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LINKING THE GOVERNMENT EXPENDITURES TO THE ACHIEVEMENT OF THE EUROPE 2020 STRATEGY INDICATORS. EVIDENCE FROM CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Abstract. In order to evaluate the degree of sustainable development at CEEC (Central and Eastern European Countries) by means of an aggregate indicator and to determine if the government expenditures in the field of environment, environment protection, fuel, energy, education and social protection could influence the achievement of the Europa 2020 targets, a data panel of 10 CEEC for 2007–2018 period was analysed through Fully Modified Ordinary Least Squares (FMOLS) method and a Vector Error Correction Model (VECM). To calculate the indicator, an algorithm that included six steps was used. The results of the study show, on long-term, statistically significant correlations between the target indicator and all the selected variables, except for the government expenditures with the education variable. However, on short-term, there were identified strong connections reflected in bidirectional causality between government expenditures with social protection and the target indicator. Also, on short-term, a strong causal relationship was identified from target indicator to the total government expenditures for education, from the environmental protection government expenditures to the government expenditures for social protection and from the total government expenditures for social protection to the total government expenditures for education.

Keywords: research and development, climate change and energy, education, poverty and social exclusion, target indicator.

JEL Classification: G18, O44, Q56.

Introduction

At European level, the Strategy for a Sustainable Europe by 2030 is already being prepared, presenting three scenarios (European Commission, 2019) to ensure the best ways to achieve the Sustainable Development Goals (SDGs): Scenario 1 – A Global European Union (EU)

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Strategy with regard to the SDGs, Scenario 2 – Continuous integration of the SDGs into all relevant EU policies and Scenario 3 – Increased emphasis on external action. Through these scenarios, Europe can contribute by 2030 to achieving the United Nations' sustainable development goals, with the EU and its Member States as pioneers in the transition to sustainability for the benefit of all. We therefore considered it appropriate to analyze the way in which the Europe 2020 Strategy has been implemented, in order to be able to formulate conclusions and opinions on policies at Member State level to enable future targets to be achieved (Simionescu et al., 2019).

The global financial crisis of 2007 put an end to years of economic growth and social progress in Europe and highlighted weaknesses in community building (Dijkstra et al., 2015; Welch, 2011; Cuadrado-Roura et al., 2016; European Commission, 2009).

In 2010, following the awareness of the effects of the 2007–2010 crisis at European level, a strategy was created to enable the EU to emerge from a stronger crisis and to reshape the EU into a smart, sustainable and inclusive economy, characterized by through high levels of employment, productivity and social cohesion (European Commission, 2010). As the previous Lisbon Strategy, reformed in 2005, did not produce results in overcoming the persistent large differences between Member States in the implementation of the objectives, the Europe 2020 Strategy was the EU's response to the economic, financial and environmental crisis, ensuring competitiveness and sustainable growth in Europe (Begg et al., 2010).

Three priorities have been set in the Europe 2020 Strategy: smart growth – generating an economy based on knowledge and innovation; sustainable growth – advancing a more resource-efficient, greener and more competitive economy; inclusive growth – developing an economy with higher employment rate, able to ensure economic, social and territorial cohesion.

To achieve these 2020 priorities, the Commission has proposed to the European Union five measurable targets that are monitored and translated into national targets: employment, research and innovation, climate change and energy, education and combating poverty (Florea et al., 2020). A group of nine headline indicators and four sub-indicators, assembled by Eurostat, give a synopsis of how far or close the EU is from achieving its overall targets (Bourgeais & Gebhard, 2015).

The EU is made up of countries with very different levels of socio-economic development, as has been highlighted in the many papers on the EU (Fura & Wang, 2017; Stec et al., 2014; Alexa et al., 2019; Palevičienė & Dumčiuvienė, 2015).

Starting from the heterogeneity of its members, the Europe 2020 Strategy takes into account the particularities of each Member State, the national objectives may be different from those proposed in the European Strategy, taking into account the starting point, the concrete conditions in each country, as well as depending on the bottlenecks on economic growth or other economic and social processes specific to each Member State. The approach chosen was a flexible one, the European objectives being translated into national objectives, reflecting the particularities of each country, the objectives are common and do not involve the division of tasks, they are put into practice through measures at national and European level (European Institute of Romania [IER], 2020).

In order to support the achievement of the priorities proposed in the strategy, cumulated activities at national, EU and international level were needed. Therefore, the research gap is

drawn as it follows: if there are several studies on EU and international involvement, we have identified a lack of research to analyze the effects of national involvement in achieving the objectives set out in the Europe 2020 Strategy.

The purpose of this research is to examine how the use of available resources by the governments (evaluated by using the government expenditures) of ten Central and Eastern European countries (CEEC) has affected the achievement of the targets set in the Europe 2020 Strategy.

Thus, the research hypotheses, designed to fullfill the general objective, are the following:

H1. The degree of achievement of the targets proposed by the Europe 2020 Strategy can be measured using a composite index (the target aggregated indicator).

H2. There are significant correlations between public expediture on the environmental protection, energy and fuel, education and social protection and achievement of the targets set in the Europe 2020 Strategy (expressed with the help of the target aggregated indicator).

For the evaluation of the national involvement in this paper, we aim to identify the influence of government expenditures in ten CEEC on meeting the targets set in the Europe 2020 Strategy, given that the objectives of the 2030 Agenda on sustainable development at European level are already meant to be included.

1. Literature review

1.1. Indicators used for measuring the sustainable development/Europe 2020 Strategy

Not only in the activity of authorities, governments, but also in people's daily lives, certain indicators are used, voluntarily or involuntarily, when analyzing or making forecasts, due to the more succinct presentation of information by indicators and implicitly the ease of decision-making based on them. Thus, Ravallion (2012) analyzed the possibility of using mashup indexes of development for each theory, but practice offers little or no explanation for their use. Furthermore, the role of indicators applied in the analysis and evaluation of sustainable development at EU level was assessed by Cornescu and Adam (2014) who found that the use of specific models for assessing progress is promoted due to the use of indicators relevant to the particularities of the area concerned.

Nevertheless, OECD pointed out that the main attribute of the indicators is to outline the entanglement in a good amount of relevant information that can be easily understood and interpreted (OECD, 2014). In this view, another strand in literature consider that indicators are essential for estimating the progress towards the proposed objectives (Dalal-Clayton & Krikhaar, 2007) and also for assessing the efficacy of implemented policies (European Commission, 2005). Also, Bossel (1999) and Iacobuta et al. (2019) believe that indicators can be extremely useful for policy development, integration at different levels and institutional conditions.

Most papers from the literature based on the calculation of indicators are oriented towards indicators for measuring sustainable development (Cornescu & Adam, 2014; Bossel, 1999; Paoli & Addeo, 2016; Campagnolo et al., 2016). One can talk about the use of hundreds

of different indicators in different contexts, by different users and for different purposes (Hak et al., 2016).

However, there are also other research papers pointing out the importance of monitoring the progress towards achieving the EU's objectives under the Europe 2020 Strategy, with studies being conducted at EU country level (Rappai, 2016; Ionescu et al., 2020; Pîrvu et al., 2019). Thus, Pasimeni (2013) used in the calculation of the index a set of relevant indicators introduced by the European Commission when launching the strategy and monitored on an ongoing basis. The estimation of the constructed index showed that the dimensions of smart and inclusive growth strategy are closely associated and that the correlations between each of these two dimensions and the sustainable one exist, but are declining, suggesting a need for more sustainable development frameworks in Europe.

Moreover, Rappai (2016) used a complex index, which assesses how close Member States are to completing the strategy, using calculations based on the Mahalanobis distance between actual values and target indicators and a special self-weighting average built to eliminate differences in development of countries. He concluded that the achievement of the objectives of the strategy depends essentially on the success of cohesion policy.

Furthermore, other authors bring to the attention the use of composite indexes in correlation with other significant variables. Thus, Becker et al. (2020) use a composite indicator that aggregates the distance of each country or region from the agreed objectives, which leads to highlighting trends at both national and regional level, depending on the degree of urbanization and development.

Nevertheless, Stec and Grzebyk (2018) used a synthetic indicator that dynamically compares EU Member States using ten statistical indicators for 2009–2014. The results of the zeroed unitarization method show that most EU countries prove average advancement in achieving Europe's development agenda, which casts doubt on whether the targets could be met by 2020.

Similarly, Širá et al. (2021) assessed how EU countries meet the targets set for sustainable growth through the Europe 2020 Strategy using sustainable development indicators, which were then transformed into a synthetic indicator and identified the best performing countries as Member States. Nordic countries, Romania and Croatia.

1.2. Involvement of governments in reaching the objectives of sustainable development/Europe 2020 strategy (expressed in terms of government expenditures on environmental protection, energy and fuel, education and social protection)

Among scholars, there is another presumption that it is important in which projects governments choose to use the money, so that these expenditures lead to a positive or negative impact on employment at local level or on carbon emissions levels (The Economist Intelligence Unit, 2020), as public expenditures have an extremely large mark, usually accounting for 15–30% of countries' GDP.

In this view, regarding the analysis of public expenditures used to achieve the sustainable development targets, there are several studies conducted (Osuji & Nwani, 2020) as well as the effects of government expenditures on economic growth (Lee et al., 2019).

Moreover, The Council of European Municipalities and Regions [CEMR] (2014) highlighted the importance that local and regional governments have in reaching the objectives of the Europe 2020 Strategy, as it plays an important role in including the priorities of each country at EU level.

Furthermore, Radulescu et al. (2018) showed that the most important factor among those selected under the Europe 2020 Strategy that generates effects on GDP growth and exports is the level of tertiary education. Thus, they concluded that governments should focus on actions that could improve the level of education and of specialization of people, especially since there is a declining trend in public spending on education in the analyzed countries.

Also, the crucial importance of government expenditures and good governance for sustainable economic development at EU level and the implications that increasing environmental spending has on people's perceptions of environmental protection, has been highlighted by Noja et al. (2021, 2019).

The relationship between environmental spending and gross domestic product in European countries was analyzed by Badulescu et al. (2020) and highlighted the fact that, in some European countries GDP growth leads to improved environment, both through government actions and as following the action of specialized public and private suppliers. While the positive impacts of government spending on the environment were observed in 8 countries, those of specialized suppliers were observed only in the case of 4 countries. This has resulted in the need for structural changes in economies that will lead to environmentally friendly GDP growth.

In another paper analyzing structural changes in the economy of EEC countries, Fedajev et al. (2019) identified that the key sectors in these economies are those related to services, while the productive and supply sectors of electricity, gas, steam have decreased in importance.

In terms of SDGs role in the efficiency of allocating the government expenditures, Hege et al. (2019) explores the use and added value of SDGs and indicators in the budgeting process. Several ways in which countries use SDGs in their budgetary processes have thus been identified. Most countries compare their budgets with the SDGs and make a qualitative report on the budget contribution to the SDGs, but fewer countries use the SDGs to enhance their budget performance evaluation system or as a management tool for allocating and negotiating resources.

Concerning the energy sector, in the analysis of the energy revolution needed to achieve the goals of the Energy Union, Pellerin-Carlin et al. (2017) concluded that public sector intervention is essential, being necessary to fund research in the energy field, and thus more energy companies will be able to profit and develop innovations to ensure their viability in the energy transition.

Existing strands in the literature focusing on social protection lead to Mathai et al. (2020) who noted in their study for International Monetary Fund (IMF) on social expenditures for inclusion and development in the Middle East and Central Asia that the Covid 19 Crisis required a rapid national response to public spending on health and social protection, helping to reduce poverty and inequality, but also to the accumulation of human capital and inclusive growth. Countries in the region have proven to be able to mobilize additional resources for health and social protection, including through technology.

Furthermore, in their paper on social protection and SDG, Ortiz et al. (2017) demonstrated that governments have the capacity to fund social protection and other sustainable development goals, even in poorer countries. Thus, they identified eight ways to increase funding for social protection that governments in various countries have applied: reallocation of public spending; increase in tax revenues; enlarging social security coverage and contributory income; lobby for help and increased transfers; elimination of illegal financing flows; use of fiscal and foreign exchange reserves; loans or debt restructuring and; embracing a more accommodative macroeconomic framework.

A paper (Badulescu et al., 2019) that analyzes public spending on health, environment and economic growth in EU countries highlighted that maximizing the efficiency of health spending while better protecting the environment, will lead to GDP growth both in the medium and long run, only if the emphasis is on technologies aimed at enhancing the quality of life, and not economic growth at any cost.

Another strand in the literature focus on the impact of other variables on the achievement of SDGs. Thus, using multiple regressions Glass and Newing (2019) examined the influence of different matters of governance as participation, policy coherence, reflexivity, adaptation and the importance of democratic institutions on the fulfillment of SDGs in 41 countries. Among the factors tested, those identified as generating influences on the SDGs were institutions, democratic participation, economic power, education and geographical position.

Moreover, Pasimeni and Pasimeni (2016) analyzed the effects of institutions on progress towards the EU 2020 targets. They used a previously determined index (Pasimeni, 2013) and continued the analysis by investigating its determinants through a model that includes as potential explanatory variables: the level of wealth, economic growth, sustainability of public finances and institutions. They found that institutional variables as good governance and social capital are the most important and they have the strongest estimated impacts on countries' performance.

Nevertheless, the role played by the European Parliament in implementing the Europe 2020 Agenda was also analyzed by Iniestroy et al. (2019). Thus, multi-level governance has great potential to ensure sustainable progress and is a necessary condition for accelerating the implementation of the SDGs at EU and Member State level.

We have not identified studies that analyze directly the impact of government expenditures on meeting the objectives established in the Europe 2020 strategy, which leads us to say that the proposed study makes an innovative contribution to existing research, providing a basis for decision-makers on future strategies, but also for those interested in studying these correlations.

In the light of the aforementioned studies, we consider it very important that national governments should be involved in orienting budget expenditures towards reaching the objectives of the strategy. That is why in the study, we selected from the total budgetary expenditures those through whose sizing influences can be generated on the objectives: expenditures on environmental protection, education, energy and fuels and social protection, thus analyzing, to what extent, the spending of public money whether or not it influences the achievement of the strategy's objectives.

2. Materials and methods

In this research, we aimed to identify the influences generated by government expenditures on meeting the objectives proposed in the Europe 2020 Strategy. In order to perform the econometric analysis it was necessary to calculate a relative indicator (TARGET) to measure how close the countries included in the study are to reaching the targets of the Europe 2020 Strategy. After calculating this indicator we will continue with the econometric estimation of the influences of different types of government expenditures on this indicator.

For the relative evaluation of the achievement of the targets of the Europe 2020 Strategy by the ten countries of Central and Eastern Europe, the aggregate indicator of the relative level of achievement of the targets covering twelve diagnostic variables characterizing the objectives proposed in the Europe 2020 Strategy was used. The comparative analysis was performed on the basis of the linear order of the countries according to the aggregate indicator and on the basis of the volatility index. To calculate the indicator we used an algorithm that includes 6 steps (Bluszcz, 2016).

After having calculated the aggregated indicator, the next step consists of evaluating the causality nexus between the following variables that are considered to be the most appropriate: the aggregated indicator, total environmental protection government expenditures n.e.c., total environmental protection government expenditures, total fuel and energy government expenditures, total government expenditures for education and total government expenditures for social protection. Thus, we selected panel data for 10 CEEC for 2007–2018 period. The data were collected from Eurostat statistical data (2021).

Analyzing the equation proposed by He and Richard (2010), the following equation is designed in order to establish the nexus between the above-mentioned variables in the case of a ten CEEC panel:

$$TARGET_t = \beta_1 + \beta_2 ENV\_ENC_t + \beta_3 ENV\_EXP_t + \beta_4 FUEL\_EN_t + \beta_5 \ln EDU_t + \beta_6 \ln SOCIAL_t + \mu t, \quad (1)$$

where TARGET is the aggregated indicator of the relative level of achievement of Europe 2020 targets, ENV_ENC is the total environmental protection government expenditures n.e.c., ENV_EXP is the total environmental protection government expenditures, FUEL_EN is the total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection, β (1,…,6) are coefficients allocated to the variables, μt is the residual term and t is the time period.

This methodology is innovative because it is composed of a data panel of 10 CEEC, which will be followed by obtaining of a more reliable results than in the case of a single country. Furthermore, including this type of aggregate indicator in this specific nexus with these categories of government expenditures is also an element of originality.

The first step in evaluating the causality relationship between the variables included in the model is to test if the data series used are stationary (Manta et al., 2020). Thus, these tests are performed by implementing Levin-Lin-Chu (Levin et al., 2002) panel root tests and ADF – Fisher Chi-square and PP – Fisher Chi-square tests applicable for panel data. The second

stage supposes applying the Pedroni (2000, 2004) and Kao (1999) specific panel data tests in order to identify the existence of a co-integration nexus between the selected variables.

Furthermore, after having detected a long-term co-integration relationship in the target indicator model, Fully Modified Ordinary Least Squares (FMOLS) is applied in order to evaluate the elasticity of the target indicator to total environmental protection government expenditures n.e.c., total environmental protection government expenditures, total fuel and energy government expenditures, total government expenditures for education, total government expenditures for social protection. Therefore, Phillips and Hansen (1990) recommend an estimator that implements a semi-parametric correction in order to remove the obstacles involved by the long-run correlation between the co-integrating equation and stochastic regressors innovations.

In case of a co-integration between the variables, a VECM method is applied to evaluate short-term and long-term causality nexus. This co-integration term is also known as the error correction term (ECT).

3. Empirical results and discussions

3.1. Empirical results

Before moving on to the econometric analysis, we considered it necessary to briefly present how to determine the aggregated indicator TARGET. Based on Eurostat statistical data (2021), we selected twelve variables we considered the most important to characterize the measurable objectives proposed in the Europe 2020 Strategy. The variables of the model have been divided into stimulators and inhibitors as can be observed in Table 1.

After calculating the variability indicator for the twelve variables, it turned out that only in the case of an X1-Employment the variability indicator is less than 10%, which led to its exclusion from the calculation of the TARGET indicator, whose values were normalized and then used to determine the indicator. The results obtained are presented in Table 2.

Thus, we note that in 2018 the country with the best achievement of targets is Lithuania, followed by Estonia and Latvia. At the opposite pole are Romania and Poland. In the case of Poland, the objectives for which it is deficient are those related to Poverty and social exclusion, Climate change and energy and Research and development, and in the case of Romania, Education and Research and development as can be seen from Figure 1.

The descriptive statistics analysis of variables is described in Table 3. Thus, Table 3 reveals that data (Eurostat, 2021) corresponding to the variables have large divergences. In order to solve the heteroscedasticity problem, two variables are transformed in logarithmic.

In order to establish the correlation coefficients between the variables identified at the previous subchapter 3, it is necessary to perform a covariance analysis. Thus, each cell in the table emphasizes the correlation between the two variables (see Table 4).

The results of the covariance analysis indicate that there is a negative correlation between the variables of the model, but this is less strong in the case of total government expenditures for social protection from total fuel and energy government expenditures, compared to that between total environmental protection government expenditures and the aggregated indicator of the relative level of achievement of Europe 2020 targets.

Table 1. Variables monitored under the five measurable targets under the Europe 2020 Strategy

Variable	Influence	Description
Objective Occupation		
X1 – Employment	Stimulator	The employment rate is calculated by dividing the number of people aged between 20 and 64 according to the total population of the same age group.
Objective Research and Development		
X2 – Gross domestic expenditure on R&D	Stimulator	GERD (Gross domestic expenditure on research and development) as a percentage of GDP.
Objective Climate Change and Energy		
X3 – Greenhouse gas emissions, base year 1990	Inhibitor	This indicator shows the trends in total anthropogenic emissions generated by the "Kyoto chimney" of greenhouse gases. It shows the total annual emissions in relation to the 1990 emissions of the "Kyoto Basket" of greenhouse gases. (1990 = 100).
X4 – Share of renewable energy in gross final energy consumption	Stimulator	This indicator assesses how widespread the use of renewable energy is and, implicitly, the extent to which renewable fuels have replaced fossil and / or nuclear fuels and therefore contributed to the decarbonisation of the EU economy.
X5 – Primary energy consumption	Inhibitor	The Gross Inland Consumption excluding all non-energy use of energy carriers, measuring the true energy consumption.
X6 – Final energy consumption	Inhibitor	All energy supplied to industry, transport, households, services and agriculture.
Objective Education		
X7 – People who drop out of school early	Inhibitor	Percentage of the population aged 18–24, who have the lowest level of lower secondary education and who have not been in continuing education or training.
X8 – Tertiary education level	Stimulator	Percentage of the population aged between 30 and 34 who have successfully completed tertiary education (eg universities, higher technical institutions, etc.).
Objective Poverty and Social Exclusion		
X9 – People at risk of poverty or social exclusion	Inhibitor	This indicator relates to the share of people who are: at risk of poverty or are severely deprived or materially living in households with a very low labor intensity, in the total population.
X10 – People living in households with very low work intensity	Inhibitor	People aged 0–59 living in households where the adults work 20% or less of their total work potential during the past year.
X11 – People at risk of poverty after social transfers	Inhibitor	People with an equivalised disposable income below the risk-of-poverty threshold, that is set at 60% of the national median equivalised disposable income (after social transfers).
X12 – Severely materially deprived people	Inhibitor	Severely materially deprived people who have living conditions severely constrained by a lack of resources and who experience at least 4 out of 9 deprivations items.

Table 2. TARGET indicator calculated for ten CEEC (source: author's own calculation)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bulgaria	0.5005	0.5202	0.5308	0.5538	0.5184	0.5200	0.5399	0.5423	0.5341	0.5407	0.5202	0.5517
Czechia	0.6024	0.6113	0.6091	0.6116	0.6101	0.6209	0.6283	0.6319	0.6352	0.6392	0.6526	0.6705
Estonia	0.8461	0.8233	0.8483	0.8817	0.8873	0.8626	0.8357	0.8103	0.8404	0.8356	0.8409	0.8377
Latvia	0.8253	0.7650	0.7758	0.7995	0.8143	0.8188	0.8257	0.8356	0.8219	0.8172	0.8250	0.8256
Lithuania	0.8567	0.8321	0.8238	0.8312	0.8224	0.8308	0.8394	0.8540	0.8641	0.8605	0.8520	0.8505
Hungary	0.5831	0.5696	0.5763	0.5893	0.5642	0.5640	0.5676	0.5647	0.5706	0.5722	0.5661	0.5903
Poland	0.1801	0.1938	0.2085	0.2004	0.1959	0.2032	0.2052	0.2010	0.2112	0.2313	0.2274	0.2448
Romania	0.3277	0.3303	0.3249	0.3576	0.3371	0.3274	0.3401	0.3315	0.3275	0.3221	0.3087	0.3045
Slovenia	0.7427	0.7299	0.7389	0.7491	0.7460	0.7395	0.7381	0.7257	0.7277	0.7267	0.7316	0.7231
Slovakia	0.6179	0.6323	0.6457	0.6563	0.6506	0.6574	0.6525	0.6566	0.6730	0.6631	0.6560	0.6638

Table 3. Variable definition and descriptive statistics (source: author's own calculation)

	Definition	Mean	Maximum	Minimum	Std. Dev.	Observations
TARGET	aggregated indicator	0.61	0.88	0.18	0.20	120
ENV_ENC	total environmental protection government expenditures n.e.c.	0.21	1.90	–0.6	0.24	120
ENV_EXP	total environmental protection government expenditures	1.76	3.20	–0.6	0.60	120
FUEL_EN	total fuel and energy government expenditures	0.99	4.20	–0.3	0.93	120
lnEDU	the natural logarithm of total government expenditures for education	2.47	2.83	2.06	0.19	120
lnSOCIAL	natural logarithm of total government expenditures for social protection	3.49	3.70	3.14	0.10	120

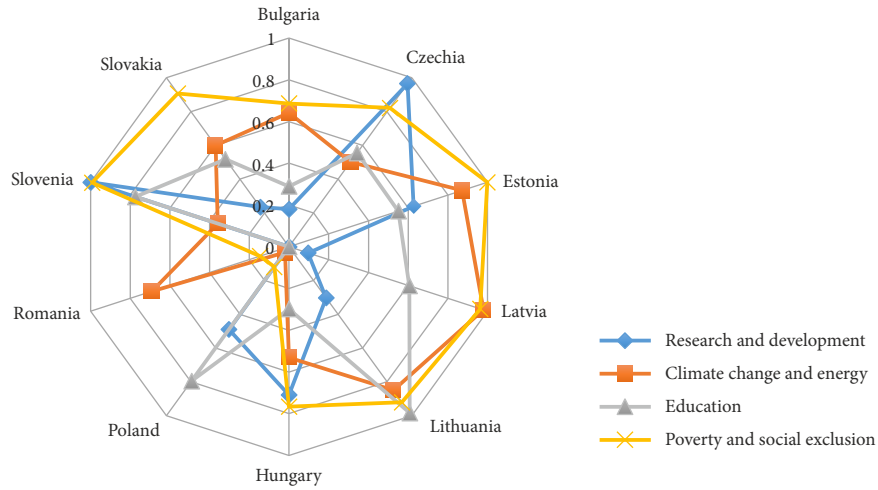

Figure 1. Fulfillment of the objectives of the Europe 2020 Strategy by the CEEC at the level of 2018

Furthermore, the LLC unit root test, ADF – Fisher Chi-square and PP – Fisher Chi-square tests results emphasize that all variables are stationary at level or first difference (see Table 5).

Therefore, due to the fact that all variables are stationary at the first difference, Pedroni test is further used (see Table 6) to acknowledge the existence of a long-term co-integration relationship between the variables of the model.

Table 4. Covariance analysis (source: author's own calculation)

	TARGET	ENV_ENC	ENV_EXP	FUEL_EN	ln*EDU*	ln*SOCIAL*
TARGET	1.0000 –					
ENV_ENC	0.0615 0.5046	1.0000 –				
ENV_EXP	–0.0109 0.9051	0.1822 0.0463	1.0000 –			
FUEL_EN	0.1291 0.1598	–0.1506 0.1006	0.1574 0.0859	1.0000 –		
ln*EDU*	0.5884 0.0000	0.0622 0.4997	–0.1959 0.0320	–0.0169 0.8542	1.0000 –	
ln*SOCIAL*	–0.2652 0.0034	–0.0171 0.8527	–0.3154 0.0004	–0.2985 0.0009	–0.1784 0.0512	1.0000 –

Note: TARGET is the aggregated indicator of the relative level of achievement of Europe 2020 targets, ENV_ENC is total environmental protection government expenditures n.e.c., ENV_EXP is total environmental protection government expenditures, FUEL_EN is total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection.

Table 5. LLC unit root test, ADF – Fisher Chi-square and PP – Fisher Chi-square (source: author's own calculation)

Methods	Statistic (*p*) in LLC	Statistic (*p*) in ADF	Statistic (*p*) in PP
TARGET	–1.4045 (*0.0801*)	22.5286 (*0.3125*)	37.4273 (*0.0104*)
d*TARGET*	1.7236 (*0.0424*)	34.5058 (*0.0229*)	84.6959 (*0.0000*)
ENV_ENC	–2.2871 (*0.0111*)	32.0370 (*0.0218*)	50.4815 (*0.0001*)
d*ENV_ENC*	–7.0983 (*0.0000*)	59.5080 (*0.0000*)	105.303 (*0.0000*)
ENV_EXP	–4.3381 (*0.0000*)	33.1575 (*0.0324*)	58.9746 (*0.0000*)
d*ENV_EXP*	–10.5283 (*0.0000*)	56.9982 (*0.0000*)	74.1684 (*0.0000*)
FUEL_EN	–2.9138 (*0.0018*)	13.7002 (*0.8454*)	27.7179 (*0.1162*)
d*FUEL_EN*	–1.4082 (*0.0795*)	30.7153 (*0.0591*)	88.6380 (*0.0000*)
ln*EDU*	–5.1126 (*0.0020*)	26.1676 (*0.1603*)	19.0293 (*0.5199*)
dln*EDU*	–5.9054 (*0.0000*)	38.4882 (*0.0077*)	68.4598 (*0.0000*)
ln*SOCIAL*	–11.7501 (*0.0000*)	58.1049 (*0.0000*)	46.9842 (*0.0006*)
dln*SOCIAL*	–12.1038 (*0.0000*)	56.2803 (*0.0000*)	73.4501 (*0.0000*)

Note: TARGET is the aggregated indicator of the relative level of achievement of Europe 2020 targets, ENV_ENC is total environmental protection government expenditures n.e.c., ENV_EXP is total environmental protection government expenditures, FUEL_EN is total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection.

Table 6. Pedroni test (source: author's own calculation)

Common AR coef. (within-dim.)				
	Stat.	P-value	Stat.	P-value
V-Stat	–1.398784	0.9191	–1.842733	0.9673
Rho-Stat	2.903861	0.9982	2.889091	0.9981
PP-Stat	–2.495110	0.0063	–2.763536	0.0029
ADF-Stat	–1.834814	0.0333	–2.799784	0.0026
Individual AR coef. (between-dim.)				
	Stat.	P-value		
G rho-Stat.	4.132535	1.0000		
G PP-Stat.	–6.567355	0.0000		
G ADF-Stat.	–1.907788	0.0282		

The Kao cointegration test was also applied in order to validate the results above.

Table 7. Kao test (source: author's own calculation)

	t-Stat.	Prob.
ADF	–2.012845	0.0221
Resid. variance	0.000206	
HAC variance	0.000161	

The Kao test statistics are calculated by pooling all the residuals of all cross-sections in the panel (Hoang, 2006). It is assumed in Kao's test that all the cointegrating vectors in every cross-section are identical. Thus, this test validates the obtained results as p-value is 0.02 (Table 7).

A third cointegration test (Johansen Fisher Panel Cointegration Test) is implemented. Once more, the results from Table 8 point out the existence of at least one cointegration relationship among the variables.

Table 8. Johansen Fisher Panel Cointegration Test (source: author's own calculation)

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	111.0	0.0029	54.7	0.0006
At most 1	56.3	0.3652	36.9	0.0205
At most 2	19.3	0.9941	10.7	0.9705
At most 3	8.5	0.9945	7.3	0.9401
At most 4	1.2	0.9998	0.1	0.9998
At most 5	0.3	0.7087	0.1	0.7087

Note: *Probabilities are computed using asymptotic Chi-square distribution.

Furthermore, the long-term cointegration coefficients will be identified by applying FMOLS to evaluate the elasticity of aggregated indicator of the relative level of achievement of Europe 2020 targets to the total environmental protection government expenditures n.e.c., total environmental protection government expenditures, total fuel and energy government expenditures, the natural logarithm of total government expenditures for education, the natural logarithm of total government expenditures for social protection and show the results in Table 9.

Moreover, the multicollinearity between the variables should be verified in order for the results of the FMOLS regression to be validated by using the Variance Influence Factor (VIF) (see Table 10).

The results show that the total environmental protection government expenditures n.e.c., total environmental protection government expenditures, total fuel and energy government expenditures and the natural logarithm of total government expenditures for social protection are statistically significant at the 5% level for the panel FMOLS and the natural logarithm of total government expenditures for education is significant at a 10% level. Firstly, the long-term elasticity of aggregated indicator of the relative level of achievement of Europe 2020 targets to the total environmental protection government expenditures n.e.c. is 0.01, pointing

Table 9. FMOLS estimation (source: author's own calculation)

Variable	Coeff.	Std. Error	t-Stat.	Prob.
ENV_ENC	0.012772	0.004286	2.980047	0.0038
ENV_EXP	–0.012845	0.001275	–10.07247	0.0000
FUEL_EN	0.009692	0.000983	9.863445	0.0000
ln*EDU*	0.011863	0.013344	0.889050	0.3765
ln*SOCIAL*	0.042922	0.011173	3.841641	0.0002

Note: TARGET is the aggregated indicator of the relative level of achievement of Europe 2020 targets, ENV_ENC is total environmental protection government expenditures n.e.c., ENV_EXP is total environmental protection government expenditures, FUEL_EN is total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection.

Table 10. VIF estimation (source: author's own calculation)

	Uncentered
Variable	VIF
ENV_ENC	1.052783
ENV_EXP	1.105960
FUEL_EN	1.038160
ln*EDU*	1.052366
ln*SOCIAL*	1.066081

Note: ENV_ENC is total environmental protection government expenditures n.e.c., ENV_EXP is total environmental protection government expenditures, FUEL_EN is total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection.

out that a 1% decrease in total environmental protection government expenditures n.e.c. conducts to a 0.01% decline in the aggregated indicator. Secondly, the long-term elasticity of the aggregated indicator to total environmental protection government expenditures is –0.01, indicating that a 1% decline in total environmental protection government expenditures conducts to 0.01% increase in the aggregated indicator. Thirdly, the long-term elasticity of the aggregated indicator to fuel and energy government expenditures is 0.009, indicating that a 1% decrease in fuel and energy government expenditures conducts to a 0.009% decline in the aggregated indicator. Similarly, a 1% decline in total government expenditures for education and for social protection conducts to a 0.01% and respectively 0.04% decline in the aggregated indicator.

Furthermore, to evaluate the causality nexus between aggregated indicator of the relative level of achievement of Europe 2020 targets, total environmental protection government expenditures n.e.c., total environmental protection government expenditures, total fuel and energy government expenditures, the natural logarithm of total government expenditures for education and the natural logarithm of total government expenditures for social protection, the Granger test based on VECM was applied (see Table 11).

The test outlines if there is a short-term, long-term, or intense causality between the variables. The results of the short-term nexus from the VECM are pointed out through the associated equations with the probabilities of the coefficients in Table 12.

3.2. Discussions

The results obtained in Table 12 emphasize the short-term influences between the variables. Thus, on short-term, the target indicator is influenced (p-values are statistically significant at 1%, 5% and 10%) by the government expenditures with the environmental protection n.e.c., by the environmental protection and by the social protection. The results may suggest a strong connection between the three variables as they are extremely important for achieving the climate changes targets.

Similarly to Noja et al. (2021), our results also show that "increasing the public financial efforts for protecting the natural environment could positively influence people's perceptions regarding the importance of public support for protecting the environment, as well as the perceptions on the government's ability to develop sound environmental policies".

Furthermore, a bidirectional causality is identified between the government expenditures with social protection and the target indicator. The results point out that social protection is also an important field that leads to a higher degree of achieving the Europe 2020 targets and the CEEC governments should pay a special attention to this type of expenditure and they should take the appropriate measures in order to increase the value of this variable. These results are in line with the ones obtained by Mathai et al. (2020) and Ortiz et al. (2017) who considered that if the governments allocate more funds for social protection, they could help reduce poverty and inequality.

Moreover, according to our results, the government expenditures with the social protection are also influencing on short-term the government expenditures with the education. While, on long-term there was not found a statistically significant nexus between the target

Table 11. VECM estimation (source: author's own calculation)

	d(*TARGET*)	d(*ENV_ENC*)	d(*ENV_EXP*)	d(*FUEL_EN*)	d(ln*EDU*)	d(ln*SOCIAL*)
ECT(–1)	–0.0031	0.0775	0.4388	–0.0482	0.0022	–0.0341
	(0.0018)	(0.0217)	(0.0790)	(0.0731)	(0.0088)	(0.0081)
	[–1.6981]	[3.5650]	[5.5531]	[–0.6593]	[0.2538]	[–4.1934]
d(*TARGET* (–1))	–0.0613	–1.2725	–1.1141	–1.9424	1.2665	–0.9865
	(0.0893)	(1.0371)	(3.7673)	(3.4885)	(0.4234)	(0.3885)
	[–0.6861]	[–1.2268]	[–0.2957]	[–0.5568]	[2.9914]	[–2.5392]
d(*ENV_ENC* (–1)	0.0109	–0.4682	–0.3496	0.1838	–0.0155	–0.0358
	(0.0058)	(0.0673)	(0.2445)	(0.2264)	(0.0274)	(0.0252)
	[1.8870]	[–6.9553]	[–1.4298]	[0.8121]	[–0.5668]	[–1.4234]
d(*ENV_EXP* (–1))	–0.0049	0.0018	0.0954	0.0387	0.0006	–0.0332
	(0.0024)	(0.02831)	(0.1028)	(0.0952)	(0.0115)	(0.0106)
	[–2.0201]	[0.0669]	[0.9284]	[0.4068]	[0.0598]	[–3.1383]
d(*FUEL_EN* (–1))	0.0036	0.0381	0.1100	–0.2711	0.0025	0.0035
	(0.0033)	(0.0387)	(0.1409)	(0.1304)	(0.0158)	(0.0145)
	[1.0878]	[0.9828]	[0.7811]	[–2.0781]	[0.1605]	[0.2412]
d(ln*EDU* (–1))	–0.0286	0.3709	0.1704	0.0819	–0.2866	–0.0047
	(0.0192)	(0.2229)	(0.8099)	(0.7500)	(0.0910)	(0.0835)
	[–1.4910]	[1.6636]	[0.2105]	[0.1092]	[–3.1490]	[–0.0562]
d(ln*SOCIAL* (–1))	0.0436	0.0215	–1.0123	0.0911	–0.2598	–0.0065
	(0.0209)	(0.2424)	(0.8807)	(0.8155)	(0.0989)	(0.0908)
	[2.0890]	[0.0887]	[–1.1493]	[0.1117]	[–2.6257]	[–0.0725]
C	0.0014	–0.0121	–0.0282	0.1160	–0.0094	0.0049
	(0.0013)	(0.0155)	(0.0564)	(0.0522)	(0.0063)	(0.0058)
	[1.1004]	[–0.7849]	[–0.5015]	[2.2209]	[–1.4966]	[0.8544]

Note: TARGET is the aggregated indicator of the relative level of achievement of Europe 2020 targets, ENV_ENC is total environmental protection government expenditures n.e.c., ENV_EXP is total environmental protection government expenditures, FUEL_EN is total fuel and energy government expenditures, lnEDU is the natural logarithm of total government expenditures for education, lnSOCIAL is the natural logarithm of total government expenditures for social protection.

indicator and the government expenditures with the education, on short-term the things are different. Thus, the results show that on short-term the target indicator is influencing the government expenditures with the education that could point out the fact that some measures to support the education system should take effect immediately in order to achieve the Europe 2020 targets. Nevertheless, the government expenditures with the social protection are influencing the government expenditures with the education revealing the necessity to ensure a good educational environment to all the people from the EU, no matter the social categories. Thus, similarly to Radulescu et al. (2018), we believe that "the governments of the 10 CEEC should encourage investments and production, not mainly consumption (such as in Romania and Hungary lately) in order to enhance the employment rate" in the 10 CEEC.

Table 12. Coefficients and probabilities associated to the variables in the equations (source: author's own calculation)

	ECT(–1)	D(TARGET (–1))	D(ENV_ENC (–1))	D(ENV_EXP (–1))	D(FUEL_EN (–1))	D(lnEDU (–1))	D(lnSOCIAL (–1))
D(TARGET)	–0.0031	–0.0613	0.0109	–0.0049	0.0036	–0.0286	0.0436
p	0.0938***	0.4929	0.0597***	0.0438**	0.2771	0.1365	0.0372**
D(ENV_ENC)	0.0775	–1.2725	–0.4682	0.0018	0.0381	0.3709	0.0215
p	0.0004*	0.2204	0.0000*	0.9466	0.3261	0.0967***	0.9293
D(ENV_EXP)	0.4388	–1.1141	–0.3496	0.0954	0.1100	0.1704	–1.0123
p	0.0000*	0.7675	0.1533	0.3536	0.4351	0.8334	0.2509
D(FUEL_EN)	–0.0482	–1.9424	0.1838	0.0387	–0.2711	0.0819	0.0911
p	0.5099	0.5779	0.4170	0.6843	0.038**	0.9131	0.9110
D(lnEDU)	0.0022	1.2665	–0.0155	0.0006	0.0025	–0.2866	–0.2598
p	0.7997	0.0029*	0.5711	0.9523	0.8725	0.0017*	0.008*9
D(lnSOCIAL)	–0.0341	–0.9865	–0.0358	–0.0332	0.0035	–0.0047	–0.0065
p	0.0000*	0.0114**	0.1552	0.0018*	0.8094	0.9551	0.9422

Note: *, **, *** is the significant level of 1, 5 or 10%.

Furthermore, the environmental protection expenditures are influencing the social protection expenditures emphasizing that there is a strong connection between taking care of the people and taking care of the nature because the ultimate goal of every European government is to have healthy people living in a healthy environment.

The results of this study on the 10 CEEC confirm also the results obtained from other studies according to which indicators are essential for estimating the advancement of the defined objectives (Dalal-Clayton & Krikhaar, 2007) and "for assessing the efficacy of policies" (European Commision, 2005). Furthermore, the findings of this study are similar to those of Pasimeni (2013) who revealed that "the smart and inclusive growth dimensions of the strategy are closely correlated and that the correlations between each of these two dimensions and the sustainable one exist, but are declining, suggesting that an orientation towards more sustainable development models is needed in Europe".

However, the results obtained suggest the idea that the countries are treating differently the key fields of activity and they should reconsider the role of the education and the one of the fuel and energy by increasing also the allocated expenditures. For this matter, the results of this research are similar with the ones of the author stating that the majority of the EU countries registered average progress in reaching Europe's development agenda (Stec & Grzebyk, 2018).

Based on the results obtained, we consider that both assumed hypotheses are verified.

Conclusions

The objective of the present study was to evaluate the degree of sustainable development at CEEC level by means of an aggregate indicator and to determine if the government expenditures in the field of environment, environment protection, fuel, energy, education and social protection could influence the achievement of the Europa 2020 targets.

For the relative assessment of the achievement of the targets of the Europe 2020 strategy by the ten countries of Central and Eastern Europe, the aggregate indicator of the relative level of achievement of the targets covering eleven diagnostic variables characterizing the objectives pro-posed in the Europe 2020 Strategy was used. The comparative analysis was performed on the basis of the linear order of the countries according to the aggregated indicator and on the basis of the volatility index. To calculate the indicator an algorithm that included six steps was used. Based on Eurostat statistics, eleven variables were used to characterize the measurable objectives proposed in the Europe 2020 Strategy. Thus, the calculation of the indicator continued with the remaining eleven variables whose values were normalized and then used to determine the indicator.

The methodology of calculating the target indicator is innovative as the specialty literature did not provide relevant information for this specific type of indicator aggregation providing a basis for authorities interested in making decisions on future strategies, but also for those interested in studying these correlations. Moreover, the selection of this group of CEEC is also innovative as most of the studies analyze a single country or a small number of developed countries.

The results of the study show, on long-term, statistically significant correlations between the target indicator and all the selected variables, except for the government expenditures with the education variable. For this matter, if we outline the practical utility of these results, we can emphasize that the education sector is not considered of utmost importance and increasing its financing is fundamental for the future development of the CEEC. Therefore, governments of the ten CEEC should make their budgets more available for public education in the next period of time and should shore up and provide more funding for training and professional reconversion schemes for early leavers from the education and develop new training systems for the unemployed people. Facilitating the access to education could also improve the economic and financial lifestyle of people and positively influence the prospects of future generations, especially in developing countries. However, these recommendations imply also a change in mentalities and attitudes towards the educational process and thus, these changes require time in order to be accepted and implemented.

Furthermore, on short-term, there were identified strong connections reflected in a bi-directional causality between government expenditures with social protection and the target indicator. This result indicates the importance of the social protection sector in achieving the Europe 2020 targets. Nevertheless, the practical usefulness of these results consists of raising awareness of the significance of this sector as of the education sector also.

There was not identified any nexus on short-term between the government expenditures with the fuel and energy and the target indicator, the correlation being statistically significant only on long-term. This result points out the fact that the negative effects of using the fuel and energy are identified on a long-term but the policymakers have to take actions on

a short-term in order to diminish the negative impacts that the increased level of fuel and energy use have on the Europe 2020 targets.

Thus, with this study, we obtained similar results with other authors, as we emphasized in the discussion section. Hence, the obtained results are solidly built and confirmed through the two described hypotheses. In this regard, we consider that the results of this paper are useful for the decisions to be taken by the national authorities in the perspective of the Europe 2030 Strategy, as they highlight the sectors whose better funding can lead to a better achievement of the indicators levels from the future Strategy.

Through the results obtained in this article, we consider that the research gap has been covered as highlighted above and improves the field through the solutions offered above to government decision-makers regarding the coherent and sustainable use of government resources.

Overall, we share the opinion according to which it is important in which projects governments choose to use their money, so that these expenditures lead to a positive or negative impact on local employment and on carbon levels (The Economist Intelligence Unit, 2020).

As for the limitations of the study, we could relate that the study includes only a panel of ten countries. Therefore, in a new developed analysis we will take into consideration other countries from the EU and also worldwide. Moreover, as threats to not achieving the Europe 2020 targets are also becoming a reality, other variables will be further analyzed in our model.

Author contributions

All five authors equally contributed in designing and writing this paper. Specific tasks were done as follows: Conceptualization, RMB and AGM; Investigation, NMF; Methodology, AGM and FLM; Project administration, RMB and NMF; Supervision, AGM and NMF; Writing – review & editing, RMB and FLM.

Disclosure statement

The authors declare no conflict of interest.

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