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Innovations and Economic Growth in Romania - Current State and Perspectives

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Abstract: Romania became a member of the EU in 2007 and thus gained the preconditions for achieving economic growth and long-term stability. Romania has not fully exploited all benefits of EU membership and is still in the group of the least developed member states. However, recent reports points to accelerated economic growth and improvement of economic performances of Romanian economy. In current situation, special emphasis should be placed on further stimulation of investments in research and development and their products. Such an orientation will result in achieving economic growth and improvement of the national competitiveness.

Keywords: *economic growth; innovation; Romania; research; development.*

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1. Introduction

Romania achieved a full EU membership in 2007. The membership has opened up the possibility of participation and doing business in the EU's Internal market, which is the basis for achieving long-term economic growth and competitiveness. However, relevant indicators indicate that Romania has not yet fully exploited all the provided opportunities and implemented necessary structural reforms. In this situation special emphasis should be placed on contemporary sources of economic growth (innovations etc.). Those elements represent a basis of future progress and achievement of competitive advantages in modern business environment.

2. Theoretical background

Considerations of the effects of innovation activities R&D in the process of achieving long term national progress began by Solow-Swan's economic growth model [32; 33]. Further researches has been carried out within the framework of endogenous theories, which place a significant emphasis on the accumulation of knowledge in the process of achieving economic growth [28], which results in the emergence of a large number of technological innovations, with a key role of amount of workforce involved in R&D processes [31]. According to Lucas [24] and Grossman and Helpman [23] key assumption of endogenous economists is based on the necessity of carrying out a continuous and planned R&D activities, at enterprise level and the overall economy. Aghion and Howitt [1] pointed out that those activities will result in innovations and positive economic effects. Large number of authors agree that special emphasis have to be placed on education, as demonstrated by Mincer [26], Easterlin [9], Stevens and Weale [35], Pereire and Aubyna [27], and Solaki [34]. Grilliches [21] and Barro [4] point to the importance of innovation activities to increase productivity at the level of the overall economy and synergy and joint action of high technology companies with the education sector and public authorities [6] in order to achieve progress and socio-economic changes [2]. Audretsch et al [3] put special emphasis on the role of modern universities in creating economic policies and new jobs, ensuring international competitiveness of the economy, and reducing development [25] differences. In general, contemporary theories points emphasize crucial importance of activating the business sector in initiating innovation activities and ensuring the transfer of knowledge and absorption of technology from abroad [7; 22]. The authors

from Eastern and South Europe agrees that low levels of innovative activities and inadequate business sector engagement in those countries slowing down their further progress and deteriorating their positions in global science [5; 8]. Also, the authors identify insufficient commercialization of innovations, lack of higher education institutions and companies interconnection [36], insufficient level of international activities of scientific staff [24] and low level of cooperation with relevant international scientific and educational institutions.

3. Research problem, aim and purpose of the research

The research problem in this paper arises from unfavorable economic situation in Romania, largely due to the transition processes and the negative effects of the global economic crisis, low levels of R&D, limiting further economic progress. This paper aims to analyse the economic situation in Romania, to provide an overview of the state of R&D and to carry out a projection of R&D over a ten-year period. The purpose of the research is to propose the measures to improve innovative activities in Romania in order to achieve long-term economic growth and international competitiveness.

4. Research Methods

In this paper, a descriptive analysis of the economic situation and investment in R&D in Romania has been carried out using large relevant indicators from European and other international databases (Eurostat and World Bank). An analysis of the economic situation is based on the following indicators: 1) GDP growth rate, 2) Value added value of sectors in GDP, 4) Employment level (% of population 20-64 years) and structure of employment (share of primary, secondary and tertiary sector). In the analysis of R&D, the following indicators were used: 1) Investments in research and development (% of GDP), 2) Sectoral structure of R&D (% of total investment), 3) Population of 18-64 years included in lifelong learning programs, 4) Doctoral students in science and technology (% of population 20-29), 5) Share of active population involved in R&D activities, 6) Employment in technology and knowledge-intensive sectors (% of total employment), 7) Export of high technology products (% of total exports) and 8) venture capital investments (% of GDP). Also, in this research a projection of investment in research and development in Romania in the

period 2017-2025 was carried out. The projection was carried out using the exponential smoothing method, which is commonly used in time series.

Prediction is calculated based on the following formulas:

$$St = \alpha\, yt / It\text{-}L + (1- \alpha)\,(St\text{-}1 + bt\text{-}1) \quad (1)$$

$$bt = y\,(St\text{-}St\text{-}1) + (1\text{-}y)\,bt\text{-}1 \quad (2)$$

$$It = \beta\, yt / St + (1- \beta)\, It\text{-}L \quad (3)$$

$$Ft + m = (St + mbt)\, It\text{-}L + m \quad (4)$$

, where are: y = observed values, S = smoothened values, B = trend factor of value, I = the periodicity index of the value, F = prediction for m period in advance and T = index indicating the time period.

5. Findings

The Romanian economy grew at an average of 3.74% per annum in the observed period [37]. The data from World Bank [38], World Bank [39], World Bank [40]. indicates that Romania has reduced the share of primary and secondary sector in GDP and increased the share of the services. However, Romanian economy still achieves high levels of agriculture in GDP[1]. Furthermore, almost a third of GDP value added is generated by the industry sector (almost 9 percentage points higher than the EU average)[2]. The traditional industry orientation and the lack of modern technologies make it difficult to create competitive and internationally recognizable products needed to achieve competitiveness and positioning on the international market.

Romania has increased the level of employment since 2014 and has reached a level of 68.8% in 2017 [19]. These data also point to the fact that Romania has still not achieved the goals set by key EU development strategies, which prescribe the need to achieve 75% employment by 2020. Analyzing the structure of employment, it is evident that Romania has reduced employment in the agricultural sector. Nevertheless, employment in agriculture is still exceptionally high (5.4 times higher than the EU average)[3].

[1] Namely, the agricultural sectors in all the transition countries, and thus in Romania, are still relatively traditional and oriented to the small family farms and as such can't be the basis for achieving economic growth and prosperity.

[2] Contemporary economic trends require the implementation of new, knowledge-based processes and the turning of the industry to the requirements of the existing fourth industrial revolution

[3] Consequently, the biggest problem is the low level of education of the agricultural population, insufficient innovation orientation and the abandonment of rural areas by the young and the educated population.

Furthermore, Romania has increased the share of employment in the secondary sector, which is above the EU average. In the contemporary conditions of de-industrialization, the challenge, and the problem, represents insufficient levels of education and qualifications of the staff[4]. Such a situation places a key role in the education sector in the further development of the staff, which will in the future be able to contribute to the growth and competitiveness of the economy. Although there is an increase in employment in the service sector, the achieved level is still exceptionally low, only 47.9% of the total population, making Romania significantly lagging behind the EU average (71.79% of total employment) [41; 42; 43]. Also, Romania has successfully carried out the negative consequences of the economic crisis since 2014 and reduced the unemployment rate to 4.9% in 2017, which is below the EU average (7.6%) [20].

According to Eurostat(1) [11] Romania decrease its level of R&D in 2016 (0,48% GDP). Also, it is noticeable that Romania lagging behind EU (2.03% of GDP)[5]. Analysis of R&D trend needs to be continued through the observation of their structure [12]. Romania is still largely oriented towards public sector investment, which is not a good foundation for implementing the appropriate structural changes and achieving the future economic prosperity. The lagging behind of the business sector in R&D activities can also be seen through total investment in venture capital[6] [13], which were at the of 0.001% of GDP, continuing the downward trend from 2014. The unfavorable situation in the business sector's scientific research activities is also reflected in the export structure of the Romanian economy, with particular emphasis on the high tech export[7] [14]. Although the available data indicate an increase in the share of high-tech exports (7,3% of total export), Romania is still significantly below (at 42% of EU average).

[4] Namely, digitization of production requires the workforce of advanced knowledge, capable of rapidly adapting to changing market conditions and being able to absorb and apply new, advanced knowledge.

[5] Based on the current R&D level, Romania is at 23.3% of the EU average, which represent a challenge in further activities aimed at achieving the knowledge society and overall digitization of society and the economy.

[6] According to Eurostat (3), it can be defined as *"a subset of a private equity raised for investment in companies not quoted on the stock market and developing new products and technologies. It is used to fund an early stage (seed and start-up) or expansion of venture (later stage venture)".*

[7] Namely, the knowledge economy and overall digitization emphasize the development of new, high-tech core products and their guidance to external markets, in order to ensure further national economy progress and competitiveness.

From 2012, Romania increased number of employees in the high tech sectors.

Last available data indicates that level of this indicator in 2017 was 3%, which is still below the EU average (4%) [15]. Positive trends in this indicator provide a good basis for further economic progress through the development of new products and processes and their commercialization. Also, Romania has consistently increased the share of the active population engaged in innovative activities [16][8]. This positive trends represents the basis for further improvement of the current situation and the orientation of thorough economic reforms. In the period from 2008, Romania has also achieved constant values of PhDs involved in the field of science and technology [17]. According to the latest available data, 0.2% of the population (20-29) are involved in some PhD programs in the field of science and technology. Regarding such values, Romania is at 40% of the EU average (0.5%). Contemporary economic trends also points to the growing need to involve the entire population in lifelong learning programs in order to ensure and stimulate further education as well as adjustment to changing labor market conditions. The available data suggest a decreasing of population involved in lifelong learning programs in Romania. In 2017, 6,8% of the population aged from 18 to 64 were involved in some form of lifelong learning [18]. Compared to the EU average (16.7%), it is clear that Romania achieves 2.45 times lower values.

6. Discussions

In close liaison with the goals and priorities of the strategy Europe 2020 [10], Romania defined national digital strategy whose implementation is planned by the end of 2020. Key areas of the Strategy are: 1) e-Government, Interoperability, Cyber Security, Cloud Computing and Social Media, 2) supporting ICT development in education, culture and health, 3) the introduction of ICT support in e-commerce and the development of new ICT solutions and 4) securing broadband internet and digital infrastructure [30]. Estimations made by the Romanian government suggests that the implementation of this Strategy should result in a *13% increase of GDP and employment growth of 11%, with an administrative cost reduction of 12%.* Also, this Romanian national plan is oriented toward fulfilling specific goals: 1) at least 35% of people use e-government systems, 2) at least 60% of citizens use the Internet regularly, 3) at least 30% of citizens make purchases online and 4)

[8] However, despite positive trends, Romania recorded significant lags for the EU average (46.6%).

coverage with broadband communication networks (over 30 Mbps) of minimum 80%. Also, as a forerunner of National Strategy, in 2015 the Regional Innovation Strategy for Smart Specialization for West Region Romania was defined, which identifies the key sectors in which the processes of smart specialization are to be implemented (automotive industry, the ICT sector, the textile industry, construction, tourism and the production of healthy food [29].

In this paper a projection of R&D investment in Romania and EU by 2028 has been carried out (Appendix 1). Research results suggest that Romania should achieve a level of 0.6% GDP invested in R&D by the 2028 Also, results suggest that value of R&D on EU level will increase to 2.31% of GDP by 2028. With such values, Romania will be at 25% of the EU average. According to that, further lagging behind in this segment, will continue[9].

7. Conclusions

The conducted research suggests that the Romanian economy, despite some positive moves, is still below the EU average: as a major reason it is necessary to state the unfavorable structure of the value added of the economy, the still high share of employment in traditional sectors, which, without orientation on R&D activities can't ensure sustainable progress of the national economy. Furthermore, Romania still lags behind in terms of total investment in research and development, which has been identified as key development generator in key European and national development strategies. It is obvious that Romania has a quality staff, but in the future, it needs its targeted and strategic orientation in order to achieve economic growth and competitiveness. However, along with the prescribed development strategies, the key role in transforming the Romanian economy in accordance with demands of the digital era will be determinate largely with the willingness and readiness of leading authorities, whose engagement in implementation of structural reforms will result in positive future economic trends.

[9] However, the results of the projections should be taken with a certain amount of reserves, since they are primarily based on the current state of some selected indicators. Future situation will only arise as a direct consequence of the economic and political authorities in Romania and the implementation of EU development strategies in the future.

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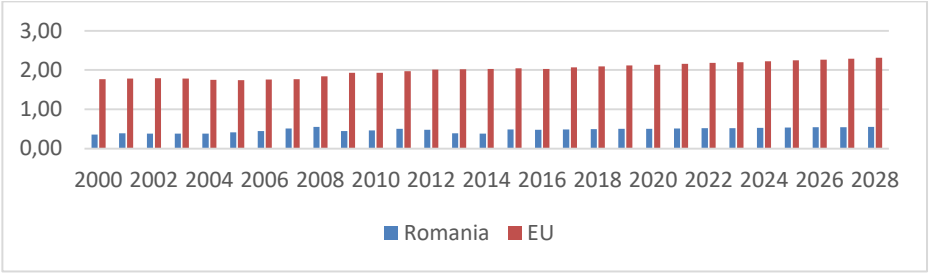
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APPENDIX 1

Projection of investments in research and development in Romania and the EU until 2028



Source: author's calculation