Diversity and Specialization: Public Policies Framework for Innovation

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Abstract: This study focuses on the problem of absorbing the researches and outcomes of innovation processes into the economy. Our **objective** was to address this problem by identifying the main factors that are related with state's support on innovation processes through public policies. Our **approach** took into consideration the case of Romania because our study is concentrated on identifying factors in order to discuss later solutions. We used public data available from the National Institute of Statistics, the National Council of Scientific Research, and from the National Authority for Scientific Research. Our **results** show that the efficiency of absorption consists in the right balance between researches diversity and researches specialization. We also found that state's public policies influence the respective balance. The **implications** that our study identified show that the efficiency of research and development public policies relates to participants' integrity and state's leadership. The political will represents the social innovation that is necessary in the first place for those public policies to be efficient.

Keywords: researches' diversity; specialization; innovation; state; public sector

JEL Classification: O30; O31; O38

1 Introduction

The aim of this research is to show that the absorption of researches into the economy is influenced by state's research and development (R&D) public policies. The subject presents importance for sustainable development. The motivation is given by the interests for disparities' elimination and emerging. This study investigates the relationship between state and innovation processes. It demonstrates that Romania's state institutions are suffering from a lack of vision, a lack of political will, and a lack of action concerning innovation. Our work concentrated on the connection between public sector policies and innovation processes. We identified two major areas of public policies intervention: the lack of

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specialization and the great diversity of researches. We tend to have educated students, but no specialists and we tend to have a lot and diverse researches without human resources, facilities or proper public policies to implement them.

The main lever by which the state can intervene in support of innovation processes is the allocation of funds for R&D. As theories and practice have shown, another important lever is represented by a set of public policies that the state initiates, maintains, and improves by managing development strategies. However, how much must the state interfere in this creative innovation process is a subject of an indirect action, especially because the creativity must not be the subject of formalization. As Jürgen and Vladislav (2012) noted, the spontaneous order enables civilization by applying consensus to abstract rules rather than to specific outcomes. Nowadays, we assist to an excessive formalism required for innovation process outcomes, and in the same time, we observe that instead of an excessive formalism, there is a need of a strategic vision and of public policies for innovation.

The existing studies focus on the idea that, in the future, the priority given to public policies that sustain the development of new products and services will be higher than the priority given to financing researches of the public R&D units.

Even so, we oppose this idea by sustaining the importance of human resources. The human resource factor presents the main importance for innovation processes. Since the process of forming generations takes years, it should be noted that ensuring stability and predictability of the entire public sector is essential for supporting innovation processes. But what is the cost for stability and predictability of state's public policies? Could it be a political cost? How much affect this political cost the public action? It is not sufficient to have public policies, although Romania does not have proper public R&D policies, but it is important to have public actions implemented according to stable public policies. This is the framework that we establish for our study.

As a solution to the problem of absorption we propose the analysis of the main actions taken by public decision makers to identify factors.

2. Related Work

In order to discuss differences of our approach we present the related achieved work in the field of innovations' absorption and public policies.

There are three significant sources of economic development (Petrakos, G., Arvanitidis, P. and Pavleas, S., 2007, p.4): new knowledge (Romer, 1990, pp. 71-102), innovation (Aghion and Howitt, 1992, pp. 323-351) and public infrastructure (Barro, 1990, 103-125). The political factor has an essential importance in assuring

long term economic development. The endogenous economic models sustain that convergence is not possible. The follower countries combine low rates of population growth with high rates of investment, but still low rates of R&D. They seem more dependent of knowledge diffusion than of knowledge creation (Verspagen, 1983, pp. 42-44).

The institutionalism underlined the role of public sector innovation (Matthews, 1986, pp. 903-918; Jutting, 2003, pp. 210). The economic sociology underlined the importance of cultural factors (Granovetter, 2005, pp. 33-50; Granovetter, 1985, pp. 481-510). The political science underlined the importance of political factors (Brunetti, 1997, pp. 163-190). Another studies underlined the importance of the geographic factor (Gallup, Sachs and Mellinger, 1999, pp. 179-232) or the demographic factor (Kalemli-Ozcan, 2002, pp. 411-439).

The importance of diversity and specialization of economic activities has been treated by several scientific papers and studies. Feldman and Audretsch (1999, pp. 409–429) argue that diversity is what determines technological change and economic growth. This is one reason why the world's governments have always funded projects that addressed interdisciplinary problems (Keller, 2001, pp. 547–555; Van der Vegt, 2005, pp. 532–547).

Innovation is considered an essential source for industrial development, economic growth, and quality of life (Cardinal, 2001, pp. 19–36; Romer, 1990, pp. 71–102). Innovation is in a direct relationship with scientific research (Griliches, 1980; Lim, 2004, pp. 287–321). Thus, knowledge has always been regarded as an important antecedent for the scientific knowledge. The studies suggest that there is a positive relationship between diversity and innovation. Table 1 presents the main studied ideas, the authors, and the type of state's intervention through public policies.

Table 1. Specialty studies related to diversity and innovation (private sector) and public policies that state can use

The type of study	Author(s)	Public policy
the *diversity of multicultural teams* is associated with positive outcomes, such as increased levels of innovation, creativity, and problem solving	Adler (2002)	social inclusion lifelong learning equal opportunities supporting R&D youth policy
regions with high cultural diversity have high levels of development and innovation	Niebuhr (2006, p.1)	
innovation is positively associated with the presence of a *balance between genders*	Gratton (2007, p. 1–10)	
diverse teams tend to perform better or worse than homogeneous teams	DiStefano and Maznevski (2003, pp. 1–3)	

The diversity is very important, also because diversity addresses the perspective on science, the problem solving patterns, the approaches taken in research, designing research plans, and the interpretation of experimental results.

The countries can benefit of the results obtained by other countries without having high R&D costs (Coe and Helpman, 1993, p.1). The United States are responsible for the main part of R&D expenses at the OECD level (Englader and Gurney, 1994, pp. 49-109).

We can say, in summary, that to achieve innovation, there is need of knowledge. The diversity determines innovation and economic growth. State levers that can occur are a good education, an open, excellent, and attractive research system, and the promotion and support for markets of innovative products and services.

3. Problem Statement

In a report of Romanian Presidential Administration from 2007, it states that "the education and research system of Romania is not able to support a prosperous and competitive economy. Maintaining the current education system in Romania can endanger the competitiveness and prosperity of the country. This system has four main issues: ineffective, irrelevant, unfair, and poor. The management of primary and secondary schools was overly politicized, thereby preventing the accumulation of know-how and training professional managers. System inertia is huge. Investing in early education is the most profitable investment in education, with the largest individual and social benefits and with the lowest opportunity costs. Decentralization of the education system lacks action; decentralization delay will cause the system to become more inert. The worst thing to do is a massive injection of money into an unreformed education system" (The Romanian Presidential Administration, 2007).

There is absolutely no wonder that young people have low expectations and high unemployment rates. What is alarming is that many of them leave the country to work abroad. The curricula remain outdated and inadequate to labor market needs. Education remained informative, although many laws have specified the need of acquiring competences. The level of expenses for education is less than a half of the average European level, and the effects caused by different levels of development between urban and rural areas is alarming.

An ideal and generally accepted situation for our research problem is that where the trend effects in the economy by harnessing technological innovations is positive and has a positive climb higher than the trend of constant efforts of public sector involvement in supporting innovative processes, as shown in Figure 1.
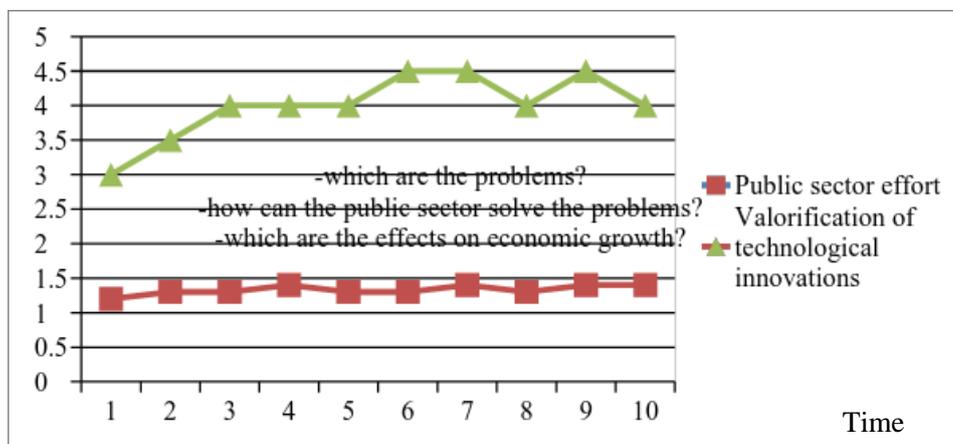
Figure 1. The ideal situation of public sector involvement in supporting innovation processes and the main research problems

4. Our Approach

Our concern to identify the type of action that state must take in the problem of establishing public policies related to innovation leaded us to address some legitimate questions that are necessary to emphasize the empirical statements which stand at the basis of formulating the research hypothesis. Table 2 presents the generally accepted assumptions that sustain a direct and positive impact on innovation, our proposed assumptions and the research questions that we identified for our research problem.

Table 2. The research questions

Generally accepted assumptions	Our assumptions	The research questions
The education system is important in the process of human resource formation	The balance between diversity of researches and specialization	
The existence of open and attractive research systems		
Lifelong learning and specialization		
Attracting private sector through public policy		
The macroeconomic stability	Participants' integrity State's leadership	
Youth, social inclusion, social public policies		

To identify actions, there is a need to realize a pertinent analysis and a careful observation of the facts. The research methods require a hypothetical–deductive research done by customizing the existing theories by relaxing or tightening the general accepted assumptions. We try to treat this theme by addressing the case represented by Romania.

Organizing our research approach involves identifying hypotheses, enunciating predictions by making use of deduction and observation, and checking predictions.

Thus, we aimed to verify the following hypothesis capable, and we consider developing the current state of knowledge:

H1: The balance between diversity of researches and specializations can lead to innovation only if the partnership between the public sector and the private sector is sufficiently promoted by the state through public policies. If not, this balance is altered.

H2: The participants' integrity and state's leadership are likely to influence the effectiveness of R&D public policy through state vision regarding innovation processes.

In support of the above mentioned hypothesis, we have considered—taking into account the problems that we have identified as affecting the general accepted knowledge in the field—the following conditions: the balance between diversity of researches and specialization, the participants' integrity involved in realizing the innovative processes, and leadership characteristics of the state.

We used data available from the National Institute of Statistics (INS), the National Council of Scientific Research (CNCS), the National Authority for Scientific Research (ANCS), the Institute of Public Policies (IPP), and from the EU documents. Basing on Table 2, we proposed some indicators to analyze. We present these indicators in Table 3.

Table 3. The proposed indicators

Hypothesis	Research questions	Indicators
H1	Does Romania have the researches that could be absorbed by the market?	The applicability of researches The balance between theoretical and practical researches The financing policies The main R&D results The cooperation between universities and the private sector The sources of information used by the private sector
	Does Romania have the	Structure of the employees from the R&D

	logistics of carrying out innovative processes?	activities depending on the education level Structure of the R&D employees on scientific domains The rate of tertiary education/ The school's abandonment rate Structure of total expenses/ Total R&D expenses Funds' provenience
H2	Does Romania offer a stable and predictable framework for innovative processes?	The level of transparency The stability of legislation The existence of a strategy for innovation

5. Results

In sustaining H1 we analyzed the indicators related to diversity and specialization of researches.

The applicability of researches Most R&D units—60%—believe that the Romanian research provides solutions to economic competitiveness of Romania (ANCS, 2012, p.67). The applicability in economics of the outcomes from R&D is considered by 65% of R&D units as one relatively low in 2008–2010 (ANCS, 2012, p. 68). We considered that these data are sufficient for demonstrating the research hypothesis.

The balance between theoretical and practical researches Most of the outputs of R&D in enterprises (59%) are purely theoretical, 24% have immediate applicability and 12% require more complex technological transfer process (ANCS, 2012).

The financing policies/the main R&D results In terms of financing achieved through national programs for research, there are several issues, all in relation to the broad innovation policy at EU level (Table 4).

Table 4. The results of research-development-innovation activities for 2008–2010

Aspects	Characteristics	Results
Financing realized through national programs	It encourages exploitation of research results	65%
	Regarding the assessment, it can be said that it supports, but not enough, those that lead to achieving results with economic application	57%
	Project monitoring is directed to establish project performance and	69%

	progress, but the means used are not the most appropriate	
Documentations	Developed by every research unit	5 per year (approximately)
	Aquired by every research unit	2 per year (approximately)
Patens	Developed by every research unit	3 patens on every 2 units of research
	Aquired by every research unit	1 patent on every 10 units of research
Models and design	Developed by every research unit	1 model per unit
	Aquired by every research unit	4 models on every 10 units

Source: Adaptation after ANCS, 2012. România durabilă (The Durable Romania), [pdf]
available at
http://www.romaniainoveaza.ro/media/Resurse/Raportarea,%20evaluarea,%20monitorizar
ea.pdf> [accessed on November, 12, 2013]

Medium-sized companies (50–249 employees) produce most patents and technical-economic documentation, 61% and 55% of the total. In contrast, large firms (over 250 employees) achieved 81% of the models and industrial designs in 2008–2010 and 35% of the others' intangible assets such as copyrights, trademarks, recipes, geographical indications, and the like in the same period (ANCS, 2012).

Small and medium enterprises (SMEs) are the most active in terms of patents, development of the technical-economical documentation, and protecting other intangible assets such as copyrights, trademarks, recipes, geographical indications, and the like in 2008–2010. In contrast, large firms realize models and industrial designs (ANCS, 2012).

For the 2008–2010 period, the most valued were technical-economical documentation (49% of the total being capitalized), followed by models and industrial designs (22% of the total being capitalized) and patents (about 9% the total being capitalized) (ANCS, 2012)

The cooperation between universities and the private sector For Romania, in 2008–2010, there is a weak cooperation between innovative companies and universities, according to the data published by National Institute of Statistics (Table 5). The main cooperation partners of enterprises that innovate were suppliers (6.7%) and customers and consumers, with a share of 5.1%. The rest of the cooperation partners have small shares.

Table 5. The structure of cooperation on enterprises' size and activities 2008–2010

Partner	Enterprises				Activities	
	Total	Small	Medium	Big	Industry	Services
Any	11,2	9,1	12,2	26,2	11,7	10,4
Belonging to the same group	1,2	0,3	2,4	5,6	1,8	0,6
Suppliers	6,7	5,7	6,8	14,8	6,6	6,8
Clients or consumers	5,1	3,6	6,9	12,7	5,9	4,1
Concurrents	3,1	2,4	3,6	8,1	3,6	2,4
Consultants, private institutes of research	2,9	2	3,8	9,1	3,4	2,3
Universities	2,9	2,4	2,8	8,4	3,8	1,9
Governmental institutions of research units	1,7	1,1	1,9	6	1,8	1,6

Source: The National Institute of Statistics (NIS), Press Comunicate no. 171/ 2012, [online] available at

http://www.insse.ro/cms/files/statistici/comunicate/com_trim/Inov_ind/inov%20date%20def %202008_2010r.pdf> [accessed on November, 12, 2013]

The sources of information used by the private sector Regarding information sources, NIS shows that the main sources of information used by enterprises in industry and services in 2008–2010 were internal sources, with a share of 20.1%. Large companies have been accounted for using domestic sources of 38.5%. Institutional sources are used in much smaller proportion of only 1.7% and 1.2% universities or government institutions' public research institutes (Table 6).

Table 6. The structure of information sources in 2008–2010 (percentages)

The information source	Enterprise			
	Total	Small	Medium	Big
Internal sources	**20,1**	17,3	22,5	38,5
Market sources	**15,5**	14,1	16,9	
Suppliers				
Clients or consumers	**15,5**	14,3	16,4	24,0
Competitors	**10,7**	10,5	9,7	15,1
Consultants or private research units	**3,5**	3,0	3,2	8,9
Institutional sources	**1,7**	1,5	1,8	
Universities				
Governmental institutions or public units of research	**1,2**	0,7	1,7	3,3
Other	**6,5**	4,6	9,3	
Conferences, fairs, exhibitions				
Professional associations and organizations	**2,3**	1,7	2,7	6,2
Scientific journals and technical publications	**5,1**	3,7	7,0	11,6

Source: The National Institute of Statistics, Press Comunicate no. 171/ 2012, [online] available at

Indicators related to logistics Eurostat data show that Romania spent for R&D, in 2010, 0.47% of GDP, while the EU 27 average is 2%. Another target of the Europe 2020 strategy is to achieve a target of at least 40% in the number of people aged between 30 and 34 years who have completed tertiary education. Eurostat data show that, in 2010, the percentage of people aged between 30 and 34 years who have completed a tertiary education is 20.4%, while Bulgaria has a rate of 27.3%, while the average EU 27 is 34.6%. Regarding the school's abandonment rate, Romania has a rate of 17.5%, while Bulgaria has a rate of 12.8% and EU 27 average is 13.5%. Countries with the highest school's abandonment rate are Spain, Italy, Malta, Portugal, and Turkey.

Figure 2 presents the main indicators related to the structure of employees from R&D units and the structure of R&D expenses.

The private sector is the one which invests in R&D, although by having access to governmental funds. Regarding the open and attractive research systems, Romania does not have good values for the specific indicators (number of international scientific publications, number of citations, research results with high applicability), although we have a large number of engineers.

The indicators concerning H2 Concerning the indicators related to H2, ANCS and IPP observed that not only the transparency is missing, but the public institutions have a negative attitude toward transparency. The legislation in Romania is a subject of continual renewal, and Romania does not have a strategy for innovation (Pro Inno Europe).
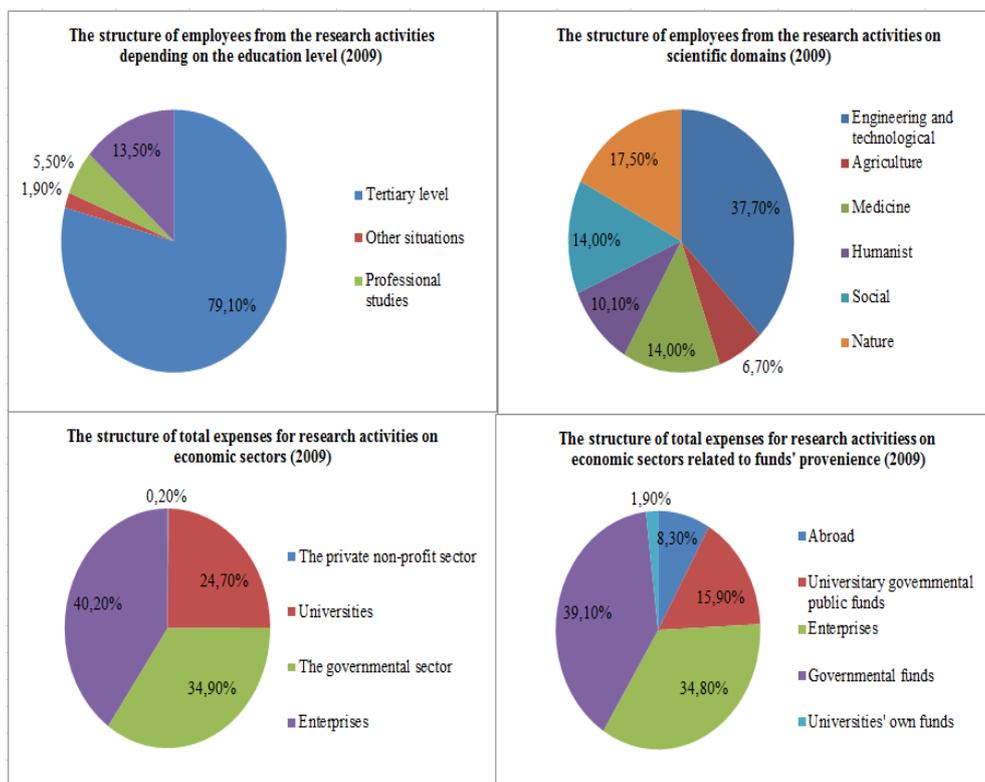
Figure 2. The structure of employees and of the total expenses for the research-development activities (2009)

Source: INSSE, The Statistical Bulletin for 2010, The Science, Technology and Innovation Chapter, [online] Available at < http://www.insse.ro/cms/files/Anuar%20statistic/13/13%20Stiinta,%20tehnologie%20si%20inovare_ro.pdf> [accessed on November, 12, 2013]

The innovation policies are approached by the R&D National Plan (2007-2013) and by sectorial programs like: Raising the Economic Competitiveness or Regional Development. The public policies for social innovations, public sector's innovation, and services' innovation are weekly represented.

6. Discussions

Of the issues raised, we mention the lack of policies to promote partnerships between universities and private sectors and the lack of researchers' specialization. Without the existence of collaboration between the academic and private sectors, the transfer of knowledge cannot be achieved, the regional market has no interest in using innovation to produce academic background, and losses are for both the sides.

At present, Romania is facing high rates of school's abandonment rate, because of the lack of appropriate policies for social inclusion. Romania has now a large number of people forced to work abroad whose children are Romanian education system's pupils. Without family and without its help, personal development suffers, human resource suffers, implicitly, from the lack of a good education, and therefore, we export cultural diversity and we do not produce sufficiently specialized human resource.

Regarding researches' diversity at the level of universities and research institutes, we find that this level is high to very high and idealistic, if we consider the reduced material with which researchers or research teams aim to resolve fundamental issues or applied research.

Results of research are measured through indicators such as number of specialized articles published in national or international level and the number of citations. Many are of fundamental research, which is precisely the type of research difficult to demonstrate the practical test. Without promoting various types of partnership, this research is not valued enough.

We can say that the lack of state's vision in terms of academic research exploitation has direct consequences on a very high diversity of research topics, with little application that involves a direct impact on innovation.

Lack of legal framework and a state incapable to propose a strategy to support the education of a generation and a research strategy adapted to competitive advantages affects the number of patents registered in academia. Most patents are owned by individuals. We often hear about these people in times of commercial break from a political show and then no longer know anything about them.

Romania is witnessing in recent years a diversity of specializations combined with the risk of losing substance. The education's offer, the specialized programs, training and many other human resource development programs are available in a considerable amount, but it comes in very many cases, with the human resource to be useful only at the entry into the system.

The lack of a systemic view makes all this flow of knowledge that may exist between educational or training programs and human resources to lose consistency and hence value.

European fund management by projects is, in Romania, a subject of great public importance, very poorly managed, and affected by all the shortcomings of public administration and public sector inertia.

The main problem is the extremely low level of transparency regarding the selection of the winning projects and activities. Romania still not accepts the idea that the European funds are public money to be spent totally transparent. On the other hand, Romania's institutions do not properly manage project information.

There is no corresponding clearly defined added value that these investments will bring in terms of real economic growth.

Another big problem is setting vague goals and targets. We cannot deny the diversity of research. It is true that all of Europe is not very good in terms of using research results, but, at least in the case of Romania, we could identify key issues that determine the general hypothesis refinement. Research is conducted by human resource, and this resource is formed by education and training, is refined by advancing specialized studies and, in Romania, is lost through brain-drain or lack of interest on capitalization.

7. Conclusions

Romania cannot compete with big industries, but Romania can get benefits from ecological agriculture, from tangible and intangible creative products, and from renewable energy. Also, in terms of research carried out in universities and research institutes, the state should not afford "wasting" time and money.

Although it is widely recognized that Romania is in a transitional stage of development permanently to a higher level, defined by indicators and targets that sounds almost metaphorically, Romanian has enough resources and potential. It remains to be seen what will be the measures and policies adopted and, more importantly, when Romania will realize that political action must be an act of ethical responsibility and especially a civic one.

In terms of applicability, we believe that we came up with proposals for treatment of the subject from the standpoint of public policy evaluation and tried to emphasize that the Romanian state, through its governmental bodies, should establish public policies that proposes a number of indicators more realistic to the Romanian economy. Defining ambiguous goals and an apparently idealistic vision are not likely to influence in a significant way the results of research. For innovation to occur, the state must reduce the diversity of researches, focus on

specialization and promote public policies capable to connect universities with public sector.

Political will and civic act seem to represent the disruptive innovations that Romanian state should perform to be able to propose and implement a strategy for innovation.

The image that we have today regarding Romania's past (1850-1945) reveals that our progress seems to be determined by two factors: a political class that has proved verticality and strategic wisdom—though not always—and an education offered by cultural factors whose authority was not overshadowed by the non-values of today's society.

Solutions in this sense are, first, education—in all its forms of expression: informal, formal, and non-formal—and, second, society, particularized, above all, through state institutions that generate a certain social and economic strategy, of which the private sector is always dependent and, through which, gradually, a large part of society have access to a higher level of needs defined by Maslow. Only in this way can the creativity of individuals be represented, treasured, and valued; creativity that will be reflected in innovation and will thus result in progress.

There is a need to achieve some steps from the prehistory phase of innovation: (1) educating society in a spirit of respect and valuing this concept, (2) removing intellectual fraud, (3) imitation by buying patents from developed economies, (4) their assimilation, (5) adaptation to the specific needs of Romanian society, (6) avoiding formalization of the creative processes. Only later will Romania be able to make substantial investments in its own forms of R&D.

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