1. Introduction

The measure of a country’s development is one of the most critical and highly debated issues in economic research [1]. However, the first issue that should be addressed in considering the essence of socio-economic development is the information that development is more than just the economic growth of a given country. Therefore, non-economic factors should also be included in research on this topic. Development, as a concept, is ambiguous and is used in variety of contexts. It is, first and foremost, understood as a chain of on-going targeted and irreversible changes in the structures of complex bodies, i.e., systems [2]. Human development finds its theoretical underpinnings in Sen’s capabilities approach which holds “a person’s capability to have various functioning vectors and to enjoy the corresponding well-being achievements” to be the best indicator of welfare [3, 4].

The Human Development Index (HDI) is one of the most commonly used measures of socio-economic development [5]. Until 2010, HDI was calculated according to the following procedure – it consisted of three components [6, 7]:

– Gross domestic product per capita;
– Estimated length of human life;
– Citizenship level of education

\[ I = \frac{P_I - P_{\text{min}}}{P_{\text{max}} - P_{\text{min}}} \]

where \( I \) – general index formula; \( P_I \) – actual value of the variable; \( P_{\text{min}} \) – minimum value of the variable; \( P_{\text{max}} \) – maximum value of the variable.

HDI = \( I_L + \frac{1}{3} I_e + \frac{1}{3} I_{PKB} \)

where \( I_L \) – life expectancy index; \( I_e \) – educational index; \( I_{PKB} \) – index for GDP per capita.

In 2010, the HDI calculation method was changed. Currently, it is calculated on the basis of four diagnostic variables: average life expectancy, national income per capita, calculated according to purchasing power parity, the average number of years of education and the share of people who could read and write with understanding. However, researchers believe the index needs further modification [2, 3, 6]. Gross domestic product (GDP) or any other aggregate, computed per capita may not provide an accurate assessment of the situation, in which most people find themselves [12].

In an effort to construct a more comprehensive measure of socio-economic development in this paper, the following determinants of socio-economic development will be used:

1. Economy and Finance.
2. Science and Technology.
3. Health.
4. Education.
5. Living Conditions.

The aim of the research is an attempt to assess the impact of the economic situation on the synthetic indicator of socio-economic development of EU countries, based on the estimation of the model, in which the synthetic measure will be a dependent variable. The implementation of the objective required the use of descriptive statistical methods, in particular, the linear regression method. The Pearson’s linear correlation coefficient was also used to study the relationship between quantitative variables.

2. Materials and Methods

The construction of the synthetic measure of development requires that the diagnostic variables are grouped as either stimulants or destimulants. The variables, included in the set of stimulants, have been marked with the sign (+), while the (–) denote destimulants.

The synthetic measure of socio-economic development will be calculated by the following formula:

\[ u_i = \frac{1}{r} \sum_{q=1}^{r} u_{iq}, (i = 1, ..., n; q = 1, ..., r), \]

where \( u_{iq} \) – synthetic variable value for the \( i \)-th country, calculated on the basis of variables, belonging to the \( q \)-th determinant; \( r \) – number of determinants.

The following variables will be used for the construction of indicators for each individual determinant of the quality of life:

I. Economy and Finance
1. Unemployment rate (–).
2. GDP per capita 1 (+).
3. Real consumption expenditures per 1 inhabitant (+).
4. The number of poor people per 1000 inhabitants (–).

II. Science and Technology
1. Gross domestic expenditure on R&D (% of total expenses) (+).
2. Human resources in science and technology (% of the active population) (+).
3. Number of patent applications, submitted to the state-sanctioned patent-governing office per million inhabitants (+).
4. Number of researchers per 1000 inhabitants (+).

### III. Health
1. Subjectively-perceived long-standing limitations in usual activities due to the health problem (–).
2. Self-reported unmet needs for medical care due to being too expensive (–).
3. Healthy life years (+).
4. Number of doctors per 1000 inhabitants (+).
5. Number of beds in hospitals per 100 000 inhabitants (+).

### IV. Education
1. Participation rates in education and training (persons aged 25 to 64 years old) (+).
2. Percentage of people with at most high school education and with no education beyond the age of 18–24 years old (–).
3. Percentage of people, obtaining college education between the age of 20 and 24 years old (+).
4. Percentage of people with a college degree aged 15 to 64 (+).
5. Percentage of people with high-school education between the age of 15 to 64 (+).

### V. Living Conditions
1. Percentage of people who are unable to meet unexpected financial expenses (–).
2. Percentage of people who are unable to make ‘ends meet’ (–).
3. Percentage of people at risk of poverty (–).
4. Share of people, living in under-occupied dwellings (+).

### 3. Research results

Table 1 presents the values of Pearson’s linear correlation coefficients between the economic indicators and the synthetic measure of socio-economic development of EU countries. The following economic indicators were used in the research: unemployment rate, GDP per capita, indicator of real expenditure per capita and percentage of people at risk of poverty.

The analysis shows that GDP per capita has a strong, statistically significant effect on the synthetic measure of socio-economic development. This is demonstrated by the value of the Pearson linear correlation coefficient (0.75). To a similarly high degree (0.77), the indicator of socio-economic development is affected by the indicator of real expenditure per capita. In the case of unemployment rate it was obtained, that this variable had the moderate, negative impact on the synthetic measure of socio-economic development (–0.44). The synthetic indicator of the percentage of people at risk of poverty has the greatest negative impact on the synthetic measure of socio-economic development, for which the Pearson’s linear correlation coefficient was obtained at the level of –0.68.

In Fig. 1–4, estimated linear regression functions are presented, in which individual economic indicators are independent variables of the model, while the created synthetic measure has become a dependent variable. In this way, we obtain information on how the increase of the independent variable by 1 affects the dependent variable of the model.

| Variable | Unemployment rate | GDP per capita | Indicator of real expenditure per capita | Percentage of people at risk of poverty | Synthetic measure of socio-economic development |
|----------|------------------|---------------|----------------------------------------|----------------------------------------|-----------------------------------------------|
| Unemployment rate | 1.00             | –0.31         | –0.32                                  | 0.27                                   | –0.44                                         |
| GDP per capita | –0.31            | 1.00          | 0.86                                   | –0.45                                  | 0.75                                          |
| Indicator of real expenditure per capita | –0.32           | 0.86          | 1.00                                   | –0.47                                  | 0.77                                          |
| Percentage of people at risk of poverty | 0.27            | –0.45         | –0.47                                  | 1.00                                   | –0.68                                         |
| Synthetic measure of socio-economic development | –0.44           | 0.75          | 0.77                                   | –0.68                                  | 1.00                                          |

*Source: author’s calculations*
Models of regression functions (presented in Fig. 1–4) allowed obtaining estimated parameters for each of the economic measures, used in this analysis. Their interpretation will allow stating if the synthetic measure increases or decreases, if each variable increases by 1. This will allow estimating which determinant has the greatest impact on the socio-economic development of EU countries.

The models of regression functions (presented in Fig. 1–4) provide estimates of marginal effects for each of the particular economic indicator, as well as the model fit statistics. The marginal effects reveal the expected magnitudes of change in the synthetic measure, associated with one unit increases in the value of each variable used. The model fit statistics allows assessing which of the economic indicators has the greatest individual ability to predict the socio-economic development of EU countries. It can be observed, that the indicator of real expenditure per capita ($r=0.77$) and GDP per capita ($r=0.75$) have the greatest impact on socio-economic development.

It is planned to develop the research about socio-economic development of MENA countries. On the basis of Eurostat data from the years 2006–2016, an attempt was made to assess the impact of the selected economic measures: unemployment rate, GDP per capita, indicator of real expenditure per capita, percentage of people at risk of poverty on the socio-economic development of the European Community countries. In pursuing the goal of the publication, a research hypothesis that economy has the positive impact on the living standards of EU residents was adopted. The synthetic measure, characterizing the standard of living, was created on the basis of selected determinants: Economy and Finance; Science and Technology; Health; Education and Living Conditions.

It can be observed, that the indicator of real expenditure per capita ($r=0.77$), followed by GDP per capita ($r=0.75$), has the greatest impact on the socio-economic development of EU citizens. The results of the correlation analysis indicate a high level of correspondence between GNP per capita and various composite social indices [12]. The unemployment rate has the negative impact ($r=–0.44$) on the socio-economic development of EU residents. The percentage of people at risk of poverty has the greatest negative impact ($r=–0.68$) on the socio-economic development. Action against poverty is needed in all developing regions [13]. EU governments should allocate funds to combat poverty.

It is planned to develop the research about socio-economic development in the European Union countries by using a multi-equation model.

### 4. Discussion

On the basis of Eurostat data from the years 2006–2016, an attempt was made to assess the impact of the selected economic measures: unemployment rate, GDP per capita, indicator of real expenditure per capita, percentage of people at risk of poverty on the socio-economic development of the European Community countries. In pursuing the goal of the publication, a research hypothesis that economy has the positive impact on the living standards of EU residents was adopted. The synthetic measure, characterizing the standard of living, was created on the basis of selected determinants: Economy and Finance; Science and Technology; Health; Education and Living Conditions.

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### References

1. Milenkovic, N., Vukmirovic, J., Bulajic, M., Radojicic, Z. (2014). A multivariate approach in measuring socio-economic development of MENA countries. Economic Modelling, 38, 604–608. doi: http://doi.org/10.1016/j.econmod.2014.02.011
2. Stec, M., Filip, P., Grzebyk, M., Pierscieniak, A. (2014). Socio-Economic Development in the EU Member States – Concept and Classification. Inzinerine Ekonomika-Engineering Economics, 25 (5), 504–512. doi: http://doi.org/10.5755/j01.ec.25.5.6413
3. Ranis, G. (2004). Human Development and Economic Growth. Yale University Economic Growth Center Discussion Paper No. 887. Available at: http://www.yale.edu/center/pdf/cpdp887.pdf
4. Sen, A. (1985). Well-Being, Agency and Freedom: The Dewey Lectures 1984. The Journal of Philosophy, 82 (4), 169–221. doi: http://doi.org/10.2307/2026184

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![Fig. 3. Regression function parameters – synthetic measure in terms of indicator of real expenditure per capita](image_url)

Source: author’s calculations

The estimated marginal effects reveal that a one unit increase in measurement of the determinant is expected to decrease in the synthetic measure by 0.005, if the people at risk of poverty are the determinant.
5. Maccari, N. (2014). Environmental Sustainability and Human Development: A Greening of Human Development Index. SSRN Electronic Journal. doi: http://doi.org/10.2139/ssrn.2426073
6. Haq, M. Ul S.; Fukuda-Parr and, A., Shiva Kuma, K. (Eds.) (2003). The Birth of the Human Development Index. Readings in Human Development. Oxford, 127–137.
7. McGanahan, D. V. et. al. (1972). Contents and Measurements of Socioeconomic Development. A UNRISD Staff Study. New York: Praeger Publishers.
8. Hassan Ali, H. M., Ibrahim, O. A. (2010). A Revised Human Development Index (RHDI) for Sudan: An Empirical Study. SSRN Electronic Journal. doi: http://doi.org/10.2139/ssrn.1530405
9. Henderson, H., Lickerman, J., Flynn, P. (Ed.) (1999). Quality of Life Indicators. A new tool for assessing national trends. Calvert-Henderson.
10. McGillivray, M., Noorbakhsh, F. (2004). Working Paper Composite indices of human well-being: Past, present, and future WIDER Research Paper. No. 2004/63.
11. Stiglitz, J., Sen, A., Fitoussi, J. P. (2009). Report by the commission on the measurement of economic performance and social progress. Available at: https://www.economie.gouv.fr/files/finances/presse/dossiers_de_presse/090914mesure_perf_eco_progres_social/synthese_ang.pdf
12. Khan, H. (1991). Measurement and determinants of socioeconomic development: A critical conspectus. Social Indicators Research, 24 (2), 153–175. doi: http://doi.org/10.1007/bf00300358
13. United Nations Development Programme (UNDP). (2019). Human Development Reports. The 2019 Global Multidimensional Poverty Index (MPI). Available at: http://hdr.undp.org/en/2019-MPI

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