

ECONOMETRIC ANALYSIS OF THE CORRELATIONS BETWEEN GDP, EDUCATION AND DEGREE OF CIVILIZATION IN ROMANIA

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Abstract: *The paper proposes a uni-factorial analysis of correlations between GDP as an indicator of macroeconomic development representative for the Romanian economy (resultant variable) and various indicators which it influences at a certain moment. The indicators were selected on the basis of available statistical data at the national level (National Statistics Institute) and international (World Bank), and in terms of methodology, we use usual statistical methods, such as Fisher test analysis of variables, Student test variable of the significance of the model parameters. The results obtained allowed interpretations in terms of economic influence on the factors such as the effort made to educational material or convicted persons or population trends or state of health on the economy in Romania in the considered period.*

Keywords: *material effort for education, macroeconomic indicator, Romanian economy, degree of civilization*

1. INTRODUCTION. APPLIED METHODS

This paper presents an empirical analysis carried out with the aim of highlighting the main factors influencing the GDP as an indicator that represents the "mirror" of a country's economics. Such research shows its relevance and necessity in terms of recent economic developments, which have worsened conditions for the resources allocated to education, particularly in Romania (Jivan and Weisz, 2014).

The indicators were selected within the limit of available data and correlations results and grouped according to the logic correlations: positive / negative on the one hand, strong / moderate / weak on the other. For analysis were used statistical methods such as Fisher's exact test and Student test and the theoretical point of view and according to Sipoș Preda (2006: 78-79), Matthew (2013) and Chilarescu (2014), the two tests study the link between variable x and y resultant variable using stochastic function of the form:

$$y = \alpha + \beta \cdot x + \varepsilon ,$$

where the α and β are called parameters or model coefficients and represent unknown values that are to be estimated, and ϵ is a random variable (residual or disruptive). Since the used regression function is stochastic, parameters α and β are not unique values, but contained averages, which are estimated using specific methods offered by mathematics and statistics.

The indicators were chosen for the period 2000-2010 (see Table 1 and 2), focusing on the correlation between: indicators related to material and human effort by society to education (school units by level of education, school laboratories, kids in kindergartens, rate of enrollment in education, school age population: 19-23 years old and over%, school population, teaching staff, indicators related to the degree of civilization (minor persons sentenced by the courts on the types of penalties, persons convicted permanently in penitentiaries, persons sentenced under rehabilitation centers, crime rate, indicators related to population and its health (total number of infant deaths, stable population) and resultative indicator GDP.

Table 1. Used statistical data

| Years | Schools (total) | Laboratories (total) | Kids in kindergartens (total) | Degree of school population: 19-23 years old and over % | School population (total) | Teaching staff (total) |
|-------|-----------------|----------------------|-------------------------------|---|---------------------------|------------------------|
| 2000 | 24481 | 20620 | 611036 | 32.9 | 4565279 | 294938 |
| 2001 | 24304 | 21103 | 616014 | 36.4 | 4554466 | 300108 |
| 2002 | 23679 | 22065 | 629703 | 41.09 | 4496786 | 286670 |
| 2003 | 18012 | 22459 | 636709 | 43.05 | 4472493 | 281272 |
| 2004 | 14396 | 22435 | 644911 | 45.33 | 4403880 | 285861 |
| 2005 | 11865 | 22689 | 648338 | 51.77 | 4360831 | 281034 |
| 2006 | 8484 | 23448 | 648862 | 59.59 | 4345581 | 277318 |
| 2007 | 8230 | 23730 | 650324 | 72.5 | 4404581 | 276849 |
| 2008 | 8221 | 25047 | 652855 | 78.3 | 4324992 | 275426 |
| 2009 | 8224 | 25755 | 666123 | 76.4 | 4176866 | 268679 |
| 2010 | 7588 | 26031 | 673736 | 70.1 | 4029226 | 252953 |

Sursa: <http://statistici.insse.ro/shop/?lang=ro>

Tabelul 2. Used statistical data (continuation)

| Years | Long term unemployment (% of total unemployment) | Convicted Minors (number of persons) | Convicted persons in jails (number of persons) | Convicted persons in reeducation centres (number of persons) | Criminality rate (no. persons convicted in 100.000 inhabitants) | No. of infant deaths (total) | Stable population (number of persons) |
|-------|--|--------------------------------------|--|--|---|------------------------------|---------------------------------------|
| 2000 | 49.2 | 6738 | 36447 | 359 | 336 | 7000 | 22435205 |
| 2001 | 48.6 | 6726 | 37406 | 319 | 370 | 7000 | 22408393 |
| 2002 | 56.5 | 7005 | 37448 | 398 | 375 | 6000 | 21794793 |
| 2003 | 61.5 | 6820 | 36104 | 319 | 353 | 5000 | 21733556 |
| 2004 | 59 | 6341 | 33007 | 167 | 320 | 4000 | 21673328 |
| 2005 | 56.3 | 6796 | 31122 | 195 | 304 | 4000 | 21623849 |
| 2006 | 57 | 6145 | 29756 | 204 | 263 | 3000 | 21584365 |
| 2007 | 50 | 5019 | 26443 | 212 | 214 | 3000 | 21537563 |
| 2008 | 41.3 | 3624 | 23100 | 163 | 171 | 3000 | 21504442 |
| 2009 | 31.6 | 3035 | 22308 | 163 | 159 | 3000 | 21469959 |
| 2010 | 34.9 | 3263 | 23614 | 179 | 195 | 3000 | 21431298 |

Sursa: <http://statistici.insse.ro/shop/?lang=ro>, <http://data.worldbank.org/country/romania>

2. FINDINGS

Regarding strong positive econometric relations (see Table 3) we mention that we noticed one, between No. of school laboratories as factorial variable and the dependent variable of gross domestic product, which in economic terms means that a growing effort by society for educational material (more school laboratories) determines the positive evolution of GDP.

Table 3. Strong positive econometric correlations regarding GDP

| No. | Factorial variable (of influence) | Correlation rapport (Multiple R) | Determination Coefficient (R Square) | T stat α | β | F | econometric model for 2000-2010 ($y = \alpha + \beta \cdot x + \varepsilon$) |
|-----|-----------------------------------|----------------------------------|--------------------------------------|-----------------|---------|---------|--|
| 1. | School laboratories | 0, 838 | 0, 702 | 3, 94 | 4, 61 | 21, 283 | GDP = - 1653868 + 83, 0248 · School laboratories |

Table 4. Moderate positive econometric correlations regarding GDP

| No. | Factorial variable (of influence) | Correlation rapport (Multiple R) | Determination Coefficient (R Square) | T stat α | T stat β | F | econometric model for 2000-2010 ($y = \alpha + \beta \cdot x + \epsilon$) |
|-----|---|----------------------------------|--------------------------------------|-----------------|----------------|--------|--|
| 1. | Kids in kindergartens | 0,782 | 0,611 | 3,54 | 3,76 | 14,192 | GDP = -4390076 + 7,2473 · Kids in kindergartens |
| 2. | Degree of school population: 19-23 years and over | 0,687 | 0,472 | 0,85 | 2,83 | 8,046 | GDP = -126040 + 7238,579 · Degree of school population: 19-23 years and over |

From Table 4, it can be seen that from the correlations between variables factorial econometric carried. Children enrolled in kindergartens, rate of enrollment in education of the population of school age: 19-23 years and over, and variable resultant gross domestic product were obtained positive results moderate, as the ratios of correlation (between 0,687 and 0,782) and the coefficient of determination falls in the range 0,60 and 0,80, which means that the connection between the factorial variables mentioned, and the dependent variable Domestic product is moderate.

For weak positive econometric correlation we mention that we noticed one, namely that of Number of patients out of hospitals as a variable factor and the dependent variable GDP. Although the correlation is of low intensity, the result nonetheless stresses that the influence of the health of the population on the Romanian economy in the long term exists.

In the empirical analysis we observed a negative and strong correlation between school population as a factor variable and the dependent variable GDP. Thus, the uni-factorial model linearly as ($y = \alpha - \beta \cdot x - \epsilon$): GDP = 4368954-0,93587 · The school population suggests that in terms of economic logic is not significant, although the intensity of influence is strong (decreasing school population cannot increase GDP or vice versa).

Table 5. Moderate negative econometric correlations regarding GDP

| No. | Factorial variable (of influence) | Correlation rapport (Multiple R) | Determination Coefficient (R Square) | T stat α | T stat β | F | econometric model for 2000-2010 ($y = \alpha - \beta \cdot x - \epsilon$) |
|-----|--|----------------------------------|--------------------------------------|-----------------|----------------|---------|---|
| 1. | Schools | 0, 678 | 0, 460 | 5, 32 | -2, 77 | 7, 680 | GDP= 516948, 1 - 16, 9918 · Schools |
| 2. | Teaching staff | 0, 754 | 0, 569 | 3, 76 | -3, 45 | 11, 910 | GDP= 3229707 – 10, 5534 · Teaching staff |
| 3. | Minors convicted | 0, 766 | 0, 587 | 5, 41 | -3, 58 | 12, 823 | GDP= 758246, 1 - 86, 6533 · Minors convicted |
| 4. | Convicted persons in jails | 0, 759 | 0, 577 | 4, 81 | -3, 50 | 12, 291 | GDP= 965087, 4 - 22, 5846 · Convicted persons in jails |
| 5. | Convicted persons in reeducation centers | 0, 687 | 0, 473 | 4, 85 | -2, 84 | 8, 082 | GDP= 613063, 9 - 1394, 03 · Convicted persons in reeducation centers |
| 6. | Criminality rate | 0, 718 | 0, 516 | 4, 86 | -3, 09 | 9, 603 | GDP= 709336, 1 - 1566, 08 · Criminality rate |
| 7. | Infant deaths | 0, 665 | 0, 443 | 4, 70 | -2, 67 | 7, 160 | GDP= 589668, 7 - 72, 4139 · Infant deaths |
| 8. | Settled population | 0, 646 | 0, 418 | 2, 64 | -2, 54 | 6, 476 | GDP= 7354953 - 0, 3256 · Settled population |

Table 5 represents negative moderate correlations and moderate between variable factors *School, Teachers, minor sentenced persons, persons convicted under rehabilitation centers and prisons, crime rate, infant deaths, stable population size and GDP* resultant variable.

CONCLUSIONS

Taking into account the complexity of influences between different indicators and GDP, it is important that the material effort by society for education strongly influences our economy, namely increasing the number of school laboratories should be a priority measure in reducing the dropout rate.

Of course, this is the quantitative side in calculating overall productivity, but it contributes to educational qualitative output, as it offers many opportunities for practical study. Students with more opportunities to obtain high performance impact the economy as a whole. As shown methodologically, moderate correlations resulted in the extremely important role of the degree of civilization (expressed by indicators such as the number of people sentenced or crime rates etc.) that influence GDP in the studied period.

Overall, although the fact is ignored too often by those responsible in this respect, the effects of the national education system and the degree of civilization on a country's economy cannot be overlooked because it is far more difficult to stop the wave effects than adopting effective measures by the government to prevent or reduce these effects, especially on the long term.

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