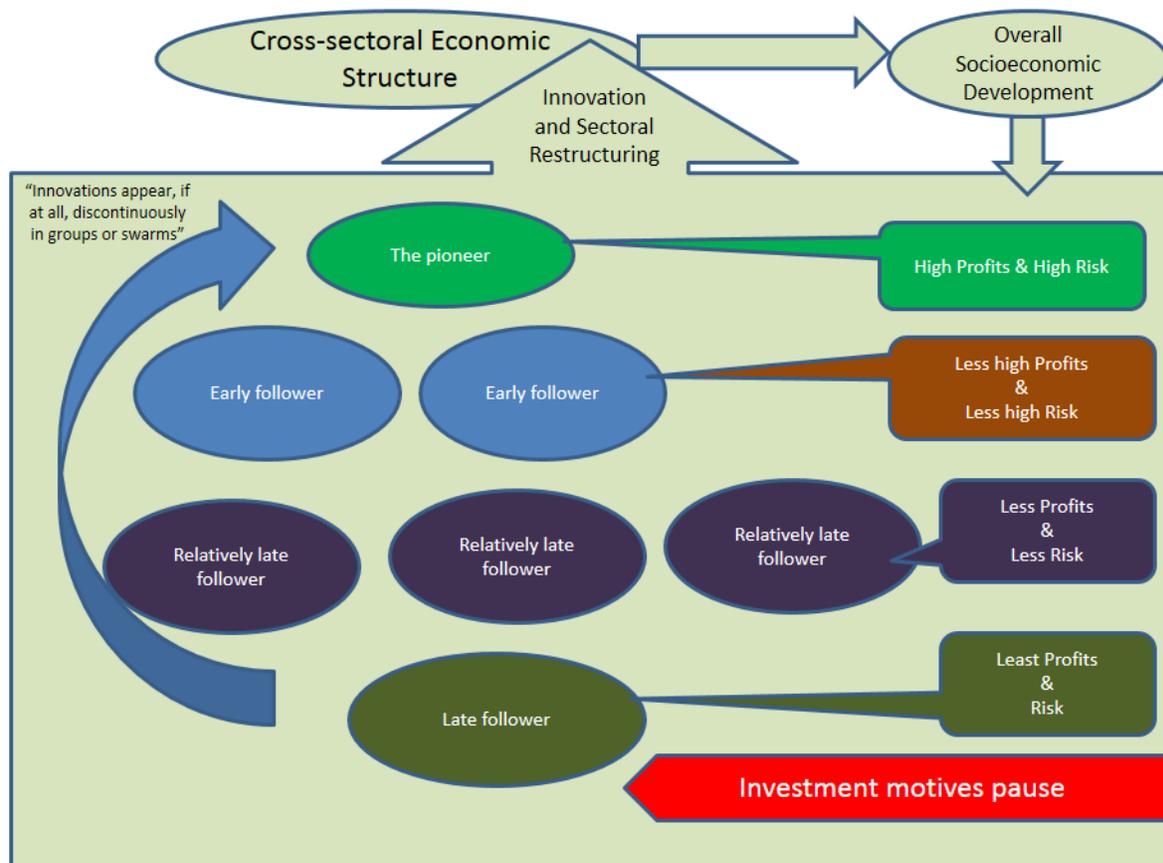


Fig. 6: The innovative entrepreneur and the followers, according to Schumpeter. Based on Vlados (2017)

In this way, in Schumpeter’s analysis of economic change, the entrepreneurs maintain the dominant role. According to Schumpeter (1928), this innovative producer-entrepreneur is never a

typical bureaucrat, nor a regular day-to-day problem handler. This entrepreneur is someone who takes risks and exceeds the established market “truths.” The innovative producer-entrepreneur has the will to establish a private empire. Moreover, where do the necessary investment resources for these “entrepreneurial revolutions” come from? Despite the steady increase in the national supply of means of production, development primarily consists of using existing resources in different ways for the production of new goods, regardless of the increase or decrease of these resources.

Of course, the means of financing innovation cannot come exclusively from the personal savings of the innovative entrepreneur. Banks have a crucial role in the process of economic development. Schumpeter argues that the banker is not the intermediary of the commodity called “purchasing power,” rather than the producer of that commodity. In most cases, the innovative entrepreneur has to resort to “credit” because most of the new entrepreneurial activities do not have income or cumulative profit from previous activities. Therefore, if a person is willing to become an entrepreneur, raising capital is the first step. Accordingly, credit comes from a “second player” in the revolutionary game of economic evolution: the “venture capitalist” who takes the risk and provides the necessary financial resources at the start of the venture.

Finally, what is the prospect of capitalism in such a volatile and revolutionary environment? Schumpeter concludes that there is no economic instability in the “order of things,” although instability exists within the “system.” In Schumpeter’s perspective, economic crises do not lead to the collapse of the capitalist system, as Marx predicted. However, Schumpeter also is pessimistic about the future of capitalism and predicts that capitalism will eventually be surpassed and transform into socialism. According to the Schumpeterian “pessimism,” three forces lead to the gradual deterioration of capitalism: (a) the decline of the entrepreneur’s role who is replaced by the technocrat of the large multi-shareholder corporation; (b) the destruction of the capitalist class that cannot protect its class interests; and (c) the deterioration of private property institutions. Of course, reality has not yet verified these “fears” of Schumpeter, at least until now.

In summary, the work of Schumpeter remains the cornerstone of economic science in the effort of understanding innovation dynamics, economic evolution, and the crisis of capitalism. In Schumpeter’s work, we do not cease to find an inexhaustible source of evolutionary thinking and analysis on modern capitalism. That is why many scholars have extended Schumpeter’s work to explain innovation, either explicitly or implicitly (Bodrožić & Adler, 2018; Hanusch & Pyka, 2007; Rahmeyer, 2016). The next section presents some relevant, more recent contributions.

5. NATIONAL INNOVATION SYSTEMS, TECHNO-ECONOMIC PARADIGMS, NATIONAL COMPETITIVENESS, AND A UNIFYING PERCEPTION OF INNOVATION INTO GLOBAL DYNAMICS

Innovation always exists and is reproduced within a historically specific socioeconomic environment. In essence, the development and diffusion of innovation in the different socioeconomic systems within the global system depend on institutional dimensions and the way these interact to create new knowledge.

To this end, the approach of “national innovation systems” systematizes these institutional dynamics (Freeman, 1995). To explain the “national system of innovation,” the study by OECD (1997), which provides a variety of definitions, is useful:

- *“The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.” (Freeman, 1987)*
- *‘The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state.’ (Lundvall, 1992)*
- *‘A set of institutions whose interactions determine the innovative performance ... of national firms.’ (Nelson, 1993)*
- *‘The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country.’ (Patel & Pavitt, 1994)*
- *‘That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies.’ (Metcalfe, 1995)”*

In non-technical language, these perspectives approach the phenomenon of innovation “bottom-up” rather than “top-down.” For the national system of innovation approaches, the competitiveness of the socioeconomic system is related to innovation directly. Knowledge and the organization of relationships, not only within the firm but also in the inter-firm relationships, are dependent upon the historically and spatially specific socioeconomic context, which is fully integrated nowadays in the overall dynamics of globalization (Figure 7).

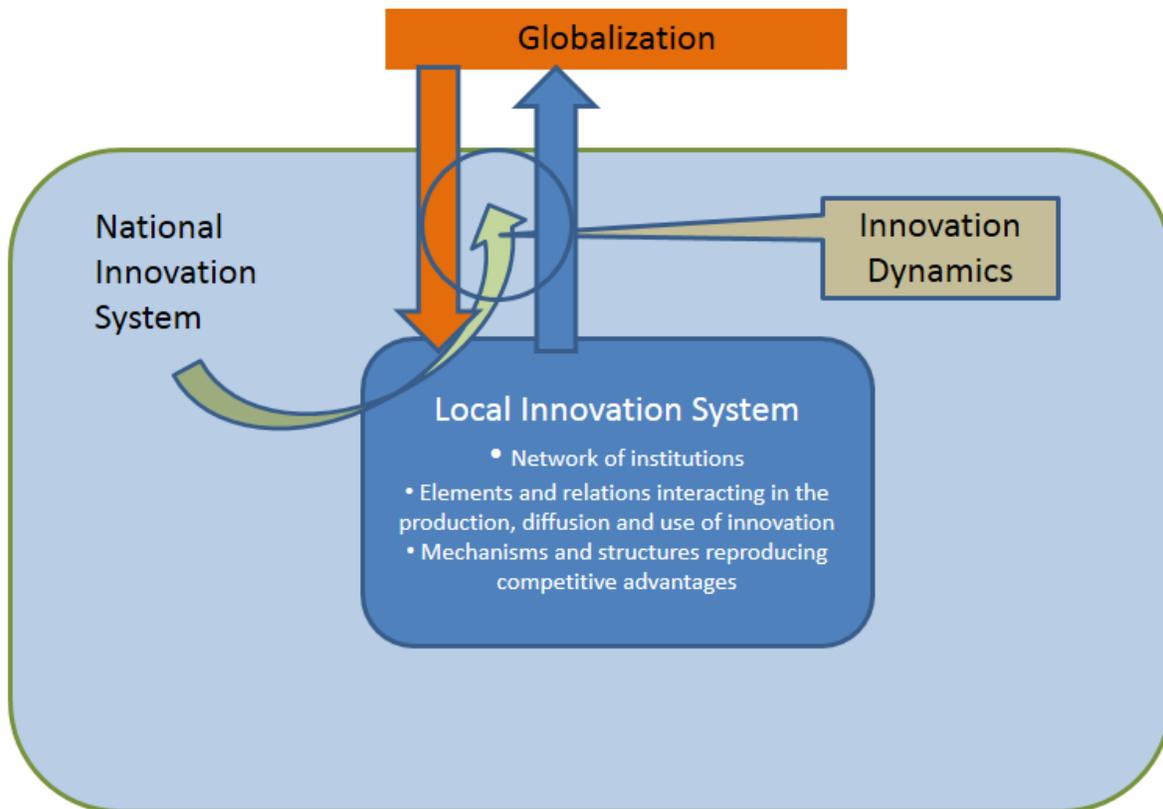


Fig. 7: A “bottom-up” innovation system. Based on Vlados (2017)

Based on this approach, the “milieu innovateur” (Aydalot, 1984), that is, the environment of innovation, is a complementary concept. The innovation environment corresponds to a set of diverse business operations and knowledge diffusion that is open to the outside and combines, in an evolutionary way, rules, expertise, and “capital relationnel” (the relational capital). In the environment of innovation perspective, spatial development is a byproduct of both innovative processes and socioeconomic synergies, all of which unfold within specific spatial contexts of local scope. Within the spatial system, the innovation environment translates to a “local innovation system,” where at least three aspects unfold and define innovation: the overall knowledge, the functional rules, and the relational capital in terms of the value of relationships that it produces.

Moreover, a more recent approach, which focuses on the dynamics of the firms that constitute this system of innovation, is the “business ecosystem” concept (Acs, Stam, Audretsch, & O’Connor, 2017; Moore, 1993; Vlados & Chatzinikolaou, 2019a). This concept, which applies an ecological metaphor to describe economic phenomena (Parisot, 2013), examines the spatially

established economic systems and the ways various socioeconomic phenomena take place. Overall, the business ecosystem concept studies co-evolving relationships between different economic actors, usually around a well-established firm (Iansiti & Levien, 2004), innovation, competitive advantage, or spatial relationships in general.

Another contribution that is moving in a converging direction belongs to Carlota Perez (1983, 2010). Perez's effort is about understanding the relationship between innovations, technical and institutional changes, and economic development. A key point of Perez's work is that during different periods of development, new technical fields attract investment and generated capital; therefore, a "new economy" accelerates and substitutes the old phase (the paradigm). The revolutions in technology are manifested in regular cycles that can be analyzed in a repetitive conceptual structure.

There is always an installation period, in which a radically new technology enters into a mature economy and disrupts to a very high degree existing technologies. Then, a deployment period follows, in which a new economy takes shape around this new technology. These two periods are connected, although in a turning point where the previous investments on the emerging technology have created a financial bubble by causing an economic collapse initially, but then paving the way for a healthier and more controlled deployment.

Specifically, Perez distinguishes during capitalism five techno-economic ages or five long "Kondratiev waves" (Barnett, 1998; Köhler, 2012; Kondratieff & Stolper, 1935). Kondratiev's theory of waves suggests that long-term cycles (50-60 years) of recessions and depressions exist that correspond to specific breakthrough technologies. According to Perez, these five waves are the following:

- i. Age of the first industrial revolution (1771-1829): the main techno-economic characteristics are the first mechanization of industry and the increase in wrought iron machinery.
- ii. Age of steam and railways (1829-1873): the main techno-economic characteristics are the emergence of steam technology that supported crucial new industries and the construction of transportation infrastructures such as railways, postal services, telegrams, ports, and steamboats.
- iii. Age of steel, electricity, and heavy engineering (1873-1918): the main techno-economic characteristics are the development and mass production of cheap steel and the spread of electricity grids.
- iv. Age of oil, automobile, and mass production (1918-1974): the main techno-economic characteristics are the rapid spread of internal combustion engines, the developments in the use of fuels and in construction technology, which accelerated the development of

- roads, road networks, motorways, and the creation of large telecommunication networks.
- v. Age of information and telecommunications (1971-present): the main techno-economic characteristics are the innovations in microelectronics, the emergence of computer technology, and the merging of global information and communication networks into a single global system.

Perez suggests that the change of the techno-economic paradigm takes place in periods of “explosive” growth only if a “good combination” exists, that is an operational “agreement” among the new “paradigm” of a long evolutionary wave and the socio-institutional climate surrounding this new technical development (Figure 8).

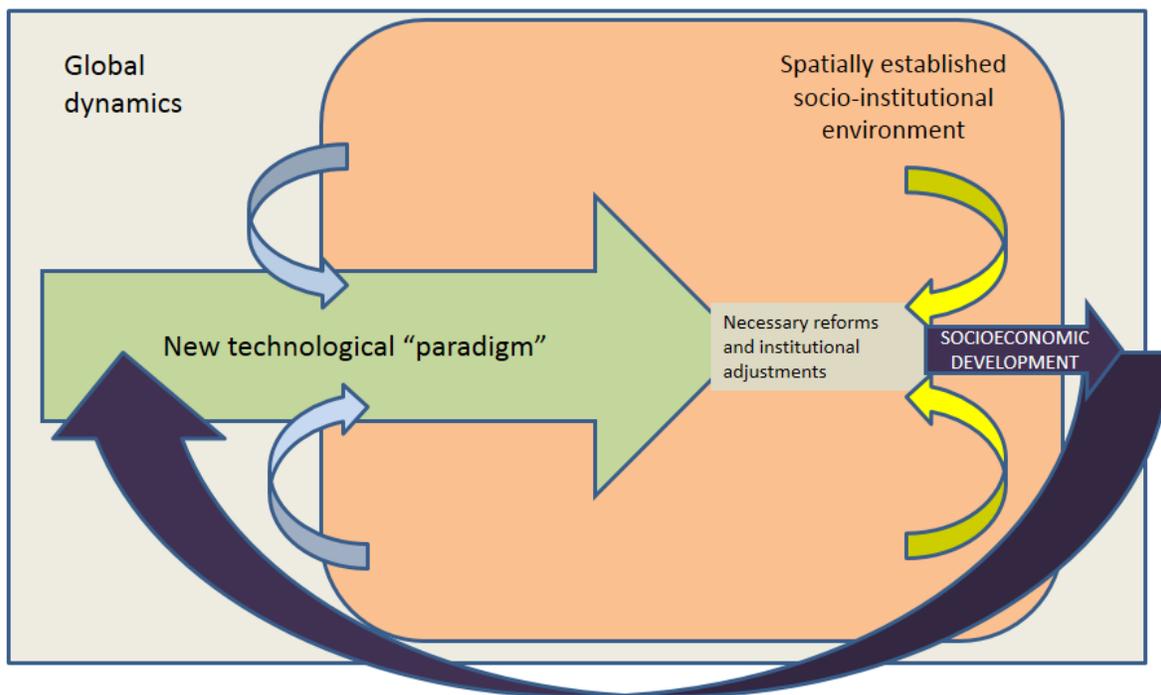


Fig. 8: The “paradigmatic” technological and economic change and the required institutional adaptation. Based on Vlados (2017)

In this perspective, recessions represent periods of a relative mismatch between the newly emerging technological paradigms and the overall institutional framework of the socioeconomic system that surrounds them. The new techno-economic paradigm might bring, according to Perez, inactivity because costs exceed productivity and, therefore, social and political reforms that will lead to overcoming this crisis are necessary (Freeman & Soete, 1994).

At the same time, Michael Porter gives his explanation of the productivity problem in terms of innovation. Porter (1990) states that national competitiveness is the byproduct of how four categories of factors shape the national environment of firms and industries: a) factors of production, b) demand conditions, c) related and supporting industries, and d) firm strategy, structure, and rivalry. To these determinants, Porter adds the factors of “chance” and “government” as external to the system. Porter uses further these determinants of national competitiveness of industries to distinguish national development in specific stages (Figure 9).

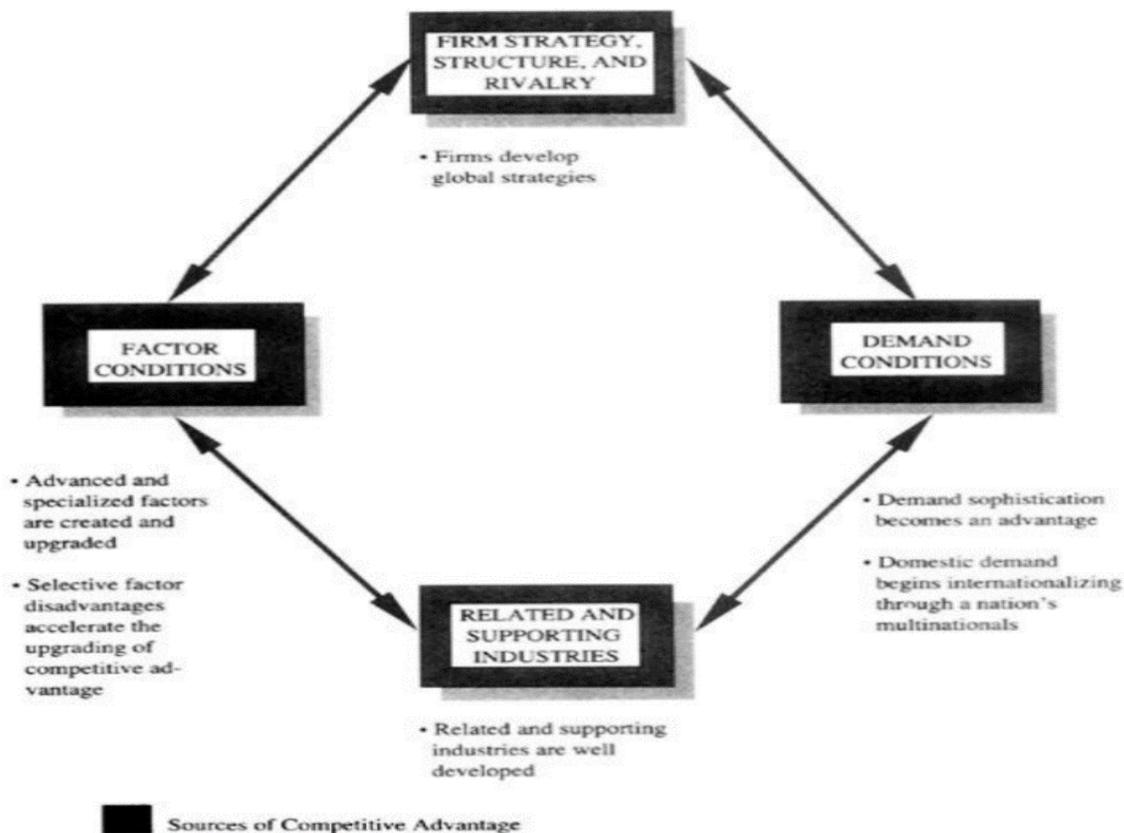


Fig. 9: The Innovation-driven economy. Reproduced from Porter (1990, p. 669)

The first stage corresponds to the “factor-driven” economy, where all thriving national industries draw advantages mostly from primary productive factors (such as natural resources). The second stage is the “investment-driven” economy, where domestic firms invest heavily, mostly on large-scale construction projects. The third is the “innovation-driven” stage, where the “diamond” of determinants is exploited fully since a large number of industries participate. The last stage corresponds to the “wealth-driven” economy, where the developed nations in terms of the

“competitiveness diamond” have to sustain their advantages deriving mostly from sophisticated industrial development. Therefore, this analysis explores the industrial structures of competitiveness, approached within the national context. A central hypothesis is that competitive advantages are not static and “endowed,” but they emerge evolutionarily from the combination of the “diamond factors.” National development and innovation depend on the historically formed institutions, at the level of individuals, firms, and industries.

Besides, Porter explains the links between national and global competitiveness by highlighting the significance of localities. Advantages stemming from innovation derive from a developing process where technology delimits the previous, traditional spatial advantages. However, in this process, innovation can also create new spatial competitive advantages, possibly at a higher level. Overall, innovation dynamics always derive from the specific “space,” which is the spatially established socioeconomic system. Besides, Porter suggests that governmental interventions must not defend old orders of things but take specific actions to accelerate change and innovation. In this overall context of economic development, Porter (1998, p. 59) insists on the critical role of business strategy: *“companies have to create an environment where people don't resist change but really expect it. An environment where companies cannibalize their own products, instead of waiting for some competitor to do it. Where companies render their own production processes obsolete rather than letting somebody else do it to them.”*

Therefore, we can understand that modern firms must “step upon” the innovative potential of their particular “place” to develop their capabilities for innovation. Accordingly, the broader socioeconomic space, at all levels, is an integrated system where all levels communicate and interact dynamically within globalization. According to Vladoš (2006), the “backbone” of this integration of the different socioeconomic formations is the byproduct of sectoral, sub-sectoral, and cross-sectoral supranational dynamics. The socioeconomic system, in its entirety, is an evolutionary interweaving of the different “production worlds” (Veltz, 2008) and the dynamics of innovation these “worlds” produce and reproduce at all spatial levels (Figure 10).

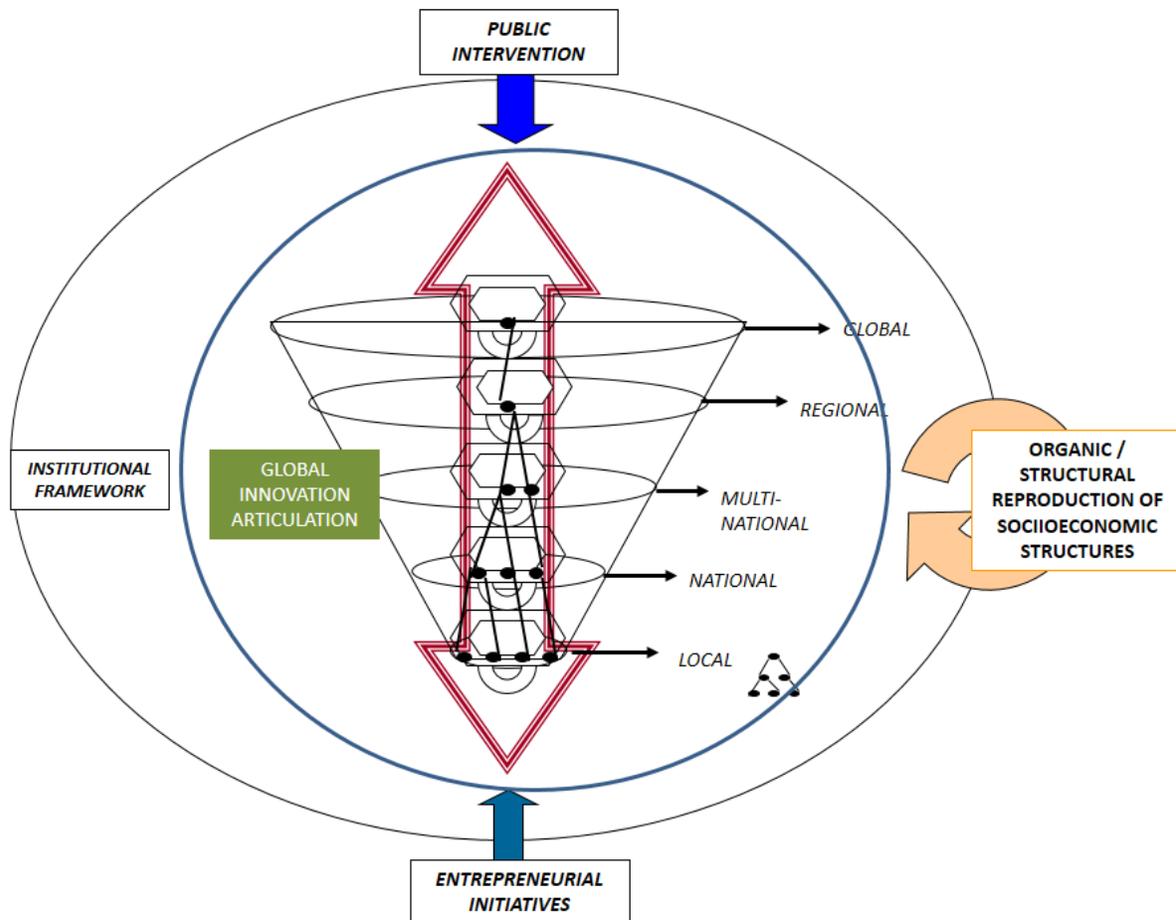


Fig. 10: From every partial level of space to the continuum of spatial levels of innovation in globalization. Based on Vlados (2006)

Nowadays, it seems that innovation constitutes the major developmental force in globalization. Different socioeconomic spatial entities intertwine dialectically in the global unification process. The unifying trajectories of the partial hierarchical socioeconomic systems, at every level (global, regional, supranational, national, local), are, in essence, production worlds linked with each other dynamically in sectoral, sub-sectoral and cross-sectoral terms. In this global context, at least four continuous forces leverage the partial socioeconomic systems and the overall dynamics of innovation: the organic and structural reproduction of social structures, the public intervention, the institutional variety and evolution, and the entrepreneurial initiatives (Vlados, 2019b; Vlados & Chatzinikolaou, 2019c).

All of the approaches above, which place particular emphasis on the spatial background of the innovation process, seem useful and accurate for conceptualizing how different socioeconomic

systems produce and reproduce innovation nowadays. It seems that we must take into account the role of all partial socioeconomic systems to understand their co-evolution in terms of innovation and change. Today, even more, the intensification of global competition, within the current restructuring crisis of globalization, seems to demand multiple interventions that can increase the innovative quality and cohesion, at all spatial levels (Vlados & Chatzinikolaou, 2019b; Vlados, Deniozos, & Chatzinikolaou, 2019).

6. CONCLUSIONS AND DISCUSSION

In this conceptual paper, we tried to explore, first, how the phenomenon of innovation unfolds in the critical hubs of economic science and, by extension, to present recent contributions that seem to emerge based on these “hubs.”

A central finding of this study is that although the approaches by A. Smith, K. Marx, J. Schumpeter emerge in different periods, they all assume that the economic system hosts multiple socioeconomic forces that transform its structural characteristics. For example, in Smith’s approach, a structural feature is the division of labor and specialization (innovation in modern terminology) within the capitalist enterprises that cause increasing returns. Humans demonstrate a tendency towards exchange, which is not only detrimental for the development of humankind (as Marx would argue later) but comes from a more profound sense of ethics and the need for personal prosperity and freedom. The man, who searches for fulfilling his interests, aspires to become as good as possible and exchange this value at the market.

Thereinafter, Marx argues that the system of capitalism carries internally constant technological improvement and multifaceted competition that pushes “even the most barbarian” nations to become civilized. However, inevitable supply-side and demand-side crises are leading to the definitive decline and finally overthrow of capitalism.

In this context, several years later, Schumpeter understands that this socioeconomic evolution of dialectical character in the system of capitalism involves at least one critical factor: the entrepreneurial innovation. Although Schumpeter seems to endorse the Marxian belief of the “advent of socialism” over time, his contribution to the analysis of entrepreneurial innovation constitutes probably the milestone for all the subsequent analyses on innovation. Schumpeter suggests that economic evolution follows a process of elevating type, where phases of recession give their place to phases of prosperity within the historical process. The innovative entrepreneur, in this perspective, acquires central importance, and innovation is, for the first time, defined thoroughly.

On top of these contributions, specialized theoretical and conceptual models of interpreting socioeconomic development begin to emerge. The approach of national innovation systems

presents how institutions constitute, in fact, a grid of relationships where, if these relationships are successful, they produce and diffuse innovation within the national system through mechanisms that reproduce specific competitive advantages. At the same time, the overall trajectory of capitalism follows a scheme of periodic changes in the “techno-economic” paradigms. In particular, waves of different technologies affect the substance and change the socio-institutional environment structurally, in all its aspects. Overall, it is of critical importance to foster the conditions that would allow an institutional adjustment primarily at the national system of innovation within global dynamics.

Upon the need for fostering an increasingly social and economically developed system, Porter’s approach towards the competitive advantage of nations acquires a central position to interpret innovation. Porter perceives a national economy to pass through different stages of development, which depend upon the level of development of specific national/industrial determinants. However, in a unifying perspective, it seems that innovation can be better conceptualized, especially within the current conditions of crisis and restructuring of globalization, as a constituent of not only national industries but also sub-sectoral and cross-sectoral supranational dynamics articulated now on combined local-global levels.

In the end, innovation is the factor that determines socioeconomic development, at all levels, that is, local, national, supranational, regional, and global. In this context, parallel as well as successive forces of political intervention, organic reproduction of social structures, entrepreneurial initiatives, and institutional forms and developments influence the multi-leveled partial socioeconomic systems.

To summarize, by synthesizing these contributions, we find that the conceptualization of innovation is deeply rooted, primarily in the contributions of classical economists. One of the critical characteristics that emerge from these findings is that innovation and the inherent change in socioeconomic systems are constant forces whose absence or existence defines the overall dynamics of development. On the foundations of economic science, innovation is a complex endogenous socioeconomic phenomenon and not a simplified exogenous, strictly technical, and social neutral, systemic inflow.

At this point, the significance of contemporary evolutionary economics to perceive innovation is critical (Nelson et al., 2018). In evolutionary economics, innovation and the Schumpeterian innovative entrepreneur are directly linked to the socioeconomic system’s level of development. In addition, the firms that create innovation are not “rational maximizers” since they demonstrate behaviors of “biological type” like “living organisms” that can also make “irrational decisions” to innovate and survive. In this sense, innovation is a discontinuous phenomenon, which

influences (and influenced by) the institution, which is an evolving, multi-level entity in constant transformation.

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