

## **Resilience to crisis. Determinants of Romanian Economy Resilience\***

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### **Abstract**

Financial crisis, severe recessions, economic shocks are frequent on the one hand as an evolution of natural economic cycles (economic downturn, industry shocks, currency crises) or appearing as a result of disruption of external factors such as the COVID health crisis, rising energy and gas prices globally this year or the current conflict between Russia and Ukraine which creates uncertainty in terms of economic stability or the consequences of sanctions imposed by EU and the US with an unquantified impact on the global economy. Their effect on the economy is persistent and often exceeds initial projections but each economy has its specificity to react to crises and recessions proving a certain level of resilience that can be strengthened. The dilemma of all researcher and economists is why a country is more vulnerable to economic shock than other and which the determinant factors for a strong resilience are as there are no universally agreed definition for resilience. The purpose of the present research is to try to respond these questions by analyzing the impact on economic growth of 8 indicators, namely Resource Productivity, Energy Dependency, Nominal Labour Productivity, Labour Transition, Integration of Internal Process, Circular Material Use, Exports of Goods and Services, R&D Expenditure, analyzing the case of Romania.

**Keywords:** Resilience, Economic Growth, Turbulence, Economic Crisis

**JEL classification:** O11, O32 O47

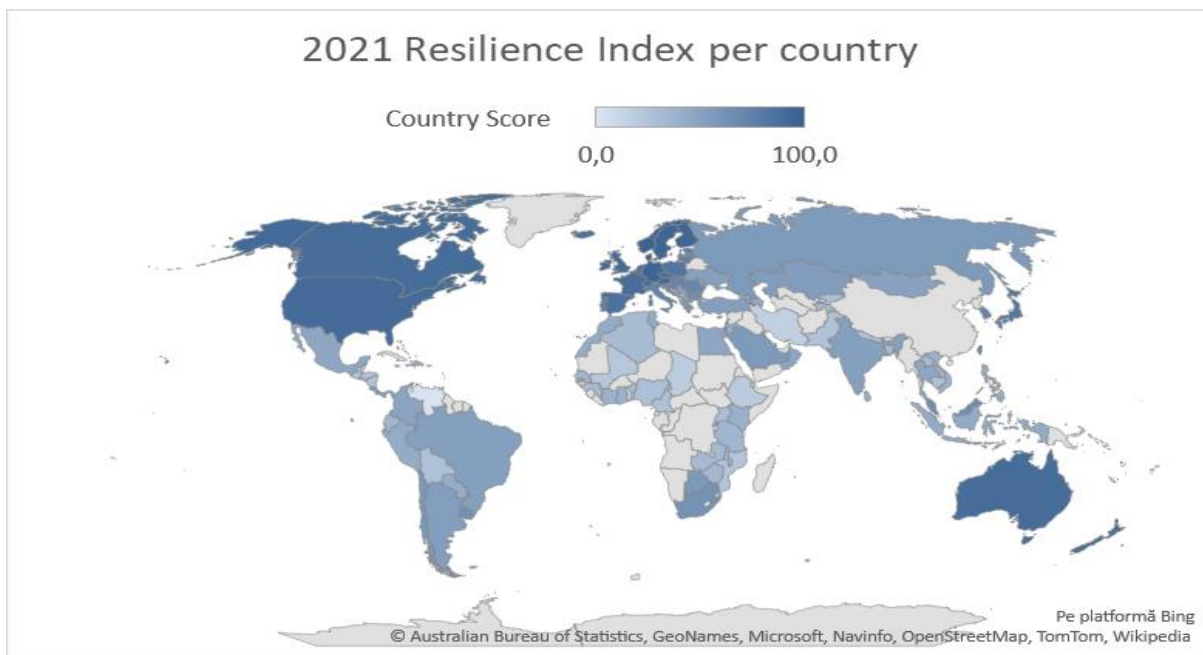
### **Introduction**

Economic resilience is intensively studied and can be attributed a series of definitions but the definition that allows a clear and comprehensive understanding is that economic resilience is the power or potential to bounce back and regain strength after a negative influence of external factors. The term resilience arise from Latin term „resilire” meaning „leap back”. Three directions are considered when referring to resilience (Briguglio, 2006) (i) ability to recover quickly from a shock; (ii) ability to absorb or neutralize shocks; (iii) ability to avoid shocks. As a paradox studied, the phenomenon „Singapore Paradox” explained by Briguglio (2003) is notorious. Despite Singapore was subject to high-intensity shocks from the outside shown resilience and managed to generate high economic growth despite all the difficulties.

Various institutions, especially insurance or forecasting ones analyze and calculate the resilience indexes of the countries for establish the capacity of the countries to face shocks and especially with the COVID-19 pandemic they have been the focus

of analysts' attention. Swiss Re Group one of the world's leading providers of insurance and reinsurance mentions in one of its studies that COVID-19 crisis reduced global macro resilience by 18% in 2020 from 2019, economies with higher levels of resilience in the pre-pandemic period (eq Switzerland, Norway) confirmed a stronger growth performance in the peak period of the economic crisis caused by the COVID pandemic compared to others with lower levels of resilience before the crisis (eq Greece, Italy).

Factory Mutual Insurance Co. (FM Global), global leader in providing insurance coverage and risk management services for large commercial and industrial properties, rated "AA" by Fitch and "A+" by S&P Global build a resilience ranking of 130 countries and ranked Romania no. 38 (score 70.4) in the world with Denmark leading with absolute score of 100, followed by Norway, Luxembourg, Germany and Switzerland but before countries like Latvia, Croatia, Slovenia or Greece. The resilience index is a cumulative result of 12 indicators, classified in 3 main categories, *Economic Factors* (Productivity, Political risk, Oil intensity, Urbanization rate), *Risk Quality Factors* (Exposure to natural hazard, Natural hazard risk, Fire risk, Inherent cyber risk) and *Supply Chain Factors* (Control of corruption, Quality of infrastructure, Corporate governance, Supply chain visibility). Below, there is better illustrated the level of resilience of countries globally, the brighter the color, the higher the level of resilience.



**Figure 1: Map of Resilience Index across the world countries**

Source: authors processing based on FM Global reports

BSI, one of the world's leading management systems certification bodies with a long history of over a century in supporting the improvement of organizations' performance, including supporting the achievement of the United Nations Sustainable Development Goals outlines 16 key elements of a resilient organization that must be taken into account in developing and achieving long-term, sustainable success. These elements are grouped into four broad categories namely Leadership, People, Process and Product, these being the basis for maintaining and developing a long-term sustainable Organizational Resilience, as shown in the figure below. The latest data on the evolution of the national economy and the global economy in general are as surprising as possible, but in line with the expectations of all specialists. The COVID-19 pandemic has hit the global economy, generating an unprecedented crisis, being more than an economic crisis, a health crisis, with effects on the health of the population and a huge psychological impact due to loss of life, measures imposed by the authorities on isolation and movement for preventing the spread of the virus. Confidence in the resilience of organizations has been severely affected globally, the forecasts are hampered by a multitude of economic, political, social and technological changes therefore many organizations are not prepared to cope with the pace of change, so it can be said that organizations that accept and adapt quickly to the current context can be considered winners. This means not only coping with the turbulence wave, its impact being like a real tsunami, but regrouping, reinventing, innovating and thus becoming much stronger, resilient and sustainable over time.



**Figure 2: Elements of Organizational Resilience**

Source: authors processing after BSI Organizational Resilience Index

The main purpose of present research is to develop a resilience test for Romania economy and to identify some long term influencing factors for assessing the country development and strength to the shocks and negative influences especially the COVID 19 crisis that took the whole world economy by surprise. The indicators that were taken into consideration for measuring their impact on the Romanian economy were established according to the elements identified by the famous international organization BSI, all this in relation to the evolution of economic growth which shows the most accurate the resilience of an economy as the negative shocks are reflected in a direct measure and in a quickly manner.

For reaching our research goal, several objectives have been considered:

- ✓ Identifying the main classes as per BSI research and finding two variables for each classes followed by databases development using official data form World Bank and European Commission;
- ✓ Performing a quantitative analysis consisting in capturing the key concepts treated and their evolution in time;
- ✓ Qualitative analysis captures the correlations between resilience of the economy and the 8 indicators considered in the analysis, from different areas but which influence in both ways the evolution of a country's economy and long-term sustainable
- ✓ Development of an econometric model with Economic Growth (RES) as a dependent variable and 8 independent variables Resource Productivity, Energy Dependency, Nominal Labour Productivity, Labour Transition, Integration of Internal Process, Circular Material Use, Exports of Goods and Services, R&D Expenditure.

## Literature Review

Economic resilience has always been associated with economic growth (Marković, 2017; Sabatino, 2019; Karl, 2009) and numerous studies have been undertaken to explain why some countries achieve high levels of GDP (gross domestic product) and are able to return to the path of growth after being hit by various adverse phenomena and to achieve economic stability and efficiency.

Briguglio (2009) manages to strengthen through his studies the opinion that it is a strong relationship between GDP per capita, resilience and vulnerability, the evolution of economic growth is explained by vulnerability and resilience.

In general, to prove if an economy shows resilience or not, it must be examined their economic performance over a period of time and the criteria can be defined and pre and post-shock growth rates and levels of economic performance can be measured (Hill, 2008).

The revised literature of the highly cited papers indexed in WebofScience includes various studies that analyze the impact of several determinants on economic performance or economic growth such as physical capital, human capital, labor, government expenditure, inflation, foreign aid, foreign direct investment, financial development, globalization and debt servicing (Sy, 2020), entrepreneurship (Aparicio, 2016), CO2 emissions and foreign direct investment (Omri, 2014), economic diversity, export performance, financial constraints, and human and social capital (Di Caro, 2017), energy consumption and carbon dioxide (CO2) emissions in high-income and upper-middle-income countries (Arminen, 2019), foreign direct investment, clean energy, trade openness, carbon emissions (Sbia, 2017).

## Methodology

In the next chapter, we propose to start a test of the resilience of the Romanian economy by highlighting some elements that influence a long-term relationship on the country's economic growth, taking into account the elements identified in the study conducted by the international organization BSI. The data series extracted and processed from credible external sources, namely the World Bank and the database of the European Commission (Eurostat) were taken into account. The surprised time interval was for a period of 10 years, respectively 2011-2020 and two elements were selected from each group. Below there are presented the elements taken into account in our research, all of which related to the economic growth percentage 2020 vs. 2019 which shows the best the resilience of the economy due to the disturbing factors with a major impact, as was the crisis generated by the COVI -19 pandemic.

The selection of variables had elements extracted from the BSI analysis as well as previous research on the impact of various indicators on economic growth.

In table no. 1 the indicators selected in our analysis are summarized.

**Table 1: Indicators used in our research**

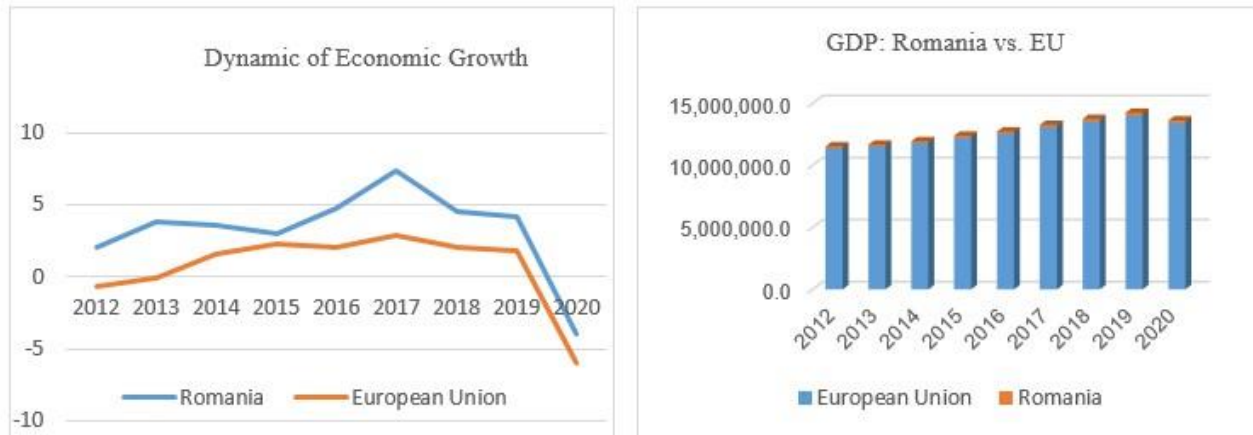
	<b>Indicator</b>	<b>Abbreviation</b>
	<i>Economic resilience (Economic Growth)%2020/2019</i>	<i>RES</i>
<b>Leadership</b>	Resource productivity	RP
<b>Leadership</b>	Energy Dependency	ED
<b>People</b>	Nominal labour productivity per person employed	NLP
<b>People</b>	Labour transitions by employment status and pay level	LT
<b>Process</b>	Integration of internal processes	IIP
<b>Process</b>	Circular material use rate	CMU
<b>Product</b>	Exports of goods and services	EGS
<b>Product</b>	R&D expenditure	RDE

Source: authors processing

The theoretical economic model we intend to develop is the following:

$$RES = \alpha + \beta_1 RP + \beta_2 ED + \beta_3 NLP + \beta_4 LT + \beta_5 IIO + \beta_6 CMU + \beta_7 EGS + \beta_8 RDE \quad (1)$$

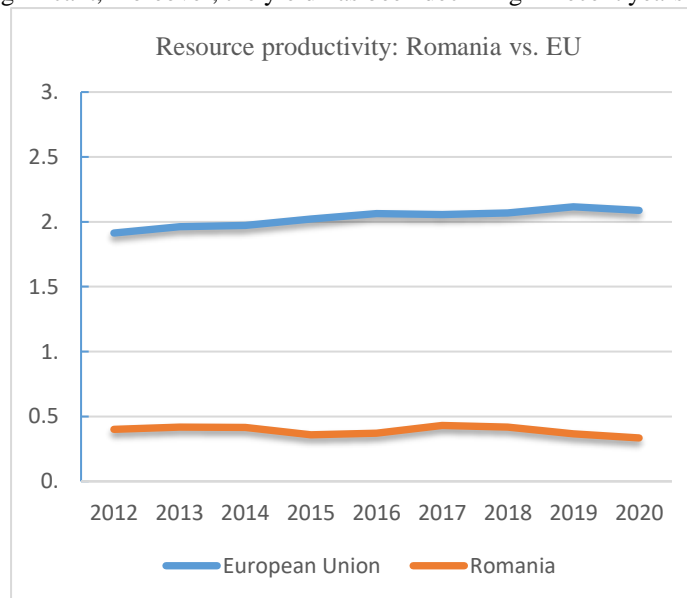
*Economic growth or GDP growth* is the most known and prestigious indicator when evaluate a country's overall performance (McCulla and Smith, 2007) showing economic resilience of a country the best when facing turbulence. Economic resilience or Gross domestic product (GDP) is the monetary, market value of all final goods and services produced in a country over a period of a year by both its citizens and foreigners (van den Bergh, 2009). For several years, Romania was consider by analysts Europe Tiger as it economic growth dynamic was above EU economic growth (see figure 3). With EUR 219 bio in 2020, Romania's GDP represent the 13<sup>th</sup> in EU, nevertheless, the weight is still low (1.6% in EU) but the potential and expectations are higher as the country is in top in terms of population (6<sup>th</sup> in EU) and surface (8<sup>th</sup> in EU). Romania is surpassed by countries like Germany, France, Italy, Spain, Netherland, Switzerland considered Europe's great powers but in the same time it is over countries considered important like Czech Republic, Portugal, Greece, Hungary.



**Figure 3: Evolution of Economic Growth and GDP dynamics**

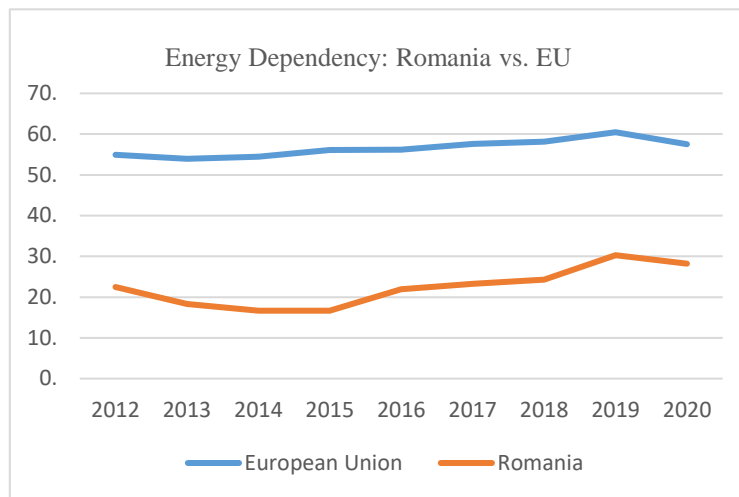
Source: data processed based on World Bank database and Eurostat

Resource productivity is defined as the gross domestic product (GDP) divided by domestic material consumption (DMC) or amount of GDP generated per unit of direct material consumed, more exactly the materials directly used by an economy. The importance of indicator is given also by European Union, as it is include in Sustainable Development Indicator (SDI) by which it is intended to be measure economic growth and progression in close correlation with environment protection, as a sustainable economy must show its effects not only now but especially for future generations. The differences between Romanian figures and EU are significant, moreover, the yield has been declining in recent years.



**Figure 4: Resource productivity dynamics**

Source: data processed based on World Bank database and Eurostat



**Figure 5: Energy dependency**

Source: data processed based on World Bank database and Eurostat

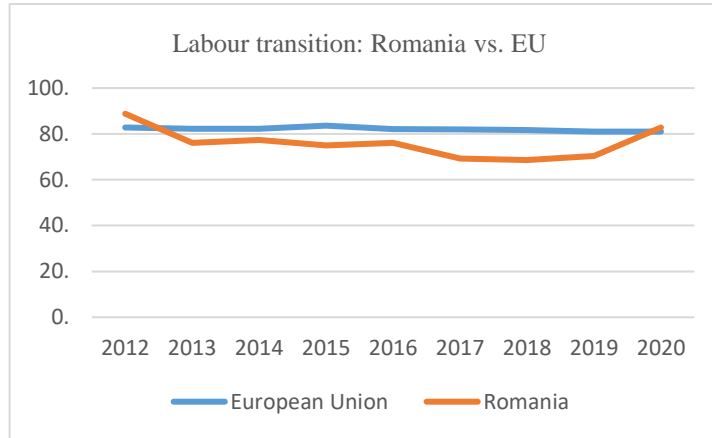
Next variable considered is *energy dependency* included in Leadership category, Resource management class, pursuing the managerial capacity to manage the given resources and to use them in the most productive way for extracting the best yields. The indicators reflect the degree of dependence of the economy on the energy purchased from outside the country to the detriment of that from own production calculated as net imports divided by the gross available energy.

The indicator is very relevant in current economic and social context, on the one hand massive price increase of energy worldwide put pressure especially on industrial producers that are large energy consumers but also on household consumers who see their income substantially affected, and on the other hand in the context of Russian-Ukraine war is expected an energy crisis due to austerity restrictions, Russia being the largest energy supplier in the European Union. Romania has a balanced energy mix and diversified partially imported and a part from own production including coal, crude oil, natural gas, hydroelectric power, nuclear power, solar and imported electricity, imported petroleum products. At the same time, our country has rich and varied resources of renewable energy (biomass, hydropower, geothermal potential, respectively for wind and photovoltaic energy). Romania's Energy Strategy Vision is to develop the energy sector in conditions of sustainability and growth and considering EU targets for 2030 and the European Green Pact for 2050, respectively.

#### *Nominal labour productivity per person*

*employed* is calculated dividing GDP to person employed and shows the productivity of national economies expressed in relation to the European Union average that is considered at 100% percent.

Along with NLP in People category we included another indicator *Labor transitions by employment status and pay level* showing the transition to the same or higher qualification level (employment status and pay). Lifelong learning and skill development during time has impact on unemployment rate, productivity rate and by default on economic growth.

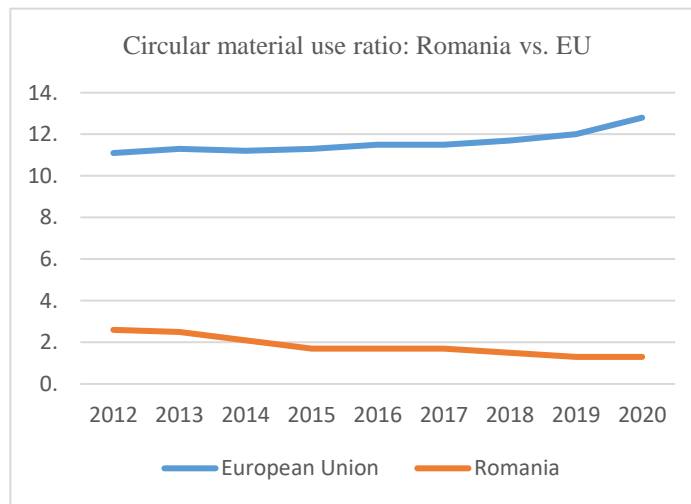


**Figure 6: Labour transition**

*Source: data processed based on World Bank database and Eurostat*

*Integration of internal processes* represent the percentage of enterprises share information between different functional areas showing a process management that focuses on improving performance by managing and optimizing internal processes, also can be described as a so called "process optimization process".

Other significant indicator that help to define economic resilience is *circular material use rate* that measures the share of material recovered and reinserted into the economy in overall material use. It is defined as the ratio of the circular use of material to the overall material use. The ratio is as higher as the more secondary materials substitute for primary raw materials and thus reducing the environmental impacts. The circular economy is a model of production and consumption that involves sharing, reusing, repairing, renovating and recycling existing materials and products as much as possible and disposal of waste as much as possible.

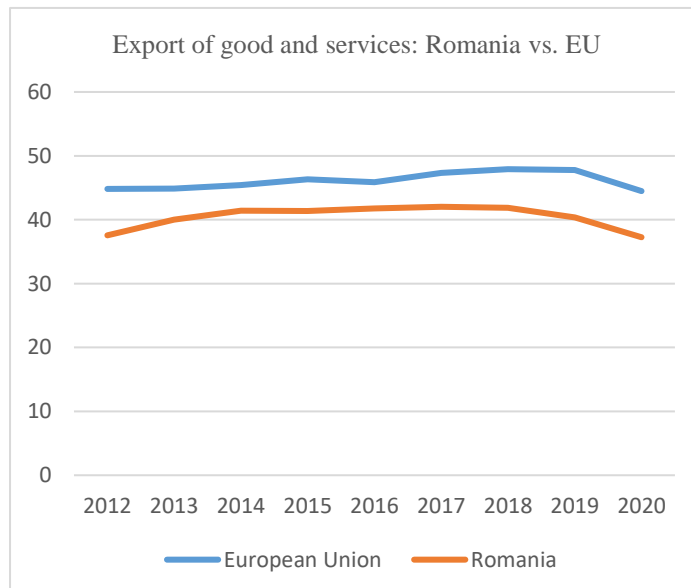


**Figure 7: Circular material use ratio**

Source: data processed based on World Bank database and Eurostat

The European Green Pact and the Circular Economy Action Plan adopted by the European Commission in 2020 set ambitious targets for the transition to circular economy models but Romania is at an early stage of development in this direction.

Exports of goods and services as of percentage of GDP represent the value of all goods and services provided to the rest of the world. The correlation between exports and economic growth is direct and positive, being an important element that supports economic growth along with domestic consumption showing the international competitiveness of a economy. Romania exports the most equipment and transport machinery, manufactured goods, food and live animals and chemicals especially to EU countries (Germany, Italy, France, Hungary, etc). Exports are the most relevant, essential activity for assessing national competitiveness, so substantial efforts are being made to stimulate export growth, and national strategies have been developed for well-defined time periods, and even export have increased over time, there is still room for improvement.



**Figure 8: Export of good and services**

Source: data processed based on World Bank and Eurostat



R&D expenditure as percentage of GDP was also taken into consideration for establishing the economy's resilience. Research and development represent in our opinion a key driver of innovation that generates new products and services and stimulates economic growth and long-term sustainability of the economy. Through continues research, innovation is encouraged for development and implementation of ideas and technologies that optimize goods and services or increase the efficiency of their production process. Romania is the last in the EU with less than 1% of GDP spent for R&D.

**Table 2: Centralized data for the period 2011-2020**

	RES	RP	ED	NLP	LT	IIP	CMU	EGS	RDE
<b>2011</b>	1.91	0.37	21.14	54.60	77.3	19.00	2.50	37.06	0.49
<b>2012</b>	2.04	0.40	22.46	55.50	88.8	20.00	2.60	37.53	0.48
<b>2013</b>	3.77	0.42	18.32	56.30	76.1	15.00	2.50	40.03	0.39
<b>2014</b>	3.61	0.42	16.66	56.90	77.4	21.00	2.10	41.43	0.38
<b>2015</b>	2.95	0.36	16.69	58.60	75.0	22.00	1.70	41.39	0.49
<b>2016</b>	4.70	0.37	21.90	63.00	76.1	22.00	1.70	41.78	0.48
<b>2017</b>	7.32	0.43	23.30	66.00	69.3	22.00	1.70	42.02	0.50
<b>2018</b>	4.47	0.42	24.29	68.70	68.6	22.00	1.50	41.86	0.51
<b>2019</b>	4.19	0.37	30.28	72.50	70.4	23.00	1.30	40.38	0.48
<b>2020</b>	-3.93	0.33	28.20	75.20	82.8	23.00	1.30	37.26	0.47

Source: authors processing based on World Bank database and Eurostat

The first step in our approach is to determine if the data series used are or not stationary using the Augmented Dickey-Fuller root drive test (ADF) in Eviews for level series and 1st or 2nd order differences. We noted with L model for level series, L1 and L2 model for first or second order differences. We choose not to test constant or trend for homogeneity of data because when performed unit root for each variable, constant and trend, for some variables constant and trend were not significant. The results of ADF test shows that the series are stationary as probability associated with t-statistic is lower than 0.05 and t-statistic is above 5% critical value so it was rejected the non-stationary hypothesis for the series of time.

**Table 3: Unit root test**

ADF Test		RES	RP	ED	NLP	LT	IIP	CMU	EGS	RDE
<b>L</b>	Test statistic	-1.5519	-0.4034	0.5836	5.7131	0.1038	0.5269	<b>-2.3427</b>	-0.9711	-0.2807
	1% critical value	-4.5826	-2.8473	-2.8473	-2.8473	-2.8473	-2.8861	-2.8473	-2.8861	-2.8473
	5% critical value	-3.3210	-1.9882	-1.9882	-1.9882	-1.9882	-1.9959	-1.9882	-1.9959	-1.9882
	Prob	0.4593	0.5088	0.8223	0.9999	0.6907	0.8058	<b>0.0257</b>	0.2677	0.5562
<b>L1</b>	Test statistic	-1.3633	<b>-4.0489</b>	<b>-2.5023</b>	-0.3264	<b>-4.0222</b>	<b>-4.3558</b>		-0.3090	<b>-2.6945</b>
	1% critical value	-2.8861	-2.9372	-2.8861	-2.8861	-2.8861	-2.8861		-2.8861	-2.8861
	5% critical value	-1.9959	-2.0063	-1.9959	-1.9959	-1.9959	-	1.9959	-1.9959	-1.9959
	Prob	0.1483	<b>0.0018</b>	<b>0.0199</b>	0.5352	<b>0.0015</b>	<b>0.0009</b>		0.5419	<b>0.0140</b>
<b>L2</b>	Test statistic	<b>-3.5778</b>			<b>-2.7963</b>				<b>-2.2829</b>	
	1% critical value	-2.9372			-2.9372				-2.9372	
	5% critical value	-2.0063			-2.0063				-2.0063	
	Prob	<b>0.0036</b>			<b>0.0126</b>				<b>0.0309</b>	

Source: authors processing using Eviews

The results on descriptive analysis of all 9 variables present a normal distribution and no unexpected value recorded for none of each variables.

**Table 4: Descriptive statistics**

	Mean	Std. Deviation	N
<b>RES</b>	3.103487	2.908841	10
<b>RP</b>	0.388300	0.032109	10
<b>ED</b>	22.324000	4.523515	10
<b>NLP</b>	62.730000	7.513846	10
<b>LT</b>	76.180000	6.195303	10
<b>IIP</b>	20.900000	2.424413	10
<b>CMU</b>	1.890000	0.499889	10
<b>EGS</b>	40.073680	2.029082	10
<b>RDE</b>	0.467000	0.044734	10

Source: authors processing using Eviews

Next step in our research approach is to find the correlations and interdependence between choose variables using Pearson Correlation, showing if there are linear correlation between the series as a ratio between the covariance of two variables and the product of their standard deviations.

**Table 5: Correlations regarding RES and RP, ED, NLP, LT, IIP, CMU, EGS, RDE**

	RES	RP	ED	NLP	LT	IIP	CMU	EGS	RDE
<b>RES</b>	1.000	0.706	-0.253	-0.223	-0.655	-0.085	0.070	0.759	0.061
<b>RP</b>	0.706	1.000	-0.358	-0.339	-0.302	-0.390	0.378	0.468	-0.273
<b>ED</b>	-0.253	0.359	1.000	0.838	-0.111	0.514	-0.600	-0.255	0.482
<b>NLP</b>	-0.223	-0.340	0.838	1.000	-0.343	0.682	-0.904	0.111	0.383
<b>LT</b>	-0.655	0.393	-0.111	-0.343	1.000	-0.210	0.497	-0.732	-0.219
<b>IIP</b>	-0.085	-0.390	0.515	0.682	-0.210	1.000	-0.817	0.238	0.560
<b>CMU</b>	0.071	0.378	-0.600	-0.904	0.497	-0.817	1.000	-0.389	-0.403
<b>EGS</b>	0.759	0.468	-0.255	0.111	-0.073	0.238	-0.389	1.000	-0.034
<b>RDE</b>	0.061	-0.274	0.482	0.383	-0.219	0.560	-0.404	-0.034	1.000

Source: authors processing using Eviews

Analyzing the result presented in table 5, there can be observed a positive strong correlation between NLP and ED that vary in the same direction, meaning that an increased level of consumed energy shows the economy is functioning, industrial production increases which makes productivity per employee to improve. There are also observed negative strong correlation between CMU and NLP or CMU and IIP meaning that the rate of recycle is low, where secondary materials substitute for primary raw materials is on a evident decline, the specificity of industrial production using new raw material and not reused one. The circular economy is at its beginning in Romania and it is compulsory to take steps both legislative and educational for increasing the rate of recycling for a sustainable economy for the future.

**Table 6: Regression Statistics**

Model	R	R Square	Adjusted R Square	Standard Error
1	0.989018	0.978157	0.80341	1.289736
a. Predictors: Constant, RP, ED, NLP, LT, IIP, CMU, EGS, RDE				
b. Dependent Variable: RES				

Source: authors processing using Eviews

According to the data presented in Table 6 there can be observed correlation ratio is  $R = 0.989$  and determination ratio R Squared is  $0.978$ , which define a strong relation between the dependent variable RES and the independent variables RP, ED, NLP, LT, IIP, CMU, EGS, RDE. The variation in one direction or another of the independent variables will implicitly lead to the variation of the independent variable RES.

**Table 7: Regression Coefficients**

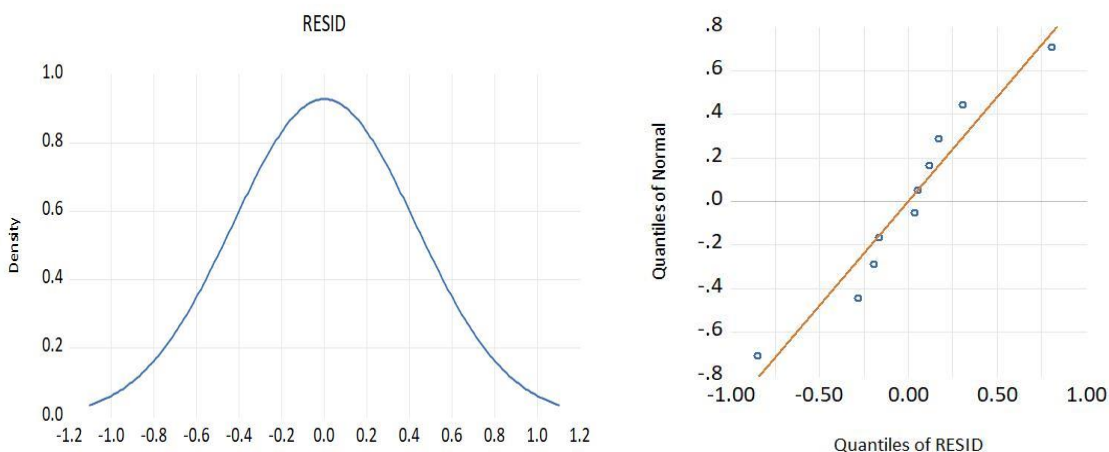
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RP	-15.58519	76.55131	-0.203591	0.8721
ED	0.378176	0.565854	0.668328	0.6249
NLP	0.034275	1.073654	0.031924	0.9797
LT	-0.185013	0.224509	-0.824075	0.5612
IIP	0.359294	0.947777	0.379091	0.7693
CMU	8.853139	19.85713	0.445842	0.7330
EGS	1.740793	1.198691	1.452245	0.3839
RDE	6.423145	14.17661	0.453080	0.7292
C	-84.34428	115.6695	-0.729184	0.5989

Source: authors processing using Eviews

With the help of the regression coefficients presented in Table 7, the estimated equation of the multiple linear regression model was constructed, as presented below:

$$RES = -15.585*RP + 0.378*ED + 0.0342*NLP - 0.185*LT + 0.359*IIP + 8.853*CMU + 1.740*EGS + 6.423*RDE - 84.344$$

Considering the model, we can see, that even if strong connection between RES and RP, it negatively influenced it but in the same time RDE and CMU positively influence economic resilience. Building a sustainable model for an economy it impose to benefit from the circular economy through which it can enable to disconnect the growth from the economic value of raw materials consumption and energy resources, giving access to innovating services that can be done only by investing in research and higher development expenditure. Simultaneous, EGS positively influence economic resilience as exports of goods and services are among representative sources of foreign exchange income helping to improve the balance of payments and create employment opportunities.

**Figure 9: Histogram and Quantile of regression model errors in Eviews**

Source: authors processing using Eviews

As far as we can see from both picture above and after performing normality test in Eviews, we can affirm that the data is normally distributed. The error histogram shows an asymmetric distribution on both sides of the Gaussian curve, confirming that the economic resilience of the Romanian Economy was a good and positive one, the economy performing very well while small deviations can be attributed to exceptional events, COVID 19 pandemic was one of major event which transmitted shock waves all around the world, affected all economies of state more or less depending of each specificity.

## Conclusion

Romania performed well during last decade, being often likened to Europe Tiger, as it has impressive economic growth, well above EU average level, but the economy is still low but there is a great potential considering its importance in Europe, a big country in term of surface, population but mostly its natural resources. Even if COVID pandemic affected global economy by important restrictions and difficulty in supply chain, Romania economy continued to show resilience, even if economy contracted, initial estimation was for a contraction of 7-8%, instead the contraction was at half estimated. The transition to a sustainable economy by growing the circular economy, allocating additional resources in research and development to have an innovative economy, along with stimulating exports, will lead to the development of a competitive and long-term sustainable economy, as shown in the present study.

The researched topic is as actual as never and of overwhelming importance, but given its complexity, it is necessary to study more intensely and to constantly find the factors that influence the ability of economies to cope with turbulence. Hence the limitations of this paper, to find as accurately as possible the determinants of resilience and at the same time to capture in real time the influences so that they are not overwhelmed by events that take place in real time. Given the current situation, on the one hand, the Russian-Ukrainian conflict and, on the other hand, the energy crisis and energy and gas prices at European level, as well as rising fuel prices, further research may surprise the state of the world's economies in these conditions events and what were the factors that sustained the coming out as the winner.

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