

THE CORRELATION BETWEEN RESEARCH & DEVELOPMENT AND THE ECONOMIC GROWTH IN ROMANIA

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Abstract: The increasing productivity of production factors, due to progresses in science and technology is today the engine of economic growth. The economic theory managed to endogenize the technical progress, first as a result of the unintended activities of firms, then as the result of profit driven behaviour of economic agents. In globalization the stock of knowledge becomes available also to developing countries and the production technologies and their employment are more democratic regarding the availability. For the developing countries it still remains the problem of financial resources and availability. Developing new technologies has a prohibitive costs, at least until the moment in which large scale production allows for the reduction of costs. Long term economic growth will depend on the creation of global technology stock, including the leverage effect of sustained R&D. In this paper we will approach the progress of Romania in the area of knowledge base economy, especially regarding the policies in the R&D sector.

Key words: knowledge economy, economic growth, research&development

In the contemporary world, nations and companies assign more and more resources for research and development. Although they are different by their nature, these activities contribute to the technical progress. The first consequence is the production of an aggregate of intangible qualities, which are expert knowledge or new concepts about commodities and equipments, usually concretized under the form of some new or improved products, as well as better techniques for the processes.

The development of the procedures presupposes the creation and the adoption of some new technology, integrated in the newer or superior fixed assets used in production. This type of technologies increases the productivity and the competitiveness of the companies, industries and of the economy as a whole. As a consequence the companies invest in manufacturing technologies before competing with prices.

The development of the products presupposes the production of some newer or better goods; the companies invest in this activity for the competitive advantages in exclusive or high-quality products. Once they are introduced the new procedures and products have the tendency to be *distributed* to other companies; the technology is “a public good”, it does not provoke rivalries (many users can use it at the same time) and trains the exclusivity (the owners cannot stop the other to use it but just in a certain manner). The inventor can keep the exclusivity of his work just for a couple of years. So, the social efficiency justifies the governmental funding for research and development. These social efficiencies imply the reduction of the consumer price, the emergence of some new and superior concepts which offer a competitive advantage and a better living standard.

1. The Significance of the Innovation in the New Economy

At the beginning of the III-rd millennium the concepts “new economy” and “new paradigm” are usually repeated in order to cover a reality from a notional point of view, where the main “constant” is the change. The continuous innovations from the high-tech field as well as the globalization of the markets have modified the economy sufficiently enough for this to be able to operate and to conceptualize it differently. The most obvious feature is the emergence of a new *Zeitgeist* of the accelerate change both in the knowledge area and in the praxis are. The discrepancy between creativity and the traditional economy

becomes more and more obvious; the perfect competition is the central paradigm in describing the “classical” capitalist economies, but “the invisible hand theory” is concentrated on the production processes, ignoring the “informational” aspects of the work (management, marketing, and research-development). Is this pattern still valid today, when the innovation has become such an important activity and millions of people are drawn into creative activities - creating, designing, and marketing the new products – and is the economic activity dedicated to a great extent to the “creation” of the technical progress?

Joseph Schumpeter’s theory which states that the innovation is the motor of the capitalist development remains no doubt the first theory which is acknowledged by many people as being the most complete one, regarding the role of the technical progress in the economic growth. This theory of the innovation is based on Schumpeter’s definition of the entrepreneur – as the person (or group of people) which has to take commercial decision concretized in the introduction of new products, procedures and systems or in its extension towards new markets or supplying sources. Schumpeter estimated that an innovative entrepreneur represents more a willing manifestation than an intellectual act and that the incredible dynamism of the capitalist society can be explained through a creative leadership. After conceptualizing the process of technological exchange under a linear form „invention \Rightarrow innovation \Rightarrow distribution“, form which dominated the economic perspective about the technological evolution, Schumpeter pointed out the most radical investments and gives less importance to the innovations and distribution.¹⁵¹

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We think that Schumpeter paid too much attention to the revolutionary inventions and underestimated the purpose of the gradual innovations in the process of the technological exchange. Referring to Schumpeter’s growth, Joel Mokyr has defined the technical progress as any change resulted from the application of the information in the production process, which allows the improvement of the efficiency, so the production of the outcomes with less resources (productivity growth) or the accomplishment of new or improved products. One has to notice that using this information does not necessarily mean using new information. Actually a large part of the growth derives from the distribution of the existent information and not from the conception of new knowledge.¹⁵²

Schumpeter has launched the concept “creative destruction” as an alternative to the “fundamentalism of the market” promoted by Adam Smith; Paul Romer describes the direct production as a process which follows the same “recipe” while the creativity is seen through the creation of some new recipes which will allow for a new, high living standard; but the efforts of creation also imply risks: while some of them will fail, the others will be concretized in new successful products, and will be substantially rewarded.

The companies and the workers whose products are not so new as compared to the new accomplishments will be seriously affected. The asymmetry of the benefits implies the fact that an economy which grants important parts of its resources to the creative activities can enjoy on the whole the welfare – with the cost of increasing the social inequality – rather than a less creative economy.

In his paper “Capitalism, Socialism and Democracy”, Schumpeter formulates a paradigm for the economic theory where the creativity is the main motor of the development and the profits are the gas supply. The essence of the simple capitalism is its capacity to reward the change allowing those which get/develop new products/processes to take the benefits of their own innovations under the form of short run monopoly profits. A competition that is too strong would volatilize these rewards “transferring” them to the consumers

¹⁵¹ Joseph Schumpeter, *Capitalism, Socialism and Democracy*, 3d ed., Harper and Row, New York, 1950.

¹⁵² Joel Mokyr, *The Lever of Riches. Technological Creativity and Economic Progress*, Oxford University Press, New York, 1990.

and would diminish the motivation of the companies to create new products. These monopoly profits provide the entrepreneurs the means to finance the creative activities as an answer to the opportunities of the market, to counter-balance the conservatism of the other competitors and the opposition of those that see their markets threatened by the new products and to implement a distribution chain which should make known the innovations a high number of consumers.

Which are the reasons that diminish the change in economy? First the uncertainty associated with the creation, development, acquisition and difficulty to compete against the new products. Creativity threatens the position of the already existing products; the inter-generation competition is a form of the competition, which is part of the “creative destruction” paradigm, where the companies develop new generations of the same product in order to eliminate the competition: the first company which enters the market with a new generation of products can win all the respective market and in consequence the profits (an obvious example are the micro-processors and the operating systems for computers).

This eliminates the profitability of the previous generation and sets the basis for a new “generation” gap which will destroy the profits of the current leader. To be creative also presupposes intrinsic risks; if the new successful products (seen in a broad sense as qualitative improvements newly manufactured) can draw huge profits, others will fail to do that causing important losses for the creators and financiers. There are some constraints for consumers, too – the consumer “invests” in the new products by simply buying these products, he suffers along with the manufacturer as they are morally superseded; the effect is more obvious in the case of some so-called network goods where the value for each consumer is given by the total number of consumers which choose that product. The costs associated with the creativity have always to be balanced with the gained profits. It is difficult to accomplish the commensuring of the values of the new products on a short term; the present enthusiasm, the complementary effects (for eg: the development of the products of the new economy; time is also essential for the market to take advantage of the potential benefits of a creative product).

2. The Simulation of the Research-Development Activity in Romania

In the neoclassical vision, the labor and the physical capital were considered the main determiners of the economic growth. The suggestions of economic policy aimed the growth of the abundance of these factors, respectively the growth of the labor force and of the investments. In spite of these the socialist system did not agree the Western economic theories; it seems that the economic decision factors from our country were strongly influenced by the neoclassical theory. So, at the beginning of the '90s the growth of the population and the physical capital accumulation is not synonymous with the economic growth. The growth of the population does not automatically determine the accumulation of competencies of the individuals and does not lead to the increase of the human capital stock. The investment in the human capital is very expensive before having the right efficiency in accomplishing the economic growth.

Along with the capital, the human factor represents a key element of the knowledge economy. A competitive, knowledge-based economy relies on the abilities of the employees in the research-development sector. These are able to offer innovative solutions for all the problems of the society.

The educational system has to provide a consistent group of researchers, so that they could assure the competitiveness of the innovative process. The quality of the high-education is extremely important for the renewal of the human resources from research and for their connection to the current stage of development.

Even through the reforms from education and their correlation with the requirements from the labor market, the number of graduates from the field of science and technology tends to decrease, and if there are not adopted any measures for the creation of a more consistent demand for the high education graduates, it appears the risk of a vicious circle regarding the human resources.

Education is important not only for providing the labor force from research but also for the entrepreneurship. The innovative behavior of the entrepreneurs can be developed through education in the field of business, in fields as management, marketing, etc. The appetite of the ones that innovate to start the correlated businesses is strongly influenced by their ability to think strategically and to act in a professional manner.

The entrepreneurial environment has to rely on modern management approaches of the businesses as for example the approval of the need and the efficiency of innovation. Although for the moment in Romania there are some factors which may have a positive impact on the growth of the companies, this situation will

change soon. The commercial liberalization will continue to refresh the consumer preferences on the internal market and the higher incomes will provide resources for the development of some sophisticated tastes. The EU integration will determine the growth of the competitive pressure and it is possible that a part of the existent foreign investments to be relocated in the developing countries from the ex-soviet regions or from Asia. The Romanian countries will have to adopt strategies based on innovation in order to survive.

An evaluation of the real priorities in the field of the innovation policies from the period 2000-2006 show that education together with the intellectual property represents the central points. This assumption seems to be the improvement of the regulating frame of the intellectual property and creates the circumstances so that the high-qualified labor market could generate innovation. Unfortunately, the factors which did not allow for this thing to happen are those which have become less attention in that period: the lack of a vision regarding the research-development supply, the awareness of the demand as well as the strong lack of the research funding.

As a consequence of the financial resources which are very limited, the number of researchers went down in an accelerated rhythm up to 2000, reaching to a number of 35094 (37,0 per 10000 employees) in 1995 at 23179 researchers (26,9 per 10000 employees) in 2000, after which the trend started to be ascending, so that in 2006, the number of researchers was of 30122 (35,6 per 1000 employees). One has simultaneously noticed an increase of the average age. The community of the researchers from the research institutes survives by the means of a mixture of national and international financial resources which still remains insufficient for providing them with the sustainable motivation and efficiency. According to the GO 442/2003 regarding the measures to attract, train and maintain the young researchers, there were granted some facilities for the young people between 14-24 years old willing to work in this field, but the measures were too recently adopted so that they could be observed. Between 1995 and 2000 Romania has lost almost 12000 researchers (table no.1). The age average of the researchers has grown because the young talented people prefer other sectors of activity.

Table no.1. The Main Indices regarding the Research Activity from Romania

	1995	2000	2001	2002	2003	2004	2005	2006
Total number of researchers	35094	23179	23597	24636	25968	27253	29608	30122
Researchers/10000 employees	37,0	26,9	27,6	29,6	31,3	33,1	35,3	35,6
Expenses for research-development projects, of which *	543556	264768	404841	499045	673211	861256	1040367	1319247
- fundamental research	72540	46083	83644	103213	170755	200083	248578	512842
- applicative research	374510	163622	252400	281282	391634	499687	680300	672793
- experimental development	96506	55063	68797	114550	110822	161486	111489	133612
-public property		196977	300724	372971	507055	631372	688166	956940
- private property		67791	104117	126074	166156	229884	352201	362307

Source: Romanian Statistical Yearbook 2002 - p. 230, 2005- p. 462, 2007- p. 485, 489

* Thousand lei current prices

The human capital represents one of the motors of the development, both at a social and at a community level, but also at an individual level. From here on in the context where the investment of the individuals in high education is reduced, representing a less frequent act than in other countries, but also reduced as a frequency in the assembly of the Romanian society, a strategy focused on the development of the educational capital constituted an attitude of active adaptation, oriented towards growth. The widely used

classification divides the components of the research system in: research institutes, research departments inside the universities, companies having as a main activity the research and research departments of some companies.

The main theoretical classification divides the research activity in fundamental and applied research, but this does not overlap with the taxonomy of the financing institutes or instruments used in Romania. In spite of these, the closest classification is the one given by the National Statistics Institute (NSI), according to which the expenses for the research and development projects were distributed in 2006 as it follows:

- Fundamental research – 38,87%.
- Applicative research – 51,00%;
- Experimental development – 10,13%;

Because the research and development activity is still concentrated in the public sector (more than 70% from the research and development activity), it is affected by the bureaucracy and specific lack of initiative (also reflected in the weak marketing activity), all these reducing its capacity to obtain competitive results on the market. In 2006, the percentage of the private sector in the total research and development expenses was of 27,5%. The statistical weight of the private sector is reduced because the benefits associated with the results of the research are weak. There is no market which could turn into profit the results of the research; the competition from the developed countries is too strong that the Romanian companies from this field could find a place on the European or international market. Moreover, many young well-prepared people prefer a certain, consistent wage at a foreign institute, rather than the risks associated with the entrepreneurial activity from Romania. We think that the statistical weight from the private sector may grow by accomplishing some partnership activities with companies and institutions from abroad which could subcontract certain stages of the research project. Such an arrangement is difficult to put into practice because of the fact that the research is seen as a strategic field which can provide the supremacy of a country of the international scene.

The Romanian research system is old in what the structure on groups of activities is concerned; so most on the research (almost 35% from the total expenses for research) correspond to the technological and industrial research. A reduced part of the funds is destined for the computer-based activities and communication activities. The infrastructure from the old system does not help very much. There are some research institutes perform the same activity in different towns which sometimes approach the same research theme, while the complementary institutes are far away from one another. We think that is necessary to build scientific parks around the universities or some well-known institutions, where the scientific activity may be accomplished.

The structure of the research and development system is varied in different fields, which represent a development opportunity but which in the context of the very low budget is translated through a dissipation of the available resources. Instead of giving them the right priority, the money from the state budget is divided between a very high number of projects, sometimes affecting their possibility to obtain notable results. Together with the public or private research institutes, the companies represent real vectors for the creation and distribution of knowledge. At the level of the Romanian enterprises the research activity is much reduced because of the sub-capitalization and lack of funds. In the restructuring process of the state enterprises, the research departments were among the first to be abolished and the private companies focus their funds on investments in increasing the production capacity, geographical extension and to qualitative aspects.

Romania is still a destination for the subcontracting activities which quite far from the production frontier. Multinational companies transfer in a certain way the technology, but less know-how in research and development, because these activities take place in their headquarters. Again, the exceptions are to be found in high-tech fields and telecommunications. Companies as Oracle, HP, Siemens, Alcatel have created centers that produce knowledge (software products, computer applications and complex telecommunications). One can say that up to the present, Romania has not succeeded to transform the competitive pressure resulted as a consequence of the open economy in an incentive of the local innovation. The change starts to happen again but the sector differences are very important.

Taking into consideration the contribution of the research, development and innovation to the growth of the productivity, economic performance and attaining the social objectives, it is generally known that the governments have a purpose in encouraging them to make the necessary expenses in order to attain the

desired level of research and development. Regarding the research-development from the private environment, the national authority may use fiscal incentives, subventions, patents and other instruments in order to increase the investments in research. In Romania this type of aid is limited to the regulations specific for the state aid, which are taken over by the *acquis communautaire*.

We think that in Romania the research and development activity has to be correlated with the current stage of the economic development. In this sense Romania does not have to investigate the current problems at an international level; it is necessary for our researchers to learn the methodological instruments used on an international level and also to manage to understand the existing technologies from the developed countries. It is necessary to build a technological infrastructure, a stock of knowledge which can represent the basis, the starting point for the future complex investigations. The alignment of the Romanian objectives with the problems of the Romanian society can be found in research themes, as for example: the improvement of the rural infrastructure, the growth of the living standard, implications of the accession to EU.¹⁵³

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¹⁵³ This problem is also outlined by other economists and analysis of the sub-development phenomenon. M. Torado shows that the researchers from the poor countries are engaged in sophisticated, research projects which are not relevant for the economic development. *Economic Development*, 7th Edition, Addison Wesley Longman, 2000