Analysis of Competitiveness Impact on Sustenable Economic Growth

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Abstract: The aim of this paper is to conduct an analysis that addresses the issue of competitiveness from the perspective of macroeconomic stability and gross domestic product growth over a period of 17 years (January 1, 2000 - October 31, 2017), quarterly values. Our objective is to determine the impact of competitiveness, measured by the indicators: exchange rate, inflation, interest rate, unemployment rate, volume of imports and export volume, on the evolution of gross domestic product using multiple linear regression. The results of this analysis confirm the importance of competitiveness on economic growth and can be used as a starting point for other researchers that want to analyze the evolution of the economic environment and the impact factors. The research is highlighted by the fact that it analyzes sustainable growth from a new and authentic perspective, while showing the importance of competitiveness in the general economy.

Keywords: exchange rate; inflation; interest rate; gross domestic product

JEL Classification: O1; L4; L26; L11

1. Introduction

The EU Cohesion Policy supporting regional and sectoral investment in economic development has been an important factor during the last 20-25 years in the process of helping poorer regions to compete in the single European market and to reach the most prosperous regions economic. The winner of the Nobel Prize for Economy, Michael Spence, said that Europe has an obligation to share its regional development experience with other countries in the world (Spence, 2011; Dawid, Herbert et al., 2013). Moreover, given the fact that literature highlight the implication of European identity as a result of interdependence between institutions of its Union, that intervenes in citizens' everyday lives, and citizen's values (Capello, 2018).

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Cohesion policy is the main investment policy of the European Union 12 (Gunasekaran et al., 2011; Samila et al, 2011). This policy addresses all regions and cities in the European Union, supporting job creation, business competitiveness, economic growth, sustainable development and improving the quality of life. Cohesion policy has a strong impact in many areas. Investments contribute to many other EU policy goals (Schwab, 2010; Balkyte & Manuela, 2010; McCann, 2016). Cohesion policy is complementary to other Union policies such as education, employment, energy, the environment, the single market, research and innovation. Cohesion policy provides, in particular, the framework and the investment strategy needed to meet the agreed growth targets (Bradley, 2015; Mendez, 2013; Ketels, 2013, Europe 2020 Strategy).

By 2020, the EU is pursuing five concrete objectives - related to employment, innovation, education, social inclusion and climate/energy. Each Member State has adopted its own national targets in these areas. Over the 2014-2020 period, € 351.8 billion - about one third of the total EU budget - was allocated to cohesion policy to meet these objectives and meet the diverse needs of all regions of the EU. Most of the funds available to cohesion policy are geared towards less developed European countries and regions, with a view to supporting them in order to recover and reduce the economic, social and territorial disparities still existing at the level of the European Union.

Cohesion policy is a catalyst for additional funding from public and private funds, as this requires Member States to co-finance from the national budget and also confers investor confidence (Stam, 2015; Colombo, 2016, p. 9; Kadocsa, György & László Borbás, 2010). Taking into account national contributions and other private investment, the impact of cohesion policy for 2014-2020 is estimated at around € 450 billion.

2. Cohesion Policy Objectives and Achievements

The Cohesion Policy has 11 thematic objectives for growth in the 2014-2020 period:

1. Strengthening research, technological development and innovation;

2. Improving access to information and communication technologies and improving their use and quality;

3. **Increasing the competitiveness of SMEs**;

4. Supporting the transition to a low-carbon economy;

5. Promoting adaptation to climate change as well as risk prevention and management;

6. Preserving and protecting the environment and promoting resource efficiency;

7. Promote sustainable transport and improve network infrastructures;

8. Promote sustainability and quality of jobs and support workers' mobility;

9. Promoting social inclusion, combating poverty and any form of discrimination;

10. Making investments in education, training and lifelong learning;

11. Improving the efficiency of public administration;

The objectives of cohesion policy are achieved through three main funds:

- The European Regional Development Fund (ERDF): seeks to strengthen economic and social cohesion at regional level by investing in growth-enhancing sectors in order to generate greater competitiveness and job creation. At the same time, the ERDF finances cross-border cooperation projects;

- The European Social Fund (ESF): invests in people, with a focus on improving employment and education opportunities. It also aims to support disadvantaged people facing the risk of poverty or social exclusion;

- The Cohesion Fund: invests in green growth and sustainable development and improves interconnection in Member States with a GDP below 90% of the EU-27 average. These are, together with the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF), the European Structural Funds and European Investment Funds (ESI) (ec.europa.eu/esif).

In order to establish the objectives, the Commission is working with Member States and regions to develop partnership agreements and operational programs outlining investment priorities and development needs. The managing authorities in the Member States manage the programs and select the individual projects. In line with this, literature highlight that funds have implications on annual growth, and can reduce regional disparities in terms of the Gini index (Fiaschi et al., 2018).

Granting funds is made according to the following steps:

- Managing authorities select individual projects. Any project with a total cost exceeding EUR 50 million must be submitted for approval to the Commission;

- At the beginning of each year, the Commission provides funds to enable countries to start investing in projects;

- Expenditure authorized by national bodies is paid by the Commission;

- Programs are constantly monitored. This includes on-the-spot audits and controls carried out by the Commission and the Member States. Both, the Commission and the Member States, must report over the entire period.

ERDF investments will support all 11 objectives, but Objectives 1-4 are the main investment priorities;

The main priorities of the ESF are Objectives 8-11, although the Fund also supports Objectives 1-4;

The Cohesion Fund supports Objectives 4 to 7 and 11;

Cohesion policy generates benefits for all EU regions (Colombo et al; 2016; Mason et al, 2013). The level of investment reflects the development needs of the Member States. Regions are classified according to their gross domestic product (GDP) in more developed, transition or less developed regions. According to this classification, funds provide between 50% and 85% of the total funding of a project. The remaining financing needs may come from public (national or regional) sources or private sources. The overall policy objective is to boost the competitiveness of Europe's regions and cities by encouraging growth and job creation.

Cohesion policy encourages regions and cities in different EU Member States to collaborate and learn from each other through joint programs, projects and networks with concrete effects on every aspect of economic life, including innovation, accessibility, education, enterprise, employment workforce or the environment. Cross-border, transnational and interregional programs are funded by the ERDF. People living outside the EU also benefit from cross-border pre-accession cooperation programs. At the same time, international cooperation can take place through a "macro-regional strategy", an integrated framework for addressing the common challenges faced by Member States in defined geographical areas (MacKinnon, 2011; Dawley, 2011).

3. Analysis of the Impact of Competitivenesss on Economic Growth

Next we aim to analyze the subject of competitiveness from the point of view of macroeconomic stability and the growth of gross domestic product. In the following lines we will analyze the impact of competitiveness, measured by the indicators: exchange rate, inflation, interest rate, unemployment rate, import volume and export volume, on the evolution of gross domestic product.

3.1. Presentation of Time Series

Given that time series in their gross form has different units of measure, we will proceed to logarithm. One reason that implies the logarithm of the variables is the attenuation of the multicolinarity phenomenon. For time series that have only

positive observations, the logarithm shall be based on the command "x = log (x)" and for the time series containing both positive and negative observations, the logarithm of the series will be based on the command "x = @recode (x> 0, log (1 + x) - log (1-x))". The variables in the logarithm form will have the name "l_x", and in the differentiated form "dl_x".

3.2. Stationarity of Time Series

In order to achieve an econometric analysis, we have to consider the stationarity of the time series used. A series is considered to be stationary if the constancy conditions of the mean and variance of the time series are met. In other words, the observations used should oscillate around the average.

From an economic perspective, a series of times is stationary if a shock on it is temporary and absorbed over time. Most time series are non-static, they are considered to be I-series integrated and are denoted by l (1). In econometric terms, these time series have a single unit root (verification of stationarity is done by accepting or rejecting the null hypothesis (H0) existence of a unitary root).

The stationarity of a series of times it is made through the differentiation operation, by making the difference between the value of the variable at time t + 1 and at time t. The number of differentiation operations coincides with that of the unit rows of the series. Thus, a series that is integrated by oridn II (l (2)) requires a double differentiation. In this case, the differentiation will be done on the new logarithm series (the logarithm is made using the eview program).
The most well-known and used stationary tests are:

- ADF (Augmented Dickey-Fuller);
- PP (Phillips-Perron).

To test if a series of time is stationary, we run the Unit Root Test using the eview program. In the first phase we will select test for unit root in" in the "level" option. If the resulting prob * is below the level of relevance chosen by the researcher then it means that the time series is already stationary. Otherwise, we repeat the Unit Root Test and at "Test for unit root in" we select the "1st difference" option. If, following this test, the corresponding proble is below the level of relevance then it means that our series is an integrated 1 st series and has a single root. Otherwise, the test will be replicated and selected at "Test for unit root in-2nd difference". The new resulting series will be integrated into the 2nd order and will have two single roots.

Table 1. Synthesis of the ADF and PP stationarity test for the variables presented

Variable description	Stationarity Test (ADF)	Variable name after stationarity	Prob* ADF	Prob* PP
Evolution of GDP (mil. Eur)	**Non-stationary**	dl_gdp_mil	0,0262	0,0001
Evolution of GDP over the same period last year	**Stationary**	l_gdp_	0,0155	0,0486

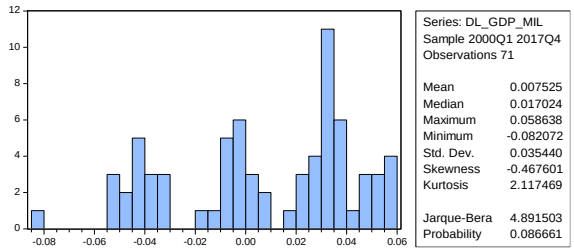
Evolution of the exchange rate (EUR/USD)	**Non-stationary**	dl_exrate	0,0000	0,0000
Evolution of Inflation Rate	**Non-stationary**	dl_hicp1	0,0000	0,0000
The evolution of the interest rate on the money market	**Non-stationary**	dl_interest_rate	0,0024	0,0014
Evolution of the unemployment rate (% of the active population)	**Non-stationary**	d2l_unempl_rate	0,0030	0,0001
Unemployment evolution (thousands of people)	**Non-stationary**	d2l_unempl_mii	0,0011	0,0001
Evolution of imports (mil. euro)	**Non-stationary**	dl_import_mil	0,0003	0,0000
Evolution of imports over the previous period	**Stationary**	l_importst_1	0,0025	0,0001
Evolution of imports over the same period last year	**Stationary**	l_importsprev	0,0038	0,0291
Evolution of exports (mil.eur)	**Non-stationary**	dl_export_mil	0,0005	0,0001
Evolution of exports over the previous period	**Stationary**	l_exportst_1	0,0017	0,0001
Evolution of exports over the same period last year	**Stationary**	l_exportprev	0,0025	0,0467

Out of the 13 variables proposed for analysis, only 5 of them were stationary in the logarithm form, for the other 9 variables we needed to generate new series and differentiate them to obtain a stationary form.

3.3. Distribution of Time Series

The distribution of a time series can be tested via the Histogram and the Jarque-Bera test. After processing in Eviews, the output will generate: distribution histogram, mean, median, minimum and maximum values, standard deviation, skewness coefficient, kurtosis coefficient, and Jarque-Bera test value. For the analyzed time series dl_gdp_mil we get the following output:

Figure 1. Histogram of the variable dl_gdp_mil



Skewness coefficient describes a normal distribution when it is zero. In the example above, the distribution of the quarterly GDP growth of the gross domestic product shows a negative asymmetry to the right.

Kurtosis coefficient describes a normal distribution if it is 3. If this indicator takes a higher value than 3 then we have a leptocurtic distribution and if it takes less than 3 then the distribution is platocratic. In our case, the vault is less than 3, which means that this distribution is platocratic.

The Jarque-Bera test tests whether a distribution is normally distributed. The test measures the difference between skewness coefficient and kurtosis coefficient with those of the normal distribution. The test has a null hypothesis: the series is normally distributed. Thus, if the probability associated with the test is higher than the chosen relevance level (1, 5 or 10%), then the null hypothesis is accepted. In the example below, as the probability value is less than the 10% relevance level, the null hypothesis that the series is normally distributed is rejected.

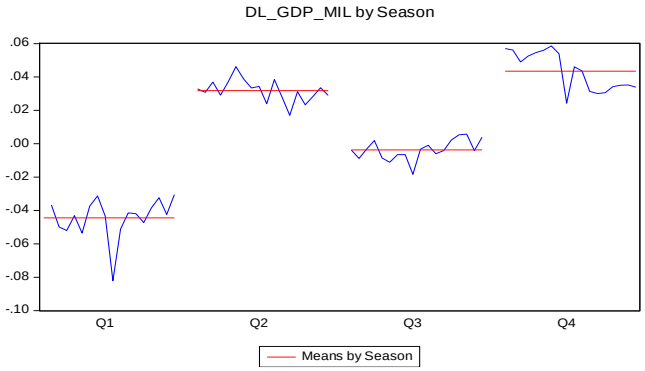
For the other variables we synthesized the main results obtained from the time series distribution tests.

Table 2. Synthesis of time series distribution analysis

Variable description	Variable name	Skewness value	Kurtosis value	Jarque-Bera	Prob.*
Evolution of GDP (mil. Eur)	dl_gdp_mil	-0,467601	2,117469	4,891503	0,086661
Evolution of GDP over the same period last year	l_gdp_	-1,629447	4,910706	42,813580	0,000000
Evolution of the exchange rate (EUR/USD)	dl_exrate	-0,640111	3,436213	5,411532	0,068190
Evolution of Inflation Rate	dl_hicp2	-0,083143	5,541926	24,637370	0,000004
The evolution of the interest rate on the money market	dl_interest_rate	-2,084548	10,707900	227,179700	0,000000
Evolution of the unemployment rate (% of the active population)	d2l_unempl_rate	-0,702601	2,350736	6,988730	0,030368
Unemployment evolution (thousands of people)	d2l_unempl_mii	-0,643060	2,526266	6,325120	0,042351
Evolution of imports (mil. euro)	dl_import_mil	-0,656489	5,273245	20,387510	0,000370
Evolution of imports over the previous period	l_importst_1	-0,174975	1,701380	5,426640	0,063160
Evolution of imports over the same period last year	l_importsprev	-1,484231	4,132983	30,286260	0,000000
Evolution of exports (mil.eur)	dl_export_mil	-0,866954	5,680817	30,154940	0,000000
Evolution of exports over the previous period	l_exportst_1	-0,357267	1,855182	5,463502	0,065105
Evolution of exports over the same period last year	l_exportprev	-1,968599	6,360215	80,377740	0,000000

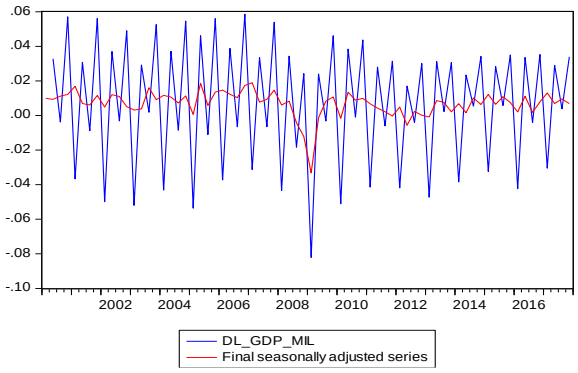
3.4. Seasonal Adjustment of Time Series

The seasonality of a time series refers to its relatively identical behavior in certain periods. To determine the seasonality of a time series, you can choose the graphical representation from the Eviews program for the seasonal average.



Graph 2. Graphical representation of the seasonality of the variable dl_gdp_mil

The graph above represents the evolution of gross domestic product per quarter and the average of observations for each quarter (horizontal line). If the differences between quarterly averages are significant (as is the case here) then the series presents seasonality. The series can be ajusted using Eviews Seasonal Adjustment. The best known and used seasonal adjustment methodologies are Tramo / Seats (which we will use below) and Census X12. Following the use of the Tramo / Seats method, a new ajusted series will be generated that will have the ending "_SA". The two series, the non-seasoned and the seasonally adjusted, are shown in the chart below.



Graph 3. The graphical representation of the non adjusted series (dl_gdp_mil) and the seasonally adjusted series (dl_gdp_mil_SA)

Analogously, the other variables were ajusted. Using the Tramo/Seats method, a new series with the ending "_SA" was generated for each variable that required seasonal adjustment. These variables were:

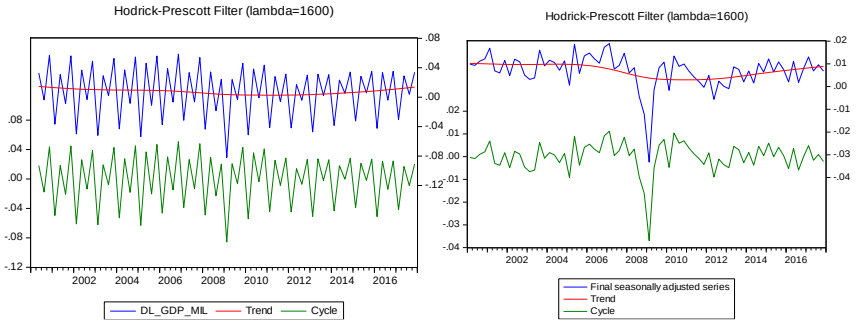
Table 3. Time series that were seasonally adjusted using the Tramo/Seats method

Variable description	Variable name	Variable name after seasonal adjustment
Evolution of GDP (Million Euro)	dl_gdp_mil	DL_GDP_MIL_SA
Evolution of the unemployment rate (% of the active population)	d2l_unempl_rate	DL2_UNEMPL_RATE_SA
Unemployment evolution (thousands of people)	d2l_unempl_mii	DL2_UNEMPL_MII_SA
Evolution of imports (million euro)	dl_import_mil	DL_IMPORTS_MIL_SA
Evolution of imports over the previous period	l_importst_1	L_IMPORTST_1_SA
Evolution of exports (EUR million)	dl_export_mil	DL_EXPORT_MIL_SA
Evolution of exports over the previous period	l_exportst_1	L_EXPORTST_1_SA

** The time series that do not appear in this table did not require seasonal adjustment, so they remained in a logarithmized and differentiated form.*

3.5. Trend of Time Series

The trend is considered to be the long-term component of a time series. The most commonly used method for delineating the trend component and trend deviation (which is calculated as the difference between the actual series and the trend series) is the Hodrick-Prescot filter. It is recommended that prior to determining the trend of a time series, make a seasonal adjustment if applicable (as we have done above).



Graph 4. Evolution of the variables dl_gdp_mil (a) and dl_gdp_mil_SA (b) trend and deviation trend, Hodrick-Prescot filter

We can see from the two graphs that the seasonal adjustment reduces the large variations between the time series and its trend. Due to this adjustment we can say that the time series does not deviate significantly from the trend than in a single moment. If we look at the graph, we can see that the deviation is justified in terms of the period in which it manifests itself - the economic crisis of 2008-2009.

3.6. Linear Multiple Regression

Simple linear regression is the basis for analyzing the relationship between a dependent variable and several independent variables. The form of a multiple regression equation is the following:

Yt = C + a1 * X1t + ... + ak * Xkt + et (1)

Where Y represents the dependent variable, X is independent variable, a is coefficients that indicate the type of connection between variables (direct or indirect), C is the constant and ε is the error term. Thus, by means of multiple linear regression, it is shown how independent variables contribute to the formation of the dependent variable, or else it shows how much the variable dependent on modifying a unit of the independent variable changes when the other independent variables remain constant. If the variables are expressed as natural logarithms, then the coefficients are interpreted as elasticity and will show how much the dependent variable changes if the independent variable changes by 1%.

For the purpose of performing the regression analysis, an equation for the evolution of gross domestic product in millions of euro (dl_gdp_mil_SA) for the period 2000-2017 (quarterly values) will be estimated according to:

• *interest rate evolution* - through the dl_interest_rate time series. The series is logarithm and differentiated (I);

• *exchange rate evolution* - through the time series expired. The series is logarithm and differentiated (I);

• *Inflation rate evolution* - through the dl_hicp1 time series. The series is logarithm and differentiated (I);

• *The evolution of exports* - through the time series l_export_prev. The series is logarithm;

• *The evolution of the unemployment rate* - through the dl2_unempl_mii_SA time series. The series is logarithm, differentiated (II) and seasonally adjusted.

The evolution of the Gross Domestic Product (the dependent variable) is represented in the regression by the time series **dl_gdp_mil_SA**, this variable has been logarithmized, stationarized and adjusted seasonally during the work. Following eviews processing, the results of multiple linear regression are:

Table 4. The result of multiple linear regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_INTEREST_RATE	0.027026	0.008976	3.010806	**0.0037**
DL_EXRATE	0.030550	0.015159	2.015346	**0.0480**
DL_HICP1	-0.011653	0.005703	-2.043320	**0.0451**
L_EXPORTPREV	0.002200	0.000737	2.986063	**0.0040**
DL2_UNEMPL_MII_SA	-0.097440	0.033167	-2.937882	**0.0046**
C	0.004493	0.001335	3.365731	**0.0013**
R-squared	0.546432	Mean dependent var		0.006900
Adjusted R-squared	0.511542	S.D. dependent var		0.007506
S.E. of regression	0.005246	Akaike info criterion		-7.581902
Sum squared resid	0.001789	Schwarz criterion		-7.390690
Log likelihood	275.1575	Hannan-Quinn criter.		-7.505863
F-statistic	15.66163	Durbin-Watson stat		2.019605
Prob(F-statistic)	0.000000			

According to the regression analysis results, there is a direct link between the dependent variable dl_gdp_mil_SA and the independent variables dl_interest_rate, dl_exclude, l_exportprev and between independent variables dl_hicp1 and dl2_unempl_mii_SA and the dependent variable, an indirect variable. Taking into account a 5% relevance level, it can be argued that the respective coefficients are statistically significant. With the help of Test F, we can tell how well independent variables explain the evolution of the dependent variable. It determines whether all coefficients of regression at the same time have a statistically zero value.

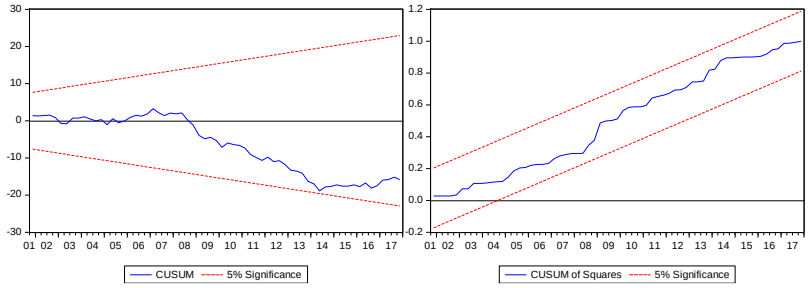
Test F has a null hypothesis: all coefficients in the regression are zero. If the probability value (Prob (F-statistic)) is lower than the assumed level of relevance, then the null hypothesis is rejected, which means that at least one of the coefficients is statistically significant. However, if the probability value is higher than the level of relevance, then the null hypothesis is accepted, which means that all regression coefficients are considered statistically insignificant (equal to zero). In the present case with a 5% relevance, we can say that all coefficients in the regression are statistically significant (Prob (F-statistic) = 0,000000).

Another relevant indicator that shows whether the regression model is well-specified is the determination ratio R2. It shows how much of the total variation of the dependent variable is due to independent variables. R^2 can take values between 0 and 1. The closer it is to 1, the more regression is better. Each time we introduce a new independent variable that is as little correlated with the dependent variable, R^2 increases. An improved measure of R^2 is adjusted R^2 which can decrease with the introduction of new independent variables, penalizing those that have little relevance to the dependent variable. In our case, we can say that the independent variables used in the regression have a significant influence on the gross domestic product, about 51%.

The Durbin Watson State (DW) indicator is a statistical test that tests the serial error correlation. If the errors are not correlated, then the pointer will register a value around it. In our example, the DW value is 2.01, indicating that there is no serial correlation of the errors.

3.7. Testing the Stability of the Equation and Estimated Coefficients

To test the stability of the equation and estimated coefficients, CUSUM and CUSUM of Squares Tests are typically used. In the first case, the CUSUM test is based on the cumulative sum of recursive errors of the regression equation. In Eviews, the graphical representation of this test includes the cumulative sum of recursive errors along with critical lines of 5%. The equation parameters are considered stable if the cumulative sum of the recursive errors does not go beyond the two critical lines.



Graph 5. Testing the stability of coefficients of CUSUM and CUSUM of Squares Tests

According to the results of both tests we can state that the equation and its coefficients are stable.

4. Conclusion

Competition is an important factor in increasing economic sustainability, a factor that must be taken into account by economic agents. In a more plastic manner, we can say that through competition, firms are forced to adopt economically efficient positions, offer the widest range of products and services at advantageous prices, while also facilitating an optimal allocation of resources in society.

According to the results highlighted in this study, we can say that the competitive advantage of SMEs is a combination of: European Union support actions; adopting a competitive behavior towards other competitors on the market; the degree of business and location performance; and last but not least the degree of development of the country in which they operate.

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