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## Examining the Drivers of Human Development in European Union

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### Abstract

This paper provides an analysis of the human development drivers in the European Union. The variables used cover the 2010-2017 period, during which the Member States have faced different economic and social challenges generated by the global economic crisis. In the analysis, I used Panel Estimated Generalized Least Squares, weighted with the Period SUR option. The paper confirms a direct relationship between three independent variables (life expectancy, corruption perception index and gross fixed capital formation) and the dependent variable - the human development index. In this context, the study demonstrated that a decrease in the dimension of corruption leads to an increase in the human development, since the growth of corruption perception index is associated with a fall in the corruption dimension. On the other hand, an inverse relationship was identified between the other two exogenous variables (the share of people leaving education and training early, respectively employment in agriculture) and the human development index.

**Keywords:** Human Development, Corruption, Employment, Education

**JEL Classification:** O15, D73, I25, J21

### Introduction

Economics is a science that generally focuses on maximizing results, and for this reason, sometimes, it fails to address the social challenges that nations are facing with. In some cases, economic policies are targeting utopic results such as economic growth objectives without having in mind any social costs, and do not attach much importance to the fundamentals of a healthy economic growth, namely human development.

Especially, human development is related to the quality of health and education systems and standard of living, factors that are also taken into consideration by United Nations Development Programme (UNDP) in computing the Human Development Index, the most used proxy for human development in scientific economic literature. However, the main economic researchers followed the UNDP methodology in their attempts to assess the impact of human development drivers, but in my view there are also other variables that may drive the human development, as is the case of corruption. In this context, I defined the drivers of human development by using corruption, early leavers rate (as a substituent for education), life expectancy (as UNDP methodology indicates - as a substituent for health), and a combination of employment in agriculture and gross fixed capital formation (which may be relevant for standard of living).

The motivation for choosing this topic consists in the lack of studies focusing on the main drivers of human development at a granular level, as I indicated above, but also in the fact that human development is the first thing that economists should have in mind in designing sustainable economic growth policies.

Bearing in mind all the arguments I have mentioned, the main objective of the paper is to determine the impact of human development drivers, which can be ensured by reaching the following specific objectives:

- ✓ estimating the impact of corruption on human development;

- ✓ computing the impact of early leavers rate on human development;
- ✓ estimating the impact of life expectancy on human development;
- ✓ computing the impact of employment in agriculture on human development;
- ✓ estimating the impact of gross fixed capital formation on human development;
- ✓ validating the maximum verisimilitude of the estimators.

## Literature Review

The scientific economic literature in the field of human development is vast, and many studies used different approaches to assess the impact of human development drivers. First of all, Dinu (2006) stated that success of modernisation depends on the focus of the economic transformation on the human dimension, which can be driven by actions in the field of education, civic participation of the population and political will to promote the values of democracy and legality.

Shah (2016) showed that some determinants of the human development index, including literacy rate and life expectancy at birth, had a positive impact on human development, given that countries with a higher level of the mentioned exogenous variables registered also a higher value of the human development index.

On the other hand, Sangali (2016) demonstrated that life expectancy at birth had a positive impact on the human development index, with the mention that positive evolutions of the life expectancy shall be promoted by the government through high quality health programs. The author's recommendation is that high quality health programs should be expanded to cover a higher number of the individuals, especially to improve the access of the poor population to high quality medical services. Another author, Crafts (1997) examined the interaction between the index of human development and growth of the gross domestic product per capita for 16 developed countries since 1870, concluding that the conventional measures which had supported economic growth have led to a improvement of the life expectancy. Also, Khodabakhi (2011) examined life expectancy and education in India over the period 2005-2010, finding that low rates of life expectancy at birth led to a decline in the human development index. From another point of view, Farid (2010), stated that since the beginning of the Enlightenment, education has been considered the way by which human capital is formed, this being a therapy for the soul - necessary for human development.

Regarding the impact of investments on development, several authors (Jalava and Pohjola, 2002; Daveri, 2002 and Stiroh, 2000) found a positive impact between these two variables in developed countries. Moreover, Bankole et al. (2011) showed that countries investing in technology, information and communication sectors also registered an increase in the human development index, given that this have the ability to improve the standard of living and educational outcomes. Mughal and Manzoor (1999) proved that high quality education leads to social development, given that the educational system will advance high-skilled people to hold responsible positions in public and corporate administrations.

Anderson (2010) analysed the effects of increased trade and investment in the US and Mexico, demonstrating that investment had a major impact on the human development index. Moreover, Arcelus et al. (2005) examined the effects of foreign direct investment on human development in the case of middle - and low-income countries, finding a positive impact for both country groups.

Sharma and Gani (2004) assessed the effects of investment on human development for two groups of countries and found that states with a higher level of human development attract more foreign direct investment, which also positively influences the human development for both country groups. Another opinion is that of Gokmenoglu et al. (2018), which states that foreign direct investments are very important for the host country, contributing to the human development and to the increase of the income of high-skilled graduates. This proves that attracting FDIs should be a priority in the policy-making process.

Mauro (1999) and Robinson (1999) stated that corruption generated high costs for political, economic and social dimensions, respectively lowered the level of investment (Rose-Ackermann, 1996). The direct relationship between corruption and human development was also analysed by Qizilbash (2001) and Akcay (2006) which found a negative impact of corruption on the dependent variable. This hypothesis was also supported by Bscherair and Tahtane (2017), but they argued their conclusion stating that corruption impede human development through the channel of political instability. Other authors (Nielsen and Haugaard, 2000) stated that this inverse relationship also affect the democracy state of play.

Jianu et al. (2019) concluded that linkage between income inequality (a relevant indicator for the social dimension) and its determinants depends on the institutional quality, this kind of inequality being more persistent in countries with extractive institutions that are also associated with states facing high levels of corruption.

Absalyamova et al. (2016) have shown that stability of human capital development is largely determined by the high level of corruption in Russia, the lower values of corruption being associated with increasing human development, reducing income inequalities and increasing economic growth rates.

## Methodology

In this section, I have described the techniques used to estimate the impact of the human development drivers, using a quantitative method to provide a rigorous construct for this analysis.

The method used aims to bring an added value in this field by examining the determinants of the human development index (HDI) over the analysed time period. In order to analyse this phenomenon, I started from establishing and verifying the following hypotheses:

- ✓ Human development index is positively influenced by life expectancy;
- ✓ The increase in the number of people leaving early the education and training systems negatively influences the human development index;
- ✓ The growth of corruption perception index (which reflects a fall in corruption level) leads to an increase in the human development index;
- ✓ The increase of people employed in agriculture favors the fall of human development.
- ✓ Human development index is positively influenced by gross fixed capital formation.

In the paper I used the panel technique, given that this approach is considered effective because it improves the robustness of the estimation and increases the degrees of freedom. On the other hand, it may trigger other challenges, such as the correlation between cross-sections and heteroscedasticity.

For testing the stationarity, I have used the Summary window, respectively the automatic lag selection option using Schwarz Criterion, which provides an overview of the following tests: Levin, Lin & Chu t\*; Breitung t-stat; Im, Pesaran & Shin W-stat; Augumented Dickey-Fuller - Fisher Chi-Square; Phillips-Perron - Fisher Chi-Square. The technique used indicated that the variables included in the model are stationary at the initial level and at the first difference, which motivates the use of an Autoregressive Distributed Lag (ARDL) model. However, I have tried to isolate the impact of the autoregressive term, taking into account the specific lags of the independent variables in accordance with the economic theory.

To reach the main objective of the paper, I used the Estimated Generalized Least Squares (EGLS) method weighted with the Period SUR option. This option was used to support the efforts for validating the model, respectively to avoid the occurrence of heteroskedasticity and of the general correlations between cross-sections.

In the process of identifying the method for estimating the effects, I initiated the Hausmann test (which verifies the compatibility with the Random Effects Model) and the Redundant Fixed Effects - Likelihood Ratio (which checks the compatibility with the Fixed Effects Model). The probabilities associated with the tests confirmed the compatibility with both models, which did not facilitate the

choice of an optimal estimation method, especially, since the Fixed Effects Model does not allow the use of the Period SUR option. In this context, I used an estimation method without effects that allowed the use of the mentioned option.

The data used in the paper have an annual frequency and covers the 2010-2017 period, for all 28 Member States of the European Union, in order to facilitate a comprehensive analysis of the human development. The statistical data used in the analysis are published by United Nations, Transparency International, Eurostat and AMECO, as shown in *Table 1*. Following the introduction of these variables in the model, 196 observations resulted.

**Table 1: Structure of the model**

| Variable  | Source                      |
|---|-----------------------------|
| Human development index                                 | United Nations              |
| Life expectancy   | AMECO                       |
| Early leavers from education and training (18-24 age %) | Eurostat                    |
| Corruption perception index                             | Transparency Internationals |
| Employment in agriculture (% of total employment)       | Eurostat                    |
| Gross fixed capital formation (% of GDP)                | Eurostat                    |

*Source: Own processing using Microsoft Office 2016*

In order to verify the heteroskedasticity I used the Breusch-Pagan-Godfrey test, for which I estimated the equation manually, given that Eviews does not display this test result in the panel window. In this respect, I estimated the following equation:

$$hdi100 = \alpha + \beta_0 life\_expectancy + \beta_1 early\_leavers + \beta_2 corruption(-1) + \beta_3 employment\_agriculture(-1) + \beta_4 gfcf + \varepsilon_t$$

, where *hdi100* is represented by the human development index multiplied by 100, *life\_expectancy* is represented by life expectancy expressed in average age at born, *early\_leavers* is represented by the share of early leavers from education and training, *corruption (-1)* is represented by corruption perception index lagged by 1 year, *employment\_agriculture (-1)* is the share of employment in agriculture in the total occupied population lagged by 1 year and *gfcf* represents the share of gross fixed capital formation in GDP, while  $\varepsilon_t$  represents the error ter.

Following the estimation of the equation, I used the "CHISQ.DIST.RT(n\*R2,  $\Omega$ )" function from the Microsoft Office Excel software [where n is the number of observations (in this case, 196), R2 is the coefficient of determination, and  $\Omega$  is the number of degrees of freedom (in this case, 5)], to determine the probability associated with the Breusch-Pagan-Godfrey test.

In order to check the autocorrelation of the residuals, I used the Durbin-Watson test, even if it is not a significant issue when using panel data (more details were presented in the next section). Lastly, in order to verify the maximum verisimilitude of the estimators, I have examined the Gauss-Markov hypotheses, as expressed in *Table 2*.

**Table 2: Econometric tools used for validating maximum verisimilitude of the estimators**

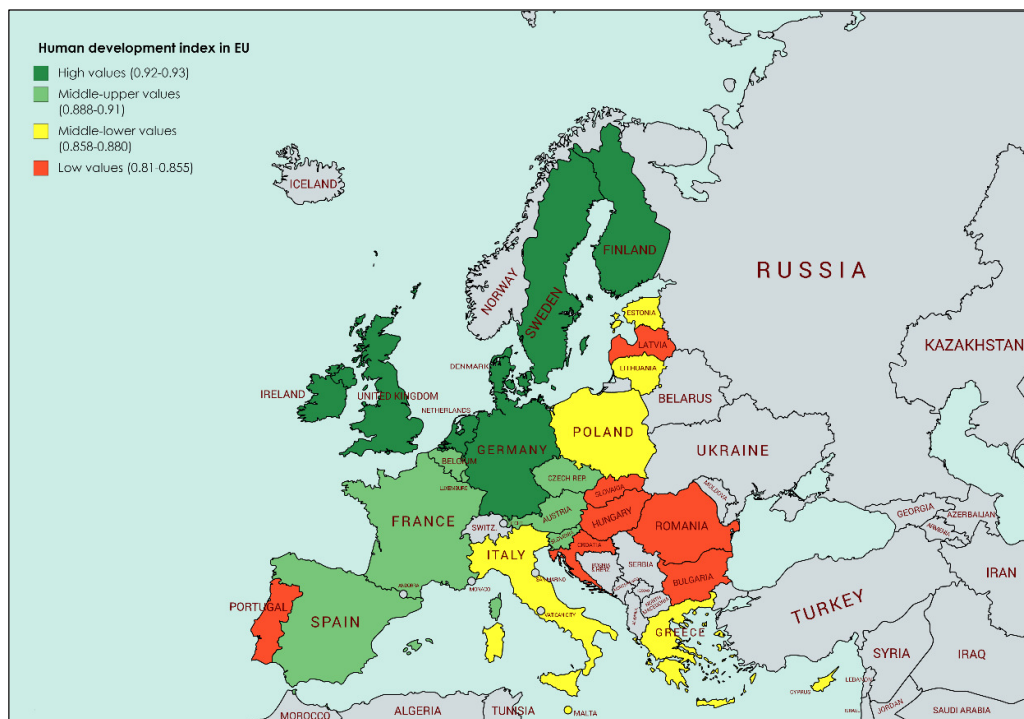
| Tool used  | Hypothesis checked                              |
|--|---|
| Fisher test  | Valid model                                     |
| Jarque-Bera test   | Normally distributed residuals                  |
| Durbin-Watson test   | Absence of autocorrelation                      |
| Breusch-Pagan-Godfrey test   | Heteroskedasticity                              |
| Cross-section Dependence Test (Breusch-Pagan, Pesaran CD, Pesaran scaled LM) | Absence / existence of cross-section dependence |
| Pearson correlation  | Existence / absence of multicollinearity        |

*Source: Own processing using Microsoft Office 2016*

## Results and Interpretations

In this section, I analysed the impact of the human development drivers in all Member States of the European Union, at the same time verifying the verisimilitude of the obtained results, as I mentioned in the methodology.

In *Annex 1*, I have illustrated the situation of human development in 2017 in all the Member States of the European Union. As can be seen, the highest values of human developments index were recorded in Ireland (0.938), Denmark (0.936) and Sweden (0.933). At the opposite pole were Romania (0.811), Bulgaria (0.813) and Croatia (0.831). The main reason for their position consists in the fact that they were the last countries joining the European Union, which had also lower benefits from structural funds, compared to the first blocks of accession. On the other hand, as can be seen in *Annex 1*, the states with the highest levels of this indicator are those from the Western Europe, which have adopted inclusive economic policies, being also supported by the European funds.



**Figure 1: Human development index in the European Union member states in 2017**

*Source: Own processing using United Development database*

In *Figure 1*, I have clustered the Member States of the European Union depending on the level of the human development index in four categories, with an equal number of countries. In the first category are the states having the highest values of the human development index, respectively those registering a value between the 0.920-0.938 interval. This category includes: IE, DE, SE, NL, DK, UK and FI. Then, in the next category were included BE, AT, LU, FR, SI, ES and CZ, which registered values between 0.888-0.916. The third category is represented by the IT, MT, EE, EL, CY, PL and LT, with a level of the human development index between 0.858-0.880. The last category of countries (lowest values of HDI, between 0.811-0.855) is composed by SK, LV, PT, HU, HR, BG and RO. As can be seen in *Figure 1*, the northern, western and central states of the European Union are the most developed countries, with the highest values of the HDI, excepting Portugal; Eastern and Southern European Union Member States, respectively Portugal form the group of developing Member States, bearing in mind the lower levels of indicator.

The results obtained following the calculation of the impact of human development drivers were attached in *Figure 2*. As can be seen, the estimators are statistically significant, given that their probabilities are below the significance threshold of 5%. The value of R-squared (0.613271) confirmed the linearity of the regression and the appropriate choice of the regressors, their evolution explaining the fluctuation of the endogenous in a proportion of 61.32%. Also, the probability associated with the Fisher test is 0.00% (below the 5% significance level), which confirmed the validity of the econometric model from a statistical point of view.

| Dependent Variable: HDI100<br>Method: Panel EGLS (Period SUR)<br>Date: 01/04/20 Time: 14:27<br>Sample (adjusted): 2011 2017<br>Periods included: 7<br>Cross-sections included: 28<br>Total panel (balanced) observations: 196<br>Linear estimation after one-step weighting matrix<br>Period SUR (PCSE) standard errors & covariance (d.f. corrected) |             |                    |             |        |
|---|-------------|--------------------|-------------|--------|
| Variable  | Coefficient | Std. Error         | t-Statistic | Prob.  |
| LIFE_EXPECTANCY   | 0.552012    | 0.077650           | 7.108990    | 0.0000 |
| EARLY_LEAVERS   | -0.136158   | 0.028137           | -4.839050   | 0.0000 |
| CORRUPTION(-1)  | 0.065563    | 0.009564           | 6.855240    | 0.0000 |
| EMPLOYMENT_AGRICULTURE(-1)  | -0.156625   | 0.043391           | -3.609649   | 0.0004 |
| GFCF  | 0.058070    | 0.014243           | 4.077242    | 0.0001 |
| C   | 40.30547    | 6.257173           | 6.441482    | 0.0000 |
| Weighted Statistics   |             |                    |             |        |
| R-squared   | 0.613271    | Mean dependent var | 17.58202    |        |
| Adjusted R-squared  | 0.603094    | S.D. dependent var | 18.98045    |        |
| S.E. of regression  | 0.913420    | Sum squared resid  | 158.5237    |        |
| F-statistic   | 60.26002    | Durbin-Watson stat | 1.763401    |        |
| Prob(F-statistic)   | 0.000000    |                    |             |        |
| Unweighted Statistics   |             |                    |             |        |
| R-squared   | 0.809519    | Mean dependent var | 87.45000    |        |
| Sum squared resid   | 550.8759    | Durbin-Watson stat | 0.075319    |        |

**Figure 2: Estimation results**

*Source: Own processing using Eviews 9.0*

Next, I have presented the impact of exogenous variables on the human development index. According to the results, the increase of life expectancy by one percentage point led to a growth of the human development index with 0.552012 deviation points in the analysed period. The reason is that countries with a higher life expectancy, have also an educated and healthy population, while the situation of developing Member States is at the opposite.

On the other hand, an increase of the early leavers rate by 1 percentage point led to a reduction of the human development index by 0.136158 deviation points. The underdevelopment generates the inability of adolescents to access or continue the university studies, which creates the premises of a lower level of education. Further, this limits the opportunities of people on labour market and, implicitly, the wage expectations, which may cause a fall in human development level.

From another point of view, when corruption perception index register a hike by one deviation point, the human development index increases by 0.065563 deviation points. The high values of the corruption perception index are associated with a lower level of corruption. Reducing corruption leads to a higher confidence of the population in government institutions, which provides economic stability in terms of production, consumption and investment, this favoring development gains. In this context,

high quality government institutions may have an positive effect on different forms of development, implicitly on human development.

As regards the employment in agriculture, expressed as a percentage of the total employment, its increase by one percentage point led to a reduction of the human development index with 0.1516625 deviation points. A high employment rate in the agricultural sector determines a decline in the human development due to the fact that population employed in agriculture is facing issues related to their standard of living. Moreover, in the case of this category of population, human emancipation is limited and stationary, or in some cases, is growing slowly.

This paper, also demonstrated that, an increase in the gross fixed capital formation (expressed as % of GDP) by one percentage point of GDP caused a HDI growth of 0.058070 deviation points. This can be explained by the fact that investments generates higher opportunities on the labour market for the active population by creating jobs and increasing wages channels, which increase the level of development.

The results shows that the greatest impact of HDI drivers was obtained for the exogenous related to life expectancy (0.552012 pp). The increase in life expectancy is achieved by facilitating the access of population to a well-developed health system and, therefore, to a better life, which finally drives up the human development level. On the other hand, the employment rate in agricultural sector has the greatest negative impact on the HDI (0.156625), which confirms that the reduction of the employed population in this sector and their reallocation to better paid jobs leads to an increase in the standard of living, which favors the positive evolution of the dependent variable.

Regarding the autocorrelation of the residuals hypothesis, I used the Durbin-Watson test. In this case, I checked the values of dU and dL for 196 observations with 6 degrees of freedom, as follows:

$$dL = 1.7035$$

$$dU = 1.8296$$

Given that the value of the Durbin-Watson test (1.763401) is between dL and dU statistics, I concluded that the test is inconclusive, which cannot recommend any decision related to the autocorrelation of the residuals. However, the problem of autocorrelation loses its importance in the case of panel data, and I chosed to ignore it, bearing also in mind the result of the Durbin-Watson.

Further, according to the methodology, I processed the Breusch-Pagan-Godfrey test (*Figure 3*). For 5 degrees of freedom, the result of the test provided a probability of 9.06%, which confirms the hypothesis related to the model homoscedastic feature (the probabilities of exogenous variables have values higher than the significance threshold of 5%), this result being also in accordance with Gauss - Markov theorem.

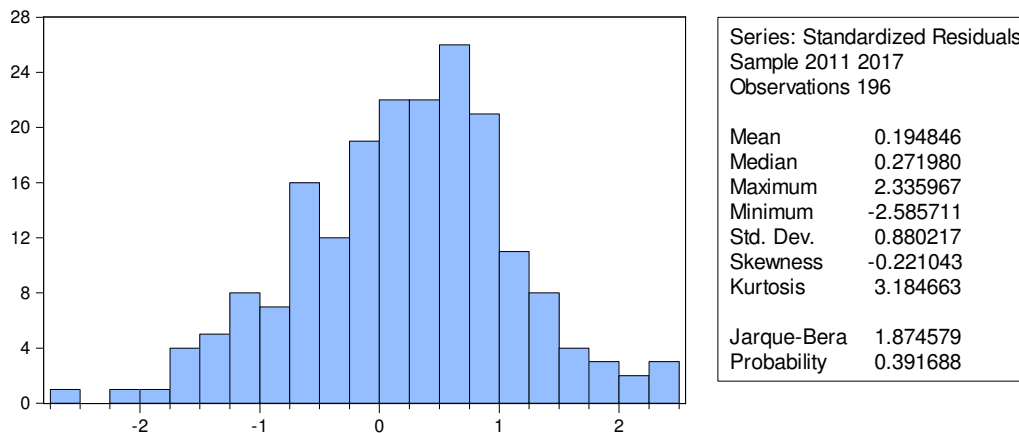


| Dependent Variable: RESID01*2            |             |                       |             |        |
|--|-------------|-----------------------|-------------|--------|
| Method: Panel Least Squares              |             |                       |             |        |
| Date: 01/04/20 Time: 14:40               |             |                       |             |        |
| Sample (adjusted): 2011 2017             |             |                       |             |        |
| Periods included: 7                      |             |                       |             |        |
| Cross-sections included: 28              |             |                       |             |        |
| Total panel (balanced) observations: 196 |             |                       |             |        |
| Variable                                 | Coefficient | Std. Error            | t-Statistic | Prob.  |
| LIFE_EXPECTANCY                          | -0.033489   | 0.040502              | -0.826830   | 0.4094 |
| EARLY_LEAVERS                            | -0.022507   | 0.018208              | -1.236118   | 0.2179 |
| CORRUPTION(-1)                           | 0.003814    | 0.006878              | 0.554573    | 0.5798 |
| EMPLOYMENT_AGRICULTURE(-1)               | 0.011020    | 0.018429              | 0.597967    | 0.5506 |
| GFCF                                     | -0.035550   | 0.025390              | -1.400182   | 0.1631 |
| C  | 4.124862    | 3.256328              | 1.266722    | 0.2068 |
| R-squared                                | 0.024236    | Mean dependent var    | 0.808794    |        |
| Adjusted R-squared                       | -0.001442   | S.D. dependent var    | 1.142455    |        |
| S.E. of regression                       | 1.143279    | Akaike info criterion | 3.135812    |        |
| Sum squared resid                        | 248.3464    | Schwarz criterion     | 3.236162    |        |
| Log likelihood                           | -301.3095   | Hannan-Quinn criter.  | 3.176438    |        |
| F-statistic                              | 0.943849    | Durbin-Watson stat    | 1.806210    |        |
| Prob(F-statistic)                        | 0.453810    |                       |             |        |

**Figure 3: Heteroskedasticity test**

Source: Own processing using Eviews 9.0

I had also calculated the result of the Jarque-Bera test (Figure 4), whose associated probability (39.17%) confirmed that the errors are normally distributed.

**Figure 6: Jarque-Bera test**

Source: Own processing using Eviews 9.0

Finally, I checked the Klein's criterion by comparing the correlations between the independent variables and the coefficient of determination. Given that the values of the correlations were below the level of the reference indicator, I accepted the absence of multicollinearity (Figure 7).

|              | LIFE_EXPE... | EARLY_LE... | CORRUPTI... | EMPLOYM... | GFCF      |
|--------------|--------------|-------------|-------------|------------|-----------|
|              | LIFE_EXPE... | EARLY_LE... | CORRUPTI... | EMPLOYM... | GFCF      |
| LIFE_EXPE... | 1.000000     | 0.119772    | 0.525118    | -0.501990  | -0.249129 |
| EARLY_LE...  | 0.119772     | 1.000000    | -0.209314   | 0.125743   | -0.124160 |
| CORRUPTI...  | 0.525118     | -0.209314   | 1.000000    | -0.513066  | 0.132280  |
| EMPLOYM...   | -0.501990    | 0.125743    | -0.513066   | 1.000000   | 0.013585  |
| GFCF         | -0.249129    | -0.124160   | 0.132280    | 0.013585   | 1.000000  |

**Figure 7: Klein's criterion**

*Source: Own processing using Eviews 9.0*

## Conclusions

Through this analysis, I identified a positive relationship between life expectancy and human development. This also confirms the fact that high life expectancy of the population, which can be ensured by reducing poverty, improving the health and education systems determines human development.

From another perspective, I demonstrated that the increase of corruption perception index (which reflects a fall in the incidence of corruption) impacts positively the human development index. In countries where corruption incidence is low, citizens and resident corporates, but also investors have more confidence in the policies adopted by the government, which ensures a favorable environment for development.

Moreover, I found a positive relationship between gross fixed capital formation and human development index. In this case, a high level of investment creates more opportunities for population, which drives human development on a upward trend.

This paper also demonstrated the negative impact of early leavers rate and employment in agriculture on human development. This fact shows that, people leaving studies early are more exposed to a low quality of life and poverty, compared to the young people with higher education. A high employment rate in agricultural sector leads to the categorisation of a significant part of the employed population in a lower income category, which causes a decrease in the standard of living and therefore a reduction in the human development index.

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