"Growth" in the Theory of the Firm: What Role for Entrepreneurship?

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Abstract

When explaining growth, the firm as its generator should be integrated into the theory. In this spirit, the aim of this paper is to connect growth theory to the theory of the firm. Since there is no such a link in neoclassical economics, we propose the Austrian economics as a framework to make a bridge, through the concept of entrepreneurship, between these two theories. We build our theory upon two concepts: the extended Kirznerian concept of entrepreneurship (Kirzner 1999) and those of physical and social technologies (Nelson 2002). Based on these, we differentiate between two types of entrepreneurship, both contributing to growth. The first is innovation which is an entrepreneurial act shifting the production possibility frontier (PPF) out. The second is spread which pushes the economy from an inefficient point towards an efficient one on the PPF. The essence of the firm in our theory resides in these two kinds of entrepreneurial acts.

Keywords: entrepreneurship, theory of the firm, growth, innovation, production possibility frontier

1. Introduction

It is hardly questionable that firms are the engines of economic growth: ”the most profound hypothesis from the comparative historical study of the development of advanced economies over the past century is that organizations – not markets – drive the process of economic development” (Lazonick 2002:40). No matter which firm activity is emphasized by a particular theory of the growth, namely research and development (Romer 1990, Aghion – Howitt 1992), learning-by-doing (Arrow 1962) investment in capital (Solow 1956) or human capital (Lucas 1988), growth occurs through the activities of the firm. However, neoclassical growth theories[1] are isolated from the theory of the firm, that is, they do not incorporate any understanding of the firm itself into an explanation of the growth. In growth theories firms are considered like in standard microeconomics: they are black boxes; and nothing is said about why they exist, how they come to existence and how they grow. Nevertheless, an incorporation of a firm as such into the growth theory should be necessary since the activities that are thought to be the causes of economic growth are not carried out automatically by the firm; rather they are the results of their rational behavior. On this basis, it becomes apparent that a theoretical link between the theory of the firm and growth theory would be necessary.

The above kind of shortcoming holds also for the theory of the firm which has two major branches, namely contractual theories of the firm[2] and knowledge-competence-based theories[3]. Contractual theories, being neoclassical, consider the firm an efficient contractual solution to the problem of different kinds of information asymmetry which lead to market failures. Briefly, the firm exists because of market imperfections. This is a negative argument for the existence of the firm: when something goes wrong with the market, the firm comes to existence. These theories focus on transaction costs economizing in a world where opportunism characterizes agents' behavior. Asset specificity is needed for them to tell a convincing story about why there should be firms in a market economy. Yet, the issue of investment decisions is important only for reasons of avoiding the hold-up problem

[1] By neoclassical growth theories we mean not only the original neoclassical model (Solow 1956), but also endogenous growth theory (Barro – Sala-i-Martin 1999, Aghion – Howitt 1998) and the so-called neoclassical revival (Mankiw – Romer – Weil 1992).

[2] Under contractual theories of the firm we refer to those theories of the firm that follow Coase (1937). Four major (relatively) homogeneous groups of theory can be distinguished (Foss 1993): (1) the nexus of contracts view (Alchian and Demsetz 1972, Jensen – Meckling 1976), (2) formal principal-agent theory (Holmström 1979), (3) transaction costs economics (Williamson 1985), (4) the theory of property rights (Hart 1995).

[3] This branch of the theory of the firm (Foss 1999, Grant 1996, Foss – Knudsen 1996) is rather heterogeneous. Of course, there is a slight difference in views within this branch, but, au fond, these theories share the same basic views as regards the nature of the firm. Here we do not make a distinction within this branch.

(Williamson 1985, Hart 1995): fear of being "held up" distorts ex ante investments levels. Here there exist no link between investments and firm growth. A lesson from the contractual theory of the firm is that, in order to establish a bridge between the theory of the firm and growth theory, a positive function should be given to the firm to perform.

As far as the knowledge-competence-based theory is concerned, it emphasizes the role of valuable, non marketable, non imitable resources – and among them firm-specific competences and tacit knowledge – which makes the existence of the firm necessary and enables to sustain competitive advantage. Clearly, here the firm is given a positive function, that is, to be a community in which investments in these competences, i.e., human assets may be incited. But, similarly to the contractual theories, by focusing on firm-specific competences and tacit knowledge, these theories neither are able to build a theoretical bridge towards integrating growth into the theory of the firm. However, a significant advantage of such a theory should be that this allows, through the growth process of the firm itself, to better explain both economic development and the nature of the firm. Of theories of the firm, in this respect, the only exception is Edith Penrose's (1959) theory of the growth of the firm which has been neglected for decades and becomes to be recognized only in the last 10 years.

The paper is organized as follows. Section 2 deals with the Penrosian theory. In Section 3 and 4 we discuss the neglect of entrepreneurship in neoclassical growth theories and neoclassical theories of the firm, respectively. Section 5 proposes two pillars on which the theory of the firm can be connected to growth theory: the extended Kirznerian (1999) concept of entrepreneurship and the concepts of physical and social technologies proposed by Nelson and Sampat (2001). In Section 6 we propose to differentiate between two types of entrepreneurship, i.e., innovation and spread both contributing to growth. Section 7 shows elements of the theory of the firm with a "growth theory flavor" and summarizes the main arguments.

2. An integrated growth theory and the theory of the firm: Penrose's theory

In her seminal work Penrose explains that firms may be understood as collections of resources and services[4], all organized under an administrative framework. A main argument in this book is that such a conceptualization is necessary for an understanding of the growth process and diversification of the activities of firms. Going along with production, firms are getting

[4] Penrose (1959) distinguishes between the resources and the services that the resources can render. "The services yielded by resources are a function of the way in which they are used" (Penrose 1959:25).

increased knowledge of the services that may be obtained from resources. The result of such learning processes, as Penrose argues, is, first, the expansion of the firm's "productive opportunity set"[5], and second, the release of managerial excess resources that can be used in other, mostly related areas. Since the opportunity costs of excess resources are zero, there will be strong incentives for diversification which causes the firm to grow. The point is that Penrose sees an endogenous mechanism behind the expansion: each move into a new product market enables the firm to utilize unused productive services but also requires investments in the creation of new productive services that are the basis for continuing growth of the firm.[6] Clearly, intangible resources, i.e., human resources and knowledge seem to play a key role in growth process.

These views constitute a powerful critique against certain aspects of the neoclassical (contractual) theory of the firm in which growth is simply a matter of adjusting to the equilibrium size of the firm. As opposed to this, Penrose argues that services are produced endogenously through various intra-firm learning processes which lead to "new combinations of resources" (Penrose 1959:85) while expanding productive opportunity set.[7] The main methodological strength of Penrose's work, as Lazonick (2002:24) argues, is the explicit recognition of the theoretical difference between the optimizing and the innovative (growth-generating) firm.

Penrose's insights, by stressing the importance of knowledge, entrepreneurship, change and uncertainty, are reflected in many respects in the Austrian theory of the firm[8]. The development of knowledge that Penrose very emphasized seems to be an echo of Hayek's (1937) views: knowledge is both diffused and localized. Any single firm spreads local knowledge through the use of the market, and takes advantage of knowledge supplied by others. In Penrose's view, this process takes place not only in the market, but also within the firm (Turvani 2001:165). Within the firm, on the one hand, knowledge is not available as a whole to anyone, and on the other hand, knowledge of "time and place" is produced and used. Thus, firms are depositories of specialized knowledge. Besides the emphasis on knowledge, entrepreneurship too is of first importance in Penrose's theory. In fact, her theory is an

[5] The opportunities that the firm's management team can see and can take advantage of.
[6] Here it is worth recalling the distinction between the concept of productive resources as Penrose understood and the neoclassical definition of productive factor: "a resource may be acquired in the market, but, as we have seen with managerial resources, it is only within the framework of the firm using it that it acquires its distinctive character (that is, thanks to its specific place in the process of administrative coordination)" (Turvani 2001:159).
[7] A consequence of this is that there is no equilibrium firm size as opposed to neoclassical theories of the firm.
[8] Strictly speaking, there is no such as an Austrian theory of the firm, rather, there are some authors (Foss 1994, 1997, Garrouste 1999, Ioannides 1999a, 1999b, Dulbecco 1998, Dulbecco – Garrouste 1999) who have come up with ideas about the firm in the Austrian tradition.

entrepreneurial theory of the firm[9] in which the vision of the entrepreneur plays an important role. Yet, a theoretical problem is that she associated entrepreneurship with personal characteristics such as imagination, temperament, vision, which hampers an understanding of entrepreneurship on its own.

Why is entrepreneurship so important when connecting firm behavior to growth? First, it is the entrepreneur whose behavior explains the mechanism of development; profit seeking entrepreneurship, no doubt, plays an important role in determining the performance of economies (Baumol 1990). Second, entrepreneurship is a major feature of the firm, that is, entrepreneurship is a sine qua non of the firm. For these reasons, entrepreneurship is a key concept in making a theoretical bridge between the theory of the firm and growth theory. But entrepreneurship in what sense? As it follows from our critique on Penrose (1959), one needs such a concept of entrepreneurship that gives it a meaning on its own. We will show below that the Austrian economics and its concept of entrepreneurship (Kirzner 1973, 1999) provide a framework in which growth theory can be connected to the theory of the firm.

3. Entrepreneurship and firms in growth theory

In the New Growth Theory[10] that has been developing for two decades both the role of the entrepreneur and that of the firms are neglected, which is somehow in parallel with what characterizes the theory of the firm. Although the entrepreneur and economic growth were in connection in the work of Schumpeter (1934), the development of the growth theory followed a different path. Starting with the works of Solow (1956, 1957), it focused on the aggregate models of growth and did not take the micromotives behind economic performance into account. Some branches of the New Growth Theory seem to have left this way, but, as it will be shown below, they failed to incorporate the role of the entrepreneur and that of the firm into an explanation of the growth.

[9] It is important to note that Knight (1921) also developed an entrepreneurial theory of the firm that does not follow the neoclassical path. Many of his insights appear in the Penrosian theory as well as in Austrian economics. (Just recall the importance of uncertainty.) His major view is that the entrepreneurial role involves entrepreneurial judgment which is neither a factor of production nor marketable. The decisions of Knight's entrepreneur concern those variables that are taken as given in the contractual theories of the firm.

[10] By this label we mean all those formal models that have been developed since Paul Romer's (1986) seminal paper.

The New Growth Theory has a number of fields whose unifying feature is that they are based on a general equilibrium framework[11], that is, an extremely decentralized economy. An important thing is that firms (such as households) are black boxes in this framework. As Demsetz (1995) argues, this is because this theoretical structure highlights the interdependence of production and consumption units, which is unambiguously an important feature of market economies. In models based on the general equilibrium structure, growth can only be modeled as a sequence of equilibrium states. There are two kinds of models based on general equilibrium: those assuming perfect competition, and the ones building upon monopolistic competition.

The perfect competition models of economic growth include models focusing on the role of human capital (Lucas 1988) and that of learning-by-doing or knowledge externalities (Arrow 1962, Romer 1986). Here the firm is absent for the same reason as it is in the Arrow-Debreu-model: by focusing on the interdependency between the players they fail to analyze the structure of these players and, consequently, the microstructure behind the accumulation process. The economy is always in a state of equilibrium in which no profit beyond the normal profit can be reached, and as a consequence there is no role for the entrepreneur. Because of rational expectations (perfect foresight in deterministic models) the would-be entrepreneurs could not gain pure profit. Even if an entrepreneur can realize an opportunity for pure profit, anyone else could do so at the same time, which makes arbitrage impossible.

The models that break away with perfect competition are those focusing on innovation stemming from the activities of profit maximizing firms. In order to be able to model competition in innovation, models have to assume away from the perfectly nonrival and nonexcludable characteristic of technology. With long (or ever)lasting patent rights, innovation becomes only partially excludable and the goods of the innovating sector become inhomogeneous, accordingly, one can not assume perfect competition any more. That is why these theories are based on monopolistic competition. In this literature (Romer 1990, Jones 2004) innovation is thought of as a process in which an increasing number of intermediate goods can be produced which are to be used for producing final products. Once bought an idea, the buyer gets a unique patent for that idea, which leads to monopolistic competition.

Another branch of innovation-based models is called Schumpeterian growth model (Aghion and Howitt 1992, 1998). Here a process of creative destruction works: an innovation

[11] Note that the starting point of recent growth models is the Ramsey-model (e.g., Lucas 1988) in which the characteristics of a general equilibrium model are better highlighted (e.g., the saving rate is not exogenous, instead, it is endogenized through the maximizing behavior of the consumer (Barro – Sala-i-Martin 1999:59-95).

that is the result of profit-maximizing activities of firms can drive the incumbent and less efficient competitor out of the market. Innovation is conceptualized as a stochastic process; firms are thought to be able to influence the probability of the arrival of an innovation by investing in innovation activities.

These innovation-based models seem to have integrated the entrepreneur into their framework for two reasons. First, because of imperfect competition the profit or the rent of owning a patent does not disappear, and, second, the fundamental cause of the growth is innovation. In addition, by applying an incomplete contract approach the Schumpeterian model is able to take into consideration the effects of ownership structure on the size and frequency (probability) of innovation (Aghion – Tirole 1994, Aghion – Howitt 1998). But having a closer look at this theory it turns out that it does not perform better than the models based on perfect competition. Why? Entrepreneurship is equated with innovation: the entrepreneur decides how much input (labor or capital) to allocate into innovation by comparing the returns on inputs in the innovation sector with that in other sector. This is nothing else but neoclassical economizing: rational decisions about resource allocation. Note that this role should not be called entrepreneurship, and the same applies, as we will explore below, to the role of the management in the contractual theory of the firm.

To sum it up, the reasons why the New Growth Theory leaves entrepreneurship out of account are as follows. One of its branches which goes back to Solow (1956) is concerned with the relationship between the national income and its differences across countries, and with other aggregates (Mankiw 1995). To investigate this question this branch applies general equilibrium approach. However, the Schumpeterian branch is more ambitious and aims at finding the final cause or the engine of growth (Jones 2004), or explaining the mechanics of development (Lucas 1988). Yet, similarly to the former, this theory also uses the general equilibrium framework. The general equilibrium framework characterized by normal profit and parametric uncertainty[12] cannot handle the entrepreneur.

4. The neglect of entrepreneurship in the contractual theory of the firm

[12] Langlois and Robertson (1995) make a distinction between two types of uncertainty, namely parametric (weaker form) and structural (stronger form) ones. Parametric uncertainty arises from market imperfections, that is the decision-maker knows the possible outcomes and their probability to occur. Structural uncertainty arises when a decision-maker needs to base his/her decisions on judgments about future outcomes that are unknowable. This kind of distinction is in accordance with Knight's (1921) concept of risk and uncertainty. In a risky situation agents can optimize since they know objective or subjective probability of each outcome. But, uncertainty appears when neither outcomes are known nor is probability distribution.

Contractual theories of the firm neglect the role of the entrepreneur, or broadly speaking the entrepreneurial character of the firm. As Baumol argued: „The theoretical firm is entrepreneurless – the Prince of Denmark has been expunged from the discussion of Hamlet" (Baumol 1968:66).[13]

Coase (1937) itself argued that within the firm, the entrepreneur may be able to reduce transaction costs by coordinating these activities himself. However, Coase is rather ambiguous as regards the entrepreneur (Boudreaux and Holcombe 1989). Although he sees the entrepreneur as exercising mechanical tasks, on the other hand, he also stresses certain aspects of the firm that are best understood as entrepreneurial activities. His followers, however, seem to follow the first path. According to Alchian and Demsetz (1972), the firm is an employment contract among separate input-owners whose revenue as a team exceeds the separate revenues of inputs in alternative uses. Since team production entails information asymmetries, agency problems, etc., it is efficient for one of the input-owners to become a central contractual agent and residual claimant. Surely, the entrepreneur here is seen as one of the input-providers, whose job is to monitor the behavior of the other input-providers in order to assure efficiency.[14] These views are developed further in Barzel (1987) where the question of who becomes the residual claimant is also explained: that input-provider assumes the role of the entrepreneur (residual claimant) whose actions are the most costly to monitor among collaborating input-owners. Jensen and Meckling (1976) generalized the Alchian and Demsetz concept. They abandon the notion of discretionary decision-making by entrepreneurs (Boudreaux – Holcombe 1989). Williamson (1985) dealt mainly with alternative institutional arrangements such as firms, markets and hybrids. He did not shed much light on the role of the entrepreneur. Implicitly, he thinks that the task of the entrepreneur is to identify the forces that cause the costs of using the market to be higher that those of using hierarchy.

To sum it up, entrepreneurship is considered in these theories a factor of production whose function is to reduce the costs of combining other factors into some given output. Clearly, entrepreneurship is confused with managerial activities. Why is the entrepreneur identified with the manager? It is not difficult to explain this: since all data (actor's knowledge and preferences as well as the technology) are given, i.e., there is no Knightian uncertainty, the neoclassical firm performs a pure mathematical calculation, which yields an optimum. To put it differently, by presuming a weaker form of uncertainty all decisions are a matter of

[13] When Baumol wrote these words in 1968 the contractual theories have not yet existed. He referred, presumably, to the firm of the standard price theory. We think his words apply to the contractual theories as well.
[14] The entrepreneur as monitor is not a genuine decision-maker, but a type of laborer who has a comparative advantage in monitoring individual acts (Boudreaux – Holcombe 1989:149).

calculation and no room is left for entrepreneurship. The neglect of the entrepreneur, on the other hand, is connected to the equilibrium approach. Contractual theories consider the firm in a state of equilibrium without providing an explanation for the process itself that leads to it, that is, „the Coasian firm implies a general-equilibrium framework" (Boudreaux – Holcombe 1989:147). In an equilibrium there is no competition, no profit opportunities to reach, and as a consequence no entrepreneurship. Briefly, since no unattended actions appear, both optimization (maximization) and equilibrium analysis are standard analytical tools in a neoclassical world.

Note also that the problem is not only that the entrepreneur cannot be integrated into the neoclassical theory of the firm, rather, it is that there is no need for this: when knowing all data, it is possible to optimize with regard the constraints. This is a kind of mechanical decision-making that is feasible when supposing to know the relevant means-ends framework. To sum it up, the neglect of entrepreneurship in neoclassical theories of the firm flows from two facts: first, the equilibrium approach, and second, the non-existence of the knowledge problem[15].

In neoclassical theories of the firm all knowledge is taken as common, that is, there exists only an informational problem: everyone knows the same things (common knowledge) or can know those at some costs. Instead of assuming private knowledge, contractual theories assume private information (e.g., principal-agent models). The problem of private information is equivalent with that of collecting and searching for data, i.e., all information may be collected at some costs. In contrast, Hayekian private knowledge (Hayek 1937) cannot be reached by anybody else. Accordingly, the neglect of entrepreneurship stems from what these theories think about knowledge. Briefly, the problem is that they focus on information, rather than on knowledge.[16]

[15] Hayek (1945:78) defined the economic problem as follows: "The peculiar character of the problem of a rational economic order is determined by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem of how to allocate a "given" resource – if "given" is taken to mean given to a single mind which deliberately solves the problem set by these data. It is rather a problem of how to secure the best use of resources known to any members of society for ends whose relative importance only these individuals know. Or, to put it briefly, it is a problem of the utilization of knowledge which is not given in its totality." By arguing this, Hayek pointed out that the major problem resides in the distributed character of the knowledge available in an economy and in the impossibility to centralize it.

[16] As argued by a number of writers (among others Minkler 1993), information and knowledge are different things. Information is a stock of data that can be communicated without a loss of integrity, while knowledge embodies processed information and cumulated practical capabilities that is hardly communicable (if possible) and can be acquired only by learning.

The agent who can mechanically calculate, i.e., optimize in the closed world that characterizes contractual theories is, of course, the manager. Clearly, it is totally mistaken to refer then to the manager as entrepreneur since the managerial and entrepreneurial functions are essentially different. The manager is an individual who oversees the ongoing efficiency of processes. Its task is to see what processes and techniques are available and to combine these in an appropriate way. He takes charge of not wasting inputs, scheduling contracts, and so forth. It is apparent that all activities and decisions encompassed in contractual theories of the firm are carried out by him. The entrepreneurial function is quite different. While there is no single concept of entrepreneurship[17], one thing is common in those concepts that do not follow the neoclassical path: entrepreneurship is not seen as one of the inputs to production like in neoclassical theories of the firm.

Thus, two lessons come from neoclassical theories: on the one hand, equilibrium approach is not appropriate when incorporating entrepreneurship, and, on the other hand, optimizing behavior excludes entrepreneurship. Based on these requirements, we argue that it is the Austrian economics that constitutes an appropriate framework for developing such a theory of the firm that can incorporate a mechanism leading to growth. A major advantage of the Austrian approach, we think, is that entrepreneurship is conceptualized on its own, rather than associated with another concept such as innovation as in Schumpeterian theory[18].

5. Kirznerian entrepreneurship and technologies

The notion of entrepreneurship as understood in modern Austrian economics is developed by Kirzner (1973, 1997) whose theory is built on Hayek's insights about the market process (Hayek 1937) and Mises's view of the entrepreneur (Mises 1949). In the heart of Hayek's views about how the market works is the notion of equilibrium: "… equilibrium … exists if the actions of all members of the society over a period are all executions of their respective individual plans on which each decided at the beginning of the period" (Hayek 1937:37). This means that the foresights of each individual are correct. However, when individuals' plans were based on wrong assumptions concerning the external facts, plans may have to be changed. Once the plans have changed, the knowledge of the different individuals is supposed

[17] For an overview of concepts see: Kapás (2000), Foss – Klein (2004).
[18] According to Schumpeter (1934) "the essence of entrepreneurship is the ability to break away from routine", i.e., to launch new products, new technology into the market. Clearly, this is innovation. To him, entrepreneurship and innovation are one and the same, which hampers conceptually differentiate between them. Here entrepreneurship is associated with creating disequilibrium.

to come more and more into agreement. This is how market works; where the process itself is important, and not its final state.

According to Mises (1949), human action encompasses two elements: (1) a purposive, and (2) an entrepreneurial element. For Mises, the essential element in action is goal pursuit, not maximization. The entrepreneurial element is related to subjectivism including the insight that any ends-means framework relevant to a human action has itself been actively chosen in the course of that action. According to these two elements, the individual fulfills two tasks: (1) he or she identifies the relevant means-ends framework (entrepreneurial element), (2) within this means-ends framework he or she strives to achieve the goal. A major significance of Mises' concept is that, first, it attempts to define the general framework of rationality, and, second, it gives an anthropological meaning to entrepreneurship (Kapás 2002).

Kirzner (1973) follows Hayek when giving us a theory of equilibration, rather than of equilibrium. He gives the world entrepreneurship a double meaning (Koppl 2002). On the one hand, he defines entrepreneurship as alertness to profit opportunities (Kirner 1973). In this meaning, it is a praxeological category. On the other hand, entrepreneurship is an activity that consists of arbitrage.

Kirzner defines alertness as "knowledge of where to find data" (Kirzner 1973:67), and as such, it is contrasted with neoclassical maximizing. He also emphasizes that profit opportunities cannot be the subject of systematic search; instead, they must be discovered. The discovery approach to entrepreneurship comes from the nature of economic environment in which human action takes place. The economic environment is seen in the Austrian economics as one characterized by radical uncertainty[19] (O'Driscoll and Rizzo 1985). In such an environment, the neoclassical maximizing behavior cannot work because the actors do not know what they do not know. It is entrepreneurial alertness that leads to the discovery of possible alternatives. In this open world, as Koppl (2002) argues, Kirzner's concept of alertness may be usefully understood as the propensity to problematize open possibilities.[20]

The other meaning with which entrepreneurship is associated is arbitrage. The simplest way to consider it is to examine a single-period, single-commodity market. As we know from Hayek (1937), there are always sellers and buyers in the market who cannot realize their individual plans. This makes arbitrage possible: because of ignorance a seller can sell his or her goods at a price which is lower than he or she could receive elsewhere in the market; or a

[19] This can be paralleled to Knightian uncertainty and structural uncertainty (Langlois and Roberston 1995). See footnote 12.

[20] „It is through alertness that the possibilities between which the agent chooses are constituted. It is thus an aspect of all action, but cannot itself bear an opportunity cost." (Koppl 2002:11)

buyer can buy goods at higher price than he would have had to pay elsewhere. According to Kirzner, the role of the entrepreneur lies in the discovery of such kind of mistakes, and taking advantage of pure profit opportunities: he or she will buy goods at lower price and will sell it at higher price after having discovered price discrepancy. Thus, the individual plans are getting more and more mutually consistent, i.e., entrepreneurial actions bring the market towards its equilibrium just like in Hayek's theory. An important thing is that, as opposed to the search that involves costs, there is no opportunity costs associated with the discovery of price differences.[21]

Our argument is that the original notion of the entrepreneurship (Kirzner 1973) should and must be developed further in three steps. The first step was the introduction of intertemporality (Kizner 1982, 1999) which, by broadening the concept of the arbitrage, allowed to explore the obvious link between uncertainty and alertness. In this sense arbitrage means acting upon the difference between the present input prices and the discounted future output prices. Since the entrepreneurs "construct the future" (Kirzner 1999:10), intertemporality implies that the entrepreneur must possess those characteristics such as creativity and imagination by which economists traditionally (e.g. Penrose 1959) defined it. Kizner (1999:13) itself admits that "the multi-period world requires its entrepreneurs to display the Schumpeterian qualities"[22]. But, as Kirzner (1999:12) argues, "the analytical essence of the pure entrepreneurial role is itself independent of these specific qualities", that is, entrepreneurship as alertness is a definition on its own; and it may encompass several personal characteristics (amongst them creativity).

It is important to note that the intertemporal aspect of the entrepreneurship lies in the discovery of price discrepancy between present and future markets. The entrepreneur may have the possibility to affect future prices instead of taking it as given like in the single-period case. One of the means of affecting future price is applying better technology. Surely, the introduction of production and technology into the original Kirznerian framework (Kirzner 1973) brings it closer to that of other approaches such as that of Schumpeter. This is the second step by which – following Kirzner (1999) – we propose to develop further the notion of entrepreneurship. The major thing is that the possibility of introducing new technology

[21] While entrepreneurial discovery is costless, the entrepreneur, of course, does calculate the costs of acting on what he has noticed (Koppl 2002).

[22] It is worth noting that Kirzner (1999) seems to be not at all contrasted with Schumpeter, contrary to what Kirzner (1973) claimed. Originally Kirzner (1973) saw the differences as follows: "Schumpeter's entrepreneur, I pointed out, was essentially disruptive, destroying the preexisting state of equilibrium. My entrepreneur, on the other hand, was responsible for the tendency through which initial condition of disequilibrium come systematically to be displaced by equilibrative market competition" (Kirzner 1999:5).

suggests a broader interpretation of profit opportunities and coordination. When a new, more efficient technology is available, the individual plans of market actors become discoordinated in the same way as they were in the case of the single-period market. The consumers pay a higher price for the good than they would have to, had the new technology been already applied. The role of the entrepreneur is, not surprisingly, to discover this price discrepancy and take advantage of it by introducing a new technology into the market. Of course, this action can easily crowd the old technology out of the market. This is what Schumpeter called creative destruction. What is important to note here is that the essence of entrepreneurship remains the same, i.e., it is the discovery and the exploitation of pure profit opportunities.

As shown above, technology affects entrepreneurship and vice versa. This is to say that entrepreneurship in the Kirznerian sense (Kirzner 1999) encompasses entrepreneurship in the Schumpeterian sense, indeed, these two are intertwined. In order to better understand this, we argue, one has to make a third step in broadening the notion of entrepreneurship, by applying the concepts of physical and social technologies of Nelson and Sampat (2001).

Nelson and Sampat (2001) propose to distinguish between physical and social technologies. Physical technology is something that is traditionally understood as technology by scholars of economic growth, that is, production technology. Moreover, in order to get the physical technology work, one needs to apply some kind of division of labor and modes of coordination. These two together form social technology. This is a broad concept encompassing both ways of organizing activities within organizations, and ways of organizing transactions across organizational borders, which involves patterned human interactions. Social technologies provide a low transaction cost ways of getting something done. Nelson (2002) also argues that social technologies are to seen not so much as constraints on behavior, but rather as defining the effective way to do something.

No doubt that physical technology must be somehow in accordance with social technology. But, this accordance is not assured automatically. How does this come about? When a new physical technology is introduced, it may be that this does not fit in very well with the existing social technology. When this is the case, the entrepreneur can assure the accordance by discovering a new social technology: working out a new way of division of labor and a new way of coordination. Thus, the same holds for an existing physical technology: it may also be that this could work better with a new social technology, which also means entrepreneurial discovery, and as a consequence, gaining pure profit.

The important thing is that physical and social technologies change at different rate: while changes in physical technology are rather continuous, social technology entails many

inertial elements making changes in social technology discontinuous. This implies that social technology has certain flexibility (Nelson – Sampat 2001) to work well with various physical technologies. Based on these, we agree with Nelson's (2002:26) opinion according to which "physical technologies continue to play the leading role" in changes, and "social technologies … enable the implementation of physical technologies".

This being said, we propose to associate both kinds of technological changes with the acts of the entrepreneur. We call innovation the act when the alert entrepreneur introduces new physical and/or social technologies and spread when he or she discovers that technologies employed by other entrepreneurs are more efficient than those used by him or her and as a consequence he or she adopts those. The important thing to note is that these two are manifestations of the Kirznerian entrepreneurship whose essence, of course, consists in alertness and arbitrage. An advantage of such a conceptualization is that innovation and entrepreneurship are not equated with one other like in Schumpeter (1934); instead, they are concepts on their own. In addition, concepts of physical and social technologies make it possible to connect entrepreneurship to the firm. This is an important issue since the link between the original Kirznerian entrepreneurship (Kirzner 1973) and the theory of the firm is rather weak (Foss and Klein 2004): here the entrepreneur does not need a firm to exercise his function. "He *(Kirzner 1973, added by us)* abstracts from the fact that entrepreneurial activity achieves coordination not only via markets but in many cases also, in a most essential ways, through organizing a firm" (Witt 1999:99). As opposed to this, we argue that when building upon the extended Kirznerian concept the entrepreneur does need firms, as Witt (1999) also highlighted it in a somehow different context, in order to realize their plans. We develop detailed ideas along these lines below.

6. Entrepreneurship, firm, growth

Economic development is usually imagined as a shift in the production possibility frontier (PPF) of a country, which means that more (consumption or investment) goods can be produced with the same amount of resources. In neoclassical growth theory this means that the exogenous or endogenous technological improvement shifts the curve out and the new equilibrium lies at this new curve. Thus the economy is always at its PPF although this PPF is being shifted out.

When entrepreneurship and competition are understood in its Kirznerian sense, the economy is always outside the equilibrium, although it is always getting closer to it. Since the

economy never reaches its state of equilibrium, as Hayek (1937) argued, and there are always profit opportunities left unexploited (Holcombe 2003), the economy is never at the frontier of its production possibilities. If this is the case, following Boettke and Coyne (2003), we can differentiate between two roles of the entrepreneur. Entrepreneurial discoveries (1) may push the economy towards the PPF which makes the economy more efficient[23], and (2) may shift the PPF out. Thus, from an entrepreneurial point of view the economic development is not to be seen as the continual shifting of the PPF at which the economy is. Rather, it can be viewed as a process during which the PPF is shifting out, but, the economy never lies at his frontier. While the frontier is continuously moving, the nearness to its frontier has a relative meaning.

But why doesn't the economy come to rest reaching its equilibrium after a while? Or to put it differently, why don't profit opportunities run out[24]? Although Kirzner's theory of entrepreneurship is based on the existence of profit opportunities, he does not deal with the problem of where profit opportunities originate. That is why, as Holcombe (1998, 2003) argues, one can make the theory of entrepreneurship more complete by giving an explanation for the origin of profit opportunities. As he points out, the main source of profit opportunities lies in the activities of other entrepreneurs. First, technological changes depend on each other: one innovation induces others. Second, market is a process of trial and error. Entrepreneurs make errors that are realized by other entrepreneurs. By discovering the mistakes of other entrepreneurs another can make success of the same innovation. Third, entrepreneurial actions can make the old technology obsolete, so entrepreneurship can also destroy profit opportunities. But "new opportunities created must make better use of resources then the old opportunities, because if they did not, the old opportunities would still be potentially profitable" (Holcombe 1999b:76).

Our argument is that in the Kirznerian framework the notion of social and physical technology can be combined with the dual role of the entrepreneur. Discovering an intertemporal profit opportunity means realizing that applying a new technology implies lower cost and/or higher revenue in the future. The new technology could be, of course, not only physical but also social one. A new or an old physical technology can be improved by a new mode of division of labor and of coordination. The discovery of a new social or physical

[23] Whether the exploitation of profit opportunities implies more efficient production depends on the broad institutional structure that defines profit opportunities (Baumol 1990).

[24] Whether the existence of unnoticed profit opportunities means that the economy is in disequilibrium depends on the definition of equilibrium. As shown by Holcombe (1999a) Kirzner's definition of equilibrium differs from that of Hayek. In the Hayekian equilibrium one can exploit a profit opportunity, i.e. when individual plans are compatible while this is not possible in the Kirznerian one. From this point of view, innovation is disequilibrating, spread is equilibrating in the Hayekian sense but both are equilibrating in the Kirznerian sense.

technology pushes the PPF out. Sooner or later other entrepreneurs also discover the improved efficiency of these new technologies. They discover that by applying these new technologies developed by other entrepreneurs they can gain profit. That is they imitate the new social or physical technologies. By doing this they improve the efficiency of the whole economy.

On the basis of these, we argue that the two roles of the entrepreneur discussed above manifest in what we call innovation and spread, respectively. Following Nelson and Sampat (2001) we have emphasized that physical and social technologies together determine the efficiency of production. We also have shown that entrepreneurship consists in alertness to and discovery of profit opportunities even in intertemporal terms. Based on the two roles of entrepreneur and the two kinds of technology, there exits, au fond, four kinds of entrepreneurial discovery. These are as follows.

First, the entrepreneur can discover that applying a new physical technology in production can lead to intertemporal profit opportunity. This is not only discovery in its traditional sense, but, the central idea is that the application of new physical technologies may lead to gain pure profit. A successful implementation requires from the entrepreneur not only technological knowledge, but also tacit, time- and place-specific knowledge. The fact that those who make profit of an idea are not the original inventors supports this idea.

Second, discovering new social technologies can also involve pure profit: new ways of organizing production, that is, a new mode of division of labor and coordination improves the efficiency and brings profit. A new mode of division of labor implies a new knowledge problem that has to be solved inside the firm, or by a new way of organizing transactions across firms in the market. Thus when the entrepreneur works out a new mode of coordination, he or she makes an attempt to solve this new kind of knowledge problem, and the series of such social innovation can be interpreted as the (spontaneous) evolution of the firm[25], and at the same time, of contracting institutions of the market.

[25] This may be well demonstrated on the example of the evolution of firm forms. As said above modes of organizing activities both within and across firms are to be considered social technologies. Of these let us consider the variants (forms) of the firm. The traditional firm form was the U-form (Williamson 1985). But during the mid 19th century, due to the technological innovations a new production technology of the mass production became dominant. However, the most important new technology were railroads which were not only "the first modern business enterprises" (Chandler 1977:120), but also to a significant extent new technology for manufacturing firms. Railroad contributed to a dramatic decrease in transportation costs, and as a result it expanded the market in way never seen before. This new physical technology required new social technology, i.e., new modes of organizing businesses in order to take advantage of the new opportunities of scale and scope. At that time the new social technology was the M-form structure which, as Chandler argued, arose and succeeded because it was more efficient than its predecessors. The same process takes place in the New Economy: information and communication technology change at a rate never seen before. The new technology

These two roles, i.e., the discovery of new physical and social technologies are called innovation which pushes the PPF out. Innovation as we understand has to be contrasted with its neoclassical meaning where it is depicted as research and development activity that is produced by applying inputs, rather than as an entrepreneurial discovery process (Holcombe 1998). The main point is that innovation is not equated with entrepreneurship, that is, not all entrepreneurial activities are to be seen as innovation unlike in Schumpeter (1934). On the other hand, innovation is, surely, always a manifestation of entrepreneurship.

Third, it must also be seen as the discovery of profit opportunity when an entrepreneur realizes that by applying physical technology introduced by other entrepreneurs, he or she can gain profit. This is connected to the origins of profit opportunities. With different knowledge of time and place, an entrepreneur can even make success of physical technology that proved to be unsuccessful when applied by other entrepreneurs. But this kind of entrepreneurship can also refer to a simple imitation of a new and successful physical technology.

Fourth, it is obvious that the same kind of imitation-argument can be applied to social technology too. It also seems reasonable that applying social technology is more difficult because it requires more tacit knowledge. A new way of organizing production can also mean more efficient production (and thus profit opportunity) even with a different physical technology. That is, the efficiency of the social technologies can differ from place to place even with the same physical technology.

These two latter differ from the previous two ones, and these are the ones we call spread because these entrepreneurial actions can be resulted in spreading of new, more efficient technologies over the economy. It has to be noted that spread is not only a mechanistic activity; rather it is an entrepreneurial action, and also a process of trial and error. Therefore, even if a developing country can imitate the most developed (physical) technology of highly developed countries, the role of competition in economic growth is not mitigated: there is still need for entrepreneurship.

It becomes now clear that the two kinds of entrepreneurship, that is, the one that shifts the PPF out and the other one that pushes the economy closer to it occur in two different ways. Innovation shifts out the PPF because both the discovery of new physical and new social technology makes it possible to produce more with the same amount of resources. The spread

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diffuses rapidly in the economy. Moreover, this new information technology provokes fundamental changes in production technology which could not work well with the M-form structure: it requires new social technologies. Amongst them, a new firm structure emerges, namely a decentralized-disintegrated one. Firms use these to a considerable extent because of the changes in physical technology.

brings the economy closer to its PPF because both the imitation of physical and social technology raises the efficiency of more and more firms, and thus the whole economy.

To sum it up, development is fueled by innovation and spread. The point is that growth occurs due to these two kinds of entrepreneurship, and not to an increase in resources. Therefore, this does not mean that entrepreneurship is the (final) cause of growth (Holcombe 1998, Boettke and Coyne 2003); instead, it is the institutional environment that encourages entrepreneurship which then contributes to growth. This is an important issue because, in this framework, the potential for growth is unlimited, in contrast with neoclassical growth theory. At this point the major question is that of how an understanding of the growth process helps the better understanding of the nature of the firm.

7. Conclusions

On the basis of what was said above, we propose to conceive the firm as an element of social technology that provides those institutions that encourage entrepreneurship leading to growth. An advantage of such a conceptualization is that it endogenizes growth process which, in turn, takes place in the following way.

Let us start with that that an alert entrepreneur discovers a pure profit opportunity; no matter whether this results from innovation or spread. In order to exploit this, he or she needs the firm for the reasons explored by Witt (1999). As he argues, the entrepreneur always acts on the basis of what he or she thinks, that is, the business concept. When following the business concept, the entrepreneur should impose the perceived means-ends framework on the market, which requires the transmission of an interpretative concept of his or her business concept among those people with which he or she works together to exploit the perceived profit opportunity. Since the character of the business conceptions is rather unspecific, i.e., tacit, it would be difficult for the entrepreneur to communicate these to persons outside the firm, that is why he or she needs the firm. Through the transmission, the entrepreneur sets the foundation for communication process and socialization among firm members.

Once the firm established, within it, the entrepreneur uses different kinds of physical and social technologies in order to exploit the perceived profit opportunities. But it has to be noted that the firm itself is also to be seen as an element of social technology which, however, consists of other elements of social technology. This is simple to explore: the firm, on the one hand, uses a number of devices for coordinating activities across firm members such as command, reward system, communication channels, trust and so forth; and on the other hand,

can be structured in many ways (functionally, multidivisionally, etc.), which favors different kinds of division of labor. As argued below, both the coordinating devices and organizational principles are part of the social technology. Nevertheless, the point is that not only these devices are to be seen as parts of the social technology, but also the firm itself in terms of being one of the governance structures (Williamson 1985). When the entrepreneur organizes a firm to exploit profit opportunities, he or she deliberately chooses the firm amongst other elements of social technology such as market or hybrid forms. At this point it becomes clear that since the firm serves the exploitation of profit opportunities it contributes to economic growth. All this concerns the creation of a firm, but what explains its continuous existence?

The answer lies in the fact that the entrepreneur may discover that the introduction of new technologies or the application of the technologies used by others leads to profit gaining. Both innovation and spread are to be seen as manifestations of entrepreneurship. When innovating and/or imitating the entrepreneur has to experiment which should be managed in a way to lead to the best results. And the locus of these managed experimental activities is the firm (Foss and Foss 1999)[26].

As shown above, the discovery of profit opportunities requires the creation and the perpetuance of the firm. It follows from this that both kinds of entrepreneurship (innovation and spread) are embedded in a particular set of social technology called firm. When changing elements of this particular social technology (for instance changing organizational structure) as well as other elements of the social technology (for instance contracting modes in the market), the entrepreneur induces growth. Of course, the same apply to the physical technology.

To sum it up, when admitting that (1) entrepreneurs need firm, and (2) entrepreneurship manifests either in innovation or in spread both inducing growth, the theory of the firm is an entrepreneurial one which at the same time is able to explain growth. In this framework the firm is conceived as an element of social technology; and the choice itself of this particular social technology must be also seen as part of the entrepreneur's decisions. Then the entrepreneur uses the firm as a particular social technology supporting his or her entrepreneurial acts (innovation and spread). It becomes now apparent that the essence of the firm in our theory does not at all reside in resource allocation, instead, in entrepreneurial acts (innovation, spread). This is the firm which can generate growth.

[26] This also means that experimentation is important for all kinds of entrepreneurship, not only for the first one (introduction of new physical technology). This does not support the argument that competition is less important in developing countries than in developed countries. Competition is the process of trial and error, which enables the entrepreneur to experiment with new (social or physical) technologies.

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