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## **Aspects regarding the contribution of research and technical progress at GDP's growth**

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# ASPECTS REGARDING THE CONTRIBUTION OF RESEARCH AND TECHNICAL PROGRESS AT GDP'S GROWTH

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**Abstract:** The work paper aims to point out the importance of the new technologies like factor of economic development. The new technologies represent the base of competitive advantage at micro and macro level. Those countries that support research could achieve higher GDP, which is an important issue. In the first part of the paper we would like to point out the importance of technical progress and innovations at GDP's growth, presenting the relation between investments and the aggregated function of production. The last part of the work paper is an analyse of Romania's situation in the context of European integration from the point of view of investments in the component of informational technology – transformation factor of an economic and social system.

**Key words:** labour force, research, investments, innovation, GDP

## 1. INTRODUCTION

In the period of 2007-2013 more than 50 billion euros can be useable for R&D. the main goal of the state-support R&D is to improve sustainable growth throw the increasing economic competitiveness and number of employees.

Improvement of R&D is a common aim. According to the EU Commission Regulation, strengthen of “scientific and technical basic of common industry, urging improvement of the international competitiveness meanwhile support [...] the sufficient research task” (Naresh K., Krishnan M., 2000). The Regulation declares the parameters and also the application fields of the funds and the whole system. By the paragraph 87 of the EC regulation, comparable with the common market: “those supports which improve the economic situation in regions where the level of living and the employment rate is quite low. These kinds of the supports, which effect the economic, do not harm the situation of the common market in different direction” (EC Regulation, 2006).

## 2. METHODOLOGY

The influence of investments against the aggregate production's function is represented by the relation between total quantity of labour force (L) and capital (K) involved and total production of the nation, GDP:

$$GDP = f(L, K)$$

The function “f” point out the relation between the input of capital and labour force and the result, respectively GDP. Thus, GDP can be interpreted like potential income.

The output Y, the income from economy or production, can be interpreted using the mentioned function and taking in consideration the technical level, as following:

$$Y = f(K, L) \cdot A \quad (1)$$

where K= capital inputs; L= labour force input; A= technical level.

From the equation (1) results the increasing the output from the economy Y, that will be determined by the increasing of input factors, bur also by the improvement of technical level of

production A. When the output rises in an proportional way with the determined factors, result the following relation:

$$\Delta Y = f(K, L) \cdot \Delta A + MPK \cdot \Delta K + MPL \cdot \Delta L \quad (2)$$

where:  $\Delta A$ = the level of production's technical spore;  $\Delta K$ = the spore of capital production's factor;  $\Delta N$ = the spore of labour factor; MPK= marginal product of capital factor; MPL= marginal product of labour factor

It's known that the marginal product of a factor represents the spore of production (income) realized on base of increasing with one unit of this factor, others remaining constants.

Simplifying the equation (2) by equation (1), it's obtained:

$$\Delta Y / Y = \Delta A / A + (MPK / Y) \cdot \Delta K + (MPL / Y) \cdot \Delta L \quad (3)$$

Making an calculation artifice by multiplication and division with K and L of the second and respectively third terms from the second part of the equation (3), it's obtained:

$$\Delta Y / Y = \Delta A / A + \Delta K / K (MPK / Y \cdot K) + \Delta L / L (MPL / Y \cdot L) \quad (4)$$

Analysing the terms from brackets, results:  $(MPK / Y) \cdot K$  that represents the capital's percent in total income and  $(MPL / Y) \cdot L$  represents the labour factor's weight in total income. The sum of these two terms will be 1 if only the two factors have contributed at income's achieving (Czarl, A.; Belovecz, M., 2007).

Noting:  $(MPK / Y) \cdot K = v$  and  $(MPL / Y) \cdot L = 1 - v$ , the equation becomes:

$$\Delta Y / Y = \Delta A / A + \Delta K / K \cdot v + \Delta L / L \cdot (1 - v) \quad (5)$$

where :  $\Delta Y / Y$  represents the output's increase (production, income);  $\Delta A / A$  represents the evolution of technical level of production;  $\Delta K / K$  represents the income capital – production factor;  $\Delta N / N$  represents the income of labour – production factor;  $v$  represents the weight of capital in total income;  $(v-1)$  represents the weight of labour in total income.

Equation 5) reflects the contribution of the progress and of other production's factors at result's increase, as following:

- The first term from right part reflect the contribution of production's technical and technological improvement, that determines the improvement of total productivity of the factors;
- The following two terms reflects the contribution of capital factor's increase and, respectively of labour factor, contribution equals with a proper increase's rate multiplied with the weight of the factor in income. (Duda-Daianu, D.C., 2008).

Analysing the equation (5) results that the output's increase in transition period will be determined by the increase of input's factors, measured by theirs weights in the income and by the technical progress, that determines differences regarding the increase of the output on hour. The contribution of technical progress and of innovation at output's increase is decisive in present global and national development's context. Many economists had demonstrated by researches and calculations that appreciatively 1/3 from this output's increase is determined by the technical progress and innovations and 2/3 of this

output's increase is determined by the rise of production factors' total inputs. Regarding the factors' contribution at output rise, the most important weight is holed by labour factor (which can reach the level of 75% in the developed countries, while the capital contributions could represents only 25%), This aspect is suggested even by the equation (5), which demonstrates that, even in the condition of capital and labour's increase with the same rate, because their different weight in income, the labour factor will have a greater contribution to GDP's rise.

### 3. ROMANIA'S SITUATION

It's demanded a thoroughgoing study of the increase and development process's problems starting with the importance of technological innovation for investments. This affirmation is base on the actual situation of some countries from Europe and south-east Asia. These countries registered important successes regarding economic increase, infirming the old practices which sustained that only the powerful industrialized countries, with high incomes, possess the forces demanded for obtaining high growing rhythm. This way, can be demonstrated that the force which rule the increase in countries with medium and low development's level are not fundamentally different by those from developed countries.

Unfortunately, the economic experience of our country, after the revolution, proves that during the transition period through market economy has registered even a decline of economic increase. Mathematical expression of this decline is obtained by the separation of labour – production factor from the equation (5):

$$\Delta Y / Y - \Delta L / L = \Delta A / A + [(\Delta K / K) - (\Delta L / L)] \cdot v \quad (6)$$

Indicators	2004	2005	2006	2007
GDP per capita in PPS, EU27=100	33.6	34.4	37.6	39.1
Labour productivity per person employed EU27=100	34.7	35.6	38.3	39.8 <sub>f</sub>
Employment rate	57.7	57.6	58.8	59.9
Gross R&D expenditure, %GDP	0.38	0.41	0.46	0.65
Business investments, %GDP	18.9	19.3	21.8	22.0

Table 1: The evolution of some Romania's macro-economic indicators

Source: Eurostat structural indicators, 2007, [http://epp.eurostat.ec.europa.eu/portal/page?\\_pageid=1996,45323734&\\_dad=portal&\\_schema=PORTAL&screen=welcomeref&open=/&product=STRIND\\_ECOBAC&depth=2](http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=STRIND_ECOBAC&depth=2)

f- represents Eurostat's forecasts

From equation (6) we can observe that the output (GDP/capita) increases on a hand because of total production factors productivity's increase like result of technical and technological improvement of production ( $\Delta A/A$ ) and, on the other hand, because of capital/person increase.

Resort, in Romania, the decline of economic growth produced because the decrease of total productivity of production factors, like a consequence of rapid disorganization of centralized system (without putting an other system in its place), and of capital accumulation's reduction, like result of disorganization by the bursting of relations of technical and supply, production's disorganization and financial blockade.

The errors of post-revolution period determined the start of a disinvestment process, a decline of GDP/capita. In the last few years was registered a positive economic growth (table no.1) and, for maintaining this positive tendency, it's needed a greater volition to invest and to work from the part of all persons.

### 4. CONCLUSION

The research and technical progress represents an important parts of the engine of the economic growth, which is getting slower in the last couple of years in Europe, thanks to the general conjuncture decline. Referring to the economical and social impact of investments, we think that an important accent must be put on its qualitative level, because this aspects can determines the market's enlargement or segments' losing.

For investments' relaunching, Romania should action for protect its industries, in view to meet the intern needs, the aggregate demand at national level should be assure from intern, because, as was shown in the paper, the demand of equipments and plants normally result from the demand of goods for which producing was utilized. If exists an increasing demand that will not be covered (satisfied) by production's rise in the context of existing industrial capacities, will be necessary new plants and equipments. The investments' expenditure appears in the period when the new capital is established and installed. If the wanted stock of capital goods increases, this will determine the apparition of investments' boom (that will create, in time, the new capitals). If nothing else does change, even if the economic conditions continue to be favorable, justifying the capital stock's increase, the investments for new plants and equipments will stopped when the capital's stock will reach a superior level.

The future research will analyse the relation between investments and the development level for West 5 Region of Romania.

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