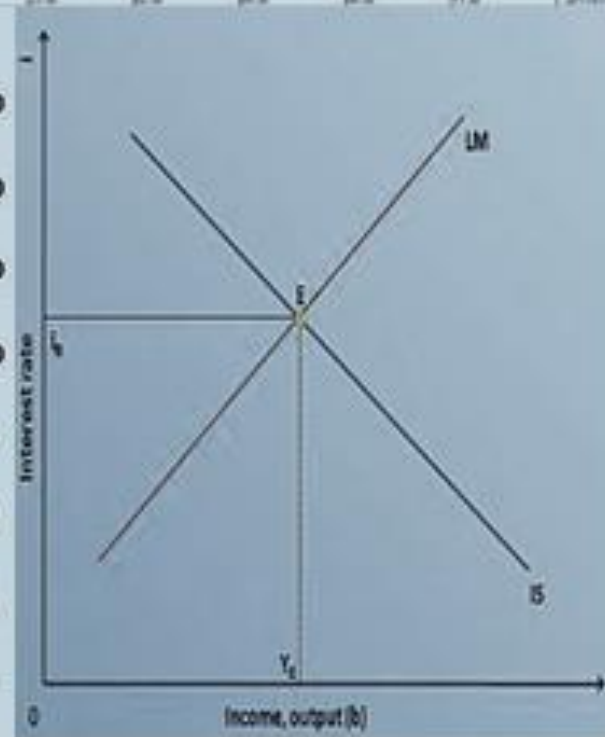


Vol. 6, Issue 2, 2018
ISSN 2343-7995 (online)



Hyperion Economic Journal



HYPERION ECONOMIC JOURNAL

**Quarterly journal published by
Faculty of Economic Sciences
Hyperion University of Bucharest
Romania**

**YEAR VI, ISSUE 2, JUNE 2018
ISSN 2343-7995 (online)**

EDITORIAL BOARD

Chief Editor:

Iulian PANAIT, Hyperion University of Bucharest

Associated editors:

Șerban ȚĂRANU, Hyperion University of Bucharest

Andrei Mihai CRISTEA, Hyperion University of Bucharest

Oana IACOB, Hyperion University of Bucharest

SCIENTIFIC BOARD

Lucian Liviu ALBU, Institute for Economic Forecasting, Romanian Academy

Ion GHIZDEANU, Romanian National Forecasting Commission

Anca GHEORGHIU, Hyperion University of Bucharest

Dorin JULĂ, Ecological University of Bucharest

Mariana BĂLAN, Institute for Economic Forecasting, Romanian Academy

Mărioara IORDAN, Institute for Economic Forecasting, Romanian Academy

Sorin BRICIU, 1 December 1918 University of Alba Iulia

Ion PĂRGARU, University Politehnica of Bucharest

Ionut PURICA, Institute for Economic Forecasting, Romanian Academy

Marin ANDREICA, Bucharest University of Economic Studies

Ana Paula LOPES, University of Porto

Marina Ochkovskaya, Lomonosov Moscow State University

Maria Jose Del Pino Espejo, Universidad Pablo de Olavide Sevilla

Susana Pilar Gaitan Guia, Universidad de Sevilla

Anda GHEORGHIU, Hyperion University of Bucharest

Carmen UZLĂU, Hyperion University of Bucharest

Corina Maria ENE, Hyperion University of Bucharest

Radu LUPU, Bucharest University of Economic Studies

Tudor CIUMARA, Financial and Monetary Research Centre „Victor Slăvescu”, Romanian Academy

Iulia LUPU, Financial and Monetary Research Centre „Victor Slăvescu”, Romanian Academy

Iulian PANAIT, Hyperion University of Bucharest

CONTENTS

Art Market vs. Financial Markets	<i>3-10</i>
<i>Mihaela-Eugenia Vasilache</i>	
Reflection on the Concept of Sustainability in Terms of Accounting	<i>11-16</i>
<i>Andrei-Mihai Cristea</i>	
Competition and Economic growth. An Econometric Analysis	<i>17-30</i>
<i>Cristiana Matei</i>	

ART MARKET vs. FINANCIAL MARKETS

Mihaela-Eugenia VASILACHE, PhD candidate
SCOSAAR, Romanian Academy, Bucharest, Romania

Abstract: *In this paper we analyse the short- and long-run relationship between the price indices of art market and of financial market. Through an econometric nonlinear (exponential-quadratic) model with structural breaks, as well as through a Structural Vector Error Correction (SVEC) model, we show that, contrary to many opinions in the literature, between 1998 – 2018q1, the dynamics of art market – assessed through the Artprice Global Index of the Art Market and the changes on the financial market – brought nearby through S&P 500 index are strong positively correlated. In our interpretation, this means that the art market could not have been widely used as an alternative to the capital market, not even during the crisis. We find that S&P 500 index may be a cause for Global Index of the Art Market, but, the inverse causality relationship can be rejected: Global Index of the Art Market does not Granger cause S&P 500.*

Keywords: Artprice Global Index of the Art Market, Lee-Strazicich unit root test, Toda-Yamamoto causality test, nonlinear model with structural breaks, SVEC.

JEL Classification: C51, G15, Z11

Introduction

In (Pownall 2007, 1) words, the Art Market "appear to offer a highly beneficial diversification strategy with extremely low correlation with traditional asset classes". In a similar reasoning, (Mamarbachi, Day and Favato 2008, 1-2) write that "art as an alternative asset class is being incorporated into portfolios in the interest of diversification. Art's low correlation with the equities market and desirable risk and reward ratio, as price appreciation defies all logic, makes it an attractive investment.

Art as an investment has an increasing demand coupled with an absolutely limited supply and the ability to survive the economic downturn." As well, (Mei and Moses 2002), by estimating an annual index of art prices for the period 1875-2000, found that "art outperforms fixed income securities as an investment" (Mei and Moses 2002, 1), and "art has been a more glamorous investment than some fixed income securities" (Mei and Moses 2002, 2), moreover "art is also found to have lower volatility and lower correlation with other assets, making it more attractive for portfolio diversification" (Mei and Moses 2002, 1).

On the other hand, (Goetzmann, Renneboog and Spaenjers 2010) showed that "equity market returns have had a significant impact on the price level in the art market over the last two centuries."

In the paper, we analyse the relationships between art market and financial market, over the period 1998 – 2018(q1).

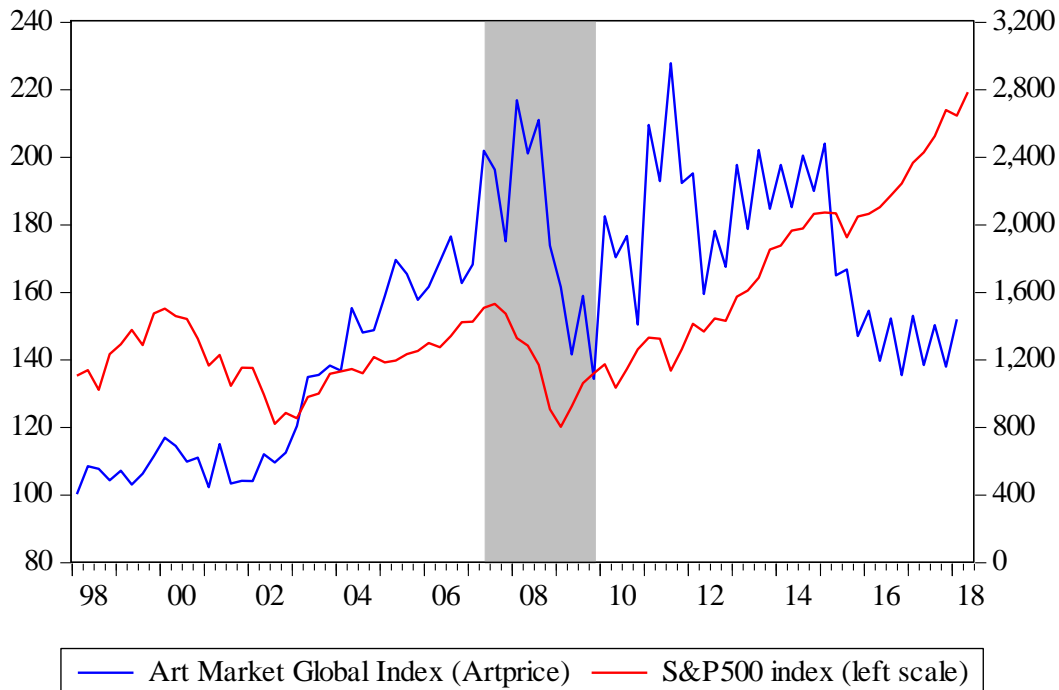
1. Data and Methodology

To analyse the relationships between art market and financial market we use the *Artprice Index of Global Art Market* and the *S&P 500 index*. We extract the *Global Index of the Art Market* from Artprice.com data, available at <http://imgpublic.artprice.com/pdf/agi.xls>. Also, we have found the data

related to *S&P 500 index* on (Yahoo Finance 2018), data available at <https://finance.yahoo.com/quote/%5EGSPC?p=%5EGSPC>.

The dynamics of the *S&P500 index* and the *Global Index of the Art Market (Artprice)* are shown in the following figure below.

Figure 1. The dynamics of the S&P500 index and the Global Index of the Art Market (Artprice index)



Source:

- ✓ For the *Global Index of the Art Market*: Artprice.com data, available at <http://imgpublic.artprice.com/pdf/agi.xls> (accessed May 6, 2018).
- ✓ For the *S&P 500 index*: (Yahoo Finance 2018) data, available at <https://finance.yahoo.com/quote/%5EGSPC?p=%5EGSPC> (accessed May 6, 2018).

Legend: in the chart, we have marked the period of the financial crisis (2007-2009)

According the standard unit root tests [Augmented Dickey-Fuller (ADF), GLS transformed Dickey-Fuller (DFGLS), Phillips-Perron (PP), Kwiatkowski, et. al. (KPSS), Elliot, Richardson and Stock (ERS) Point Optimal, and Ng and Perron (NP)], both the *global index of the art market* and the *S&P500 index* are nonstationary series. The single point break unit root tests lead to the same conclusion. But the Lee-Strazicich unit root test with one or two structural breaks (Lee and Strazicich 2003) reject the unit root under the hypothesis of two structural breaks at 10% for *Global Index of the Art Market* and at (near) 10% for *S&P500 index*.

As methodology, we analysed the causal relationship between the two index, through Toda-Yamamoto version of Granger causality test. To estimate the relationship between the *Artprice Global Art Market Index* and the *S&P 500 index* we used a following relationship:

$$\text{art}_t = \alpha(\text{S\&P 500})_t + f(t) + e_t,$$

where *art* is the *Artprice Global Art Market Index*, *S&P500* stand for the *S&P 500* financial market index, $f(t)$ is a trend (linear, or nonlinear) function, e - error variable, t – time index (quarterly intervals for 1998 to 2018q1). Model allows for trend breaks (i.e. coefficients variability by periods).

2. The Causality Relationship between Art Market and Financial Market

Since, according to standard unit root tests, both the *global index of the art market* and the *S&P500 index* are nonstationary series, more exactly, $I(1)$, we tested the presence of a causality relationship through Toda-Yamamoto version of Granger causality test. By using VAR Lag Order Selection Criteria to estimate the lag structure of VAR model, we found the following outputs:

Table 1. VAR Lag Order Selection Criteria

Endogenous variables: Global Index of the Art Market *and* S&P500 index

Exogenous variables: C

Sample: 1998Q1 2018Q1

Included observations: 74

Lag	Sequential modified LR test statistic	Final prediction error	Akaike information criterion	Schwarz information criterion	Hannan-Quinn information criterion
0	NA	2.16e+08	24.86808	24.93035	24.89292
1	302.0931	3421835	20.72135	20.90817	20.79588
2	26.24695	2607047	20.44907	20.7604*	20.57328
3	14.75767	2332136	20.33691	20.77282	20.51080
4	11.8368*	2168582*	20.2629*	20.82337	20.4865*
5	6.195047	2194306.	20.27269	20.95768	20.54594

* indicates lag order selected by the criterion

Source: Estimates based on the Artprice.com and S&P 500 data (see *Source* of Figure 1).

Most criteria (4 of 5) have selected $l = 4$, so we built an VAR(4) model. According to Toda-Yamamoto methodology, in VAR(4) model we include, as exogenous, the variables with lag = 5. In this model, we apply the VAR Granger Causality/Block Exogeneity Wald Tests. The outputs are the following:

Table 2. Testing causality relationship between S&P 500 and Global Index of the Art Market

Hypothesis	Probability
<i>S&P 500</i> does not Granger cause <i>Global Index of the Art Market</i>	0.0312
<i>Global Index of the Art Market</i> does not Granger cause <i>S&P 500</i>	0.8099

Source: Estimates based on the Artprice.com and S&P 500 data (see *Source* of Figure 1).

Toda-Yamamoto version of Granger causality test indicates that we can reject the assumption that "S&P500 index" does not Granger cause "Global Index of the Art Market" at 3.1% level (< 5%, standard level) and accordingly, we accept the hypothesis of causality: "S&P500 index" may be a cause for "Global Index of the Art Market". But, the reverse causality relationship may be rejected: "Global Index of the Art Market" *does not* Granger cause "S&P500 index" with a probability level of 80.99%. The causal relationships described above are also maintained if the model is only estimated for the crisis period (2007-2010). Even if it is an interesting result, however the causality test does not specify the sign of the causal relationship.

3. Exponential-Quadratic Model with Structural Breaks

To test the hypothesis that the art market is an alternative to securing (covering) financial investment in times of crisis, we have estimated the model

$$\text{art}_t = \alpha(\text{S\&P500})_t + f(t) + e_t,$$

where we exogenously imposing two breaks (this is because Lee-Strazicich test reject the unit roots under the assumption of two structural breaks). If this hypothesis (the Art Market is an alternative for the Financial Market) is correct, then the coefficient α is negative, at the least in times of crisis (2007-2009). A weaker assumption is that α is non-significant, that is, there is no relationship between Art Market and Financial Market.

As trend function, $f(t)$, we used an exponential-quadratic form:

$$f(t) = a \cdot \exp(t/10) + bt^2,$$

where a and b are coefficients that will be estimated through the model, along with α (in formula, we divided t to 10 only for scale reasons). This structure of the trend function was selected given the shape of the relationship between the two variables.

The outputs of the model estimation are as follows:

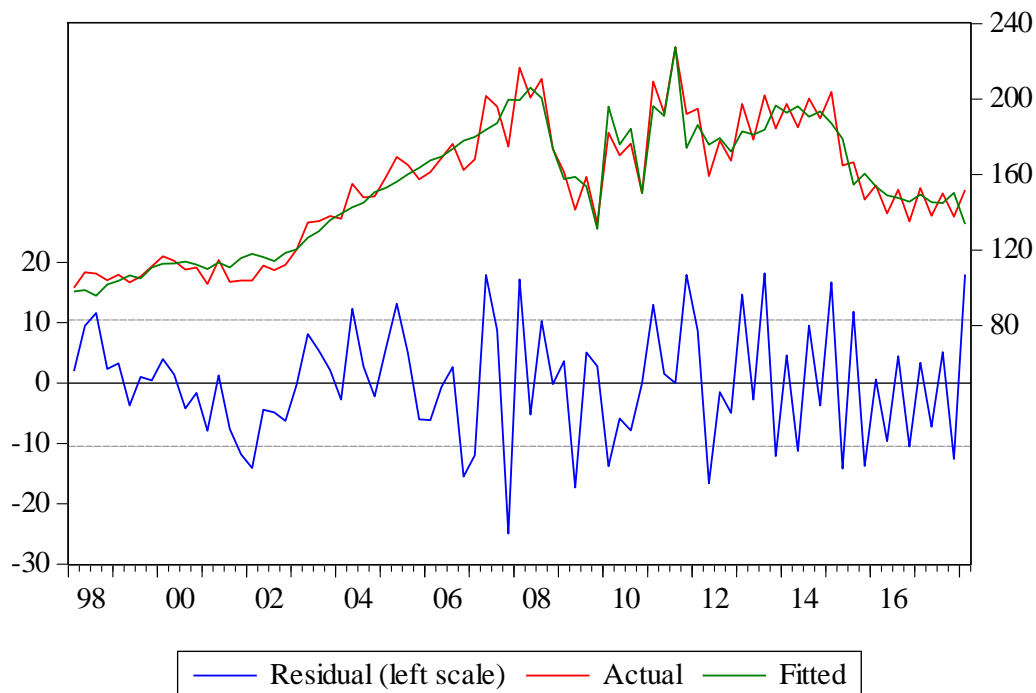
$$\text{art}_t = \begin{cases} \text{for 1998Q1 to 2007Q2} \\ 70.6615 + 0.0261(\text{S \& P500})_t - 1.2377 e^{t/10} + 0.0944 t^2 + u_t \\ \quad (5.851) \quad (2.627) \quad (-1.756) \quad (4.848) \\ \text{for 2007Q3 to 2009Q4} \\ -786.135 + 0.1058(\text{S \& P500})_t - 9.6357 e^{t/10} + 0.8919 t^2 + u_t \\ \quad (-1.861) \quad (2.086) \quad (-2.762) \quad (2.490) \\ \text{for 2010Q1 to 2018(Q1)} \\ 158.7303 + 0.1138(\text{S \& P500})_t - 0.0203 e^{t/10} - 0.0404 t^2 + u_t \\ \quad (9.365) \quad (4.839) \quad (-2.799) \quad (-3.880) \end{cases}$$

(t-statistic in parenthesis, bellow the estimators).

As estimation method, we used Least Squares with Fixed Breaks (2007Q3 and 2010Q1). Also, we have inserted into the model, as non-breaking variables, the dummy for 2010Q4 and 2011Q3.

The actual values of *Global Index of the Art Market*, the values generated by model, and the residuals are depicted in Figure 2.

Figure 2. The relationship between global index of the art market and the S&P 500 index. Econometric nonlinear (exponential-quadratic) model with Structural Breaks.



Source: Estimates based on the nonlinear (exponential-quadratic) model with Structural Breaks.

The model explains 92.1% of the art market index variation from its mean (according to R-squared) and all the coefficients are significant at the standard level of 5%. Errors are not autocorrelated (according to the Breusch-Godfrey Serial Correlation LM Test) and are not heteroscedastic (according to the White Heteroskedasticity Test). The model as a whole is significant: Prob (F-statistic = 60.432) < 0.000001.

For all periods (before the crisis, in the time of crisis, and in post-crisis) the link between the dynamics of the *Global Index of the Art Market* and the evolution of the *S&P 500 index* (the coefficient α in the model) is significant and positive. The positive value of correlation signifies that the *Global Index of the Art Market* and the *S&P 500 index* evolve, as a trend, in the same way, which means that the art market has not been widely used as an alternative to the capital market, not even during the crisis.

4. Long-run Relationship between Art Market and Financial Market

If we assuming that both the short-run (VAR) dynamics and the cointegrating equations do not exhibit of intercept or linear trends, then we find a significant long-run equilibrium relationship between the *Global Index of the Art Market* and the *S&P 500 index*. For this purpose, we built a Structural Vector Error Correction (SVEC) model with 4 lags (according with the results presented in Table 1, above). In the Structural VEC Model, we imposed that all non-significant (at least at 10%) coefficients from non-structural model are zero. As well, we inserted, as exogenous in the equation of short-run dynamics, the eighth lag (two years) of the differentiated endogenous variable [namely, $d(y_{t-8})$, where y is the exogenous variable].

The Structural VEC Model estimates are the following:

$$d(\text{art}_t) = -0.0403 \cdot (\text{art}_{t-1} - 0.0616 \cdot \text{S\&P}_{t-1}) -$$

$$- 0.0012 \cdot d(\text{art}_{t-1}) + 0.1957 \cdot d(\text{art}_{t-2}) - 0.3049 \cdot d(\text{art}_{t-3}) + 0.0902 \cdot d(\text{art}_{t-4}) + \\ + 0.1829 \cdot d(\text{art}_{t-8}) + 0.0151 \cdot d(\text{S\&P}_{t-1}) + 0.0144 \cdot d(\text{S\&P}_{t-2}) + \text{dummy} + u_t.$$

To simplify the writing, we use "art" to symbolize *Global Index of the Art Market* and "S&P" for *S&P 500 index*. In above equation, d is the operator of differencing and u_t is the residual variable. The "dummy" stands for the dummy exogenous variables, selected by detecting the outliers in residual variable [more exactly, $d(\text{art}_{2008q1})$, $d(\text{art}_{2010q1})$, $d(\text{art}_{2011q1})$].

The SVEC model fit well the data: $R^2 = 0.8186$ and the residual variable does not contain a linear, non-linear, or chaos structural patterns. According to the BDS (Brock, et al. 1996), the residuals of SVEC model are *i.i.d.* (independent and identically distributed): the probabilities associated with null hypothesis (the errors are *i.i.d.*) are greater than 5%, whatever is the embedding dimension for 2 to 6 ($2 \leq m \leq 6$). For that matter, the minimum of those probabilities is 64.86%, suitable to the correlation dimension equal to 6 ($m = 6$).

Table 3. BDS independence test for residuals in SVAR model.

Dimension	BDS Statistic	Std. Error	z-Statistic	Normal Prob.	Bootstrap Prob.
2	0.000577	0.008712	0.066188	0.9472	0.8360
3	-0.007174	0.013939	-0.514700	0.6068	0.7982
4	-0.001781	0.016708	-0.106622	0.9151	0.8910
5	0.001321	0.017530	0.075329	0.9400	0.7578
6	0.003761	0.017019	0.220981	0.8251	0.6486

Source: Estimates in EViews 10, based on the SVEC model.

For the SVEC model, the cointegration coefficient, $\beta = -0.0403$, is negative and significantly different from zero (t-Statistic = -2.729).

The long-run relationship (equilibrium) between the *Global Index of the Art Market* and the *S&P 500 index* arises in the first line of the equation:

$$\text{art} = 0.0616 \text{ S\&P.}$$

Written with the signification of the symbols, the long-run relationship is as follows:

$$\text{Global Index of the Art Market} = 0.0616 (\text{S\&P 500 index})$$

The SVEC model outcomes show that, in the long term, there is a positive and significant relationship between the *Global Index of the Art Market* and the *S&P 500 index*, and that confirms the conclusions of the nonlinear (exponential-quadratic) econometric model with structural breaks. The coefficient of connection between the *Global Index of the Art Market* and the *S&P 500 index* (i.e. 0.0616) is close to the β values calculated through the nonlinear model with structural breaks (0.026 for the period between 1998q1 and 2007q2, 0.106 for 2007q3 - 2009q4 and 0.114 after 2010, respectively).

Conclusions

We tested the relationships between the *Artprice Global Index of the Art Market* and the *S&P 500 index*. If the Art market would be an alternative for the Financial market, then there should be a weak correlation between art market dynamics and the evolution of traditional asset classes. By applying the Toda-Yamamoto version of Granger causality test, we find that *S&P 500 index* may be a cause for *Global Index of the Art Market*, but, the inverse causality relationship can be rejected: *Global Index of the Art Market* does not Granger cause *S&P 500*. These causality relationships are verified both for the whole analysed period (1998-2018q1) and in times of financial crisis (2007-20010).

Using a non-linear (exponential-quadratic) econometric model with structural breaks, we find that, for all periods (before the crisis, in the time of crisis, and after the crisis) the link between the dynamics of the *Global Index of the Art Market* and the evolution of the *S&P 500 index* is significant and positive. The positive value of correlation means that the *Global Index of the Art Market* and the *S&P500 index* move, as a trend, in the same way, which shows that the art market has not been widely used as an alternative to the capital market, not even during the crisis.

We built, also, a Structural Vector Error Correction (SVEC) model for the purpose of analysis the long-run relationship between the *Global Index of the Art Market* and the *S&P 500 index*. The SVEC model outcomes show that, in the long-run, there is a positive relationship between the *Global Index of the Art Market* and the *S&P 500 index*, and these results confirm the conclusions of the econometric nonlinear (exponential-quadratic) model with structural breaks.

Bibliography

- [1] Artprice. 2018. The Art Market in 2017. Annual Report, Artprice.com. Accessed May 6, 2018. <https://www.artprice.com/artprice-reports/the-art-market-in-2017>.
- [2] Artprice. 2018. "The Contemporary Art Market Report 2017." Saint-Romain-au-Mont-d'Or, France. Accessed February 16, 2018. <https://www.artprice.com/artprice-reports/the-contemporary-art-market-report-2017/renewed-growth>.
- [3] Brock, William, Davis Dechert, Jose Sheinkman, and Blake LeBaron. 1996. "A Test for Independence Based on the Correlation Dimension." *Econometric Reviews* 15 (3): 197-235.
- [4] Campbell, Rachel A.J. 2005. Art as an Alternative Asset Class. LIFE Research Paper No. WP05-001, Maastricht: Maastricht University. <http://ssrn.com/abstract=675643>.
- [5] Candela, Guido, and Antonello Eugenio Scorcu. 1997. "A Price Index for Art Market Auctions. An application to the Italian Market of Modern and Contemporary Oil Paintings." *Journal of Cultural Economics* 21: 175-196.
- [6] Codignola, Federica. 2015. "The Globalization of the Art Market: A Cross-Cultural Perspective where Local Features meet Global Circuits." Chap. 5 in *Analyzing the Cultural Diversity of Consumers in the Global Marketplace*, by Juan Miguel Alcántara-Pilar, Salvador del Barrio-García, Esmeralda Crespo-Almendros and Lucia Porcu, 82-100. Hershey, PA: IGI Global.
- [7] David, Géraldine, Kim Oosterlinck, and Ariane Szafarz. 2013. "Art market inefficiency." *Economics Letters* 121 (1): 23-25.
- [8] Ghinsburgh, Victor A. 2001. *The Economics of Art and Culture*. Amsterdam: Elsevier.
- [9] Gilles, Dave. 2011. Testing for Granger Causality. 29 April. Accessed May 6, 2018. <http://davegilles.blogspot.com/2011/04/testing-for-granger-causality.html>.
- [10] Goetzmann, William N, Luc Renneboog, and Christophe Spaenjers. 2010. "Art and Money." NBER Working Paper No. 15502.

- [11] Harris, Jonathan. 2013. "Introduction: The ABC of Globalization and Contemporary Art." *Third Text* 27 (4): 439-441. doi:<https://doi.org/10.1080/09528822.2013.816585>.
- [12] Hutter, Michael, and David Throsby. 2008. *Beyond Price. Value in Culture, Economics and the Arts*. Cambridge: Cambridge University Press.
- [13] Jula, Dorin, and Nicolae Marius Jula. 2013. "Economic Growth and Structural Changes in Regional Employment." *Romanian Journal of Economic Forecasting (Institute for Economic Forecasting)* 16 (2): 52-69.
- [14] Jula, Dorin, and Nicolae-Marius Jula. 2018. *Econometrie*. Bucharest: Mustang.
- [15] Kräussl, Roman, Thorsteh Lehnert, and Nicolas Martelin. 2017, June. 15th. "The True Value of Art." True Value of Art Conference. Luxembourg: University of Luxembourg.
- [16] Lee, Junsoo, and Mark C Strazicich. 2003. "Minimum Lagrange Multiple Unit Root Test With Two Structural Breaks." *Review of Economics and Statistics (MIT Press)* 85 (4): 1082-1089.
- [17] Mamarbachi, Raya, Marc Day, and Giampiero Favato. 2008. "Art as an Alternative Investment Asset." 26 March. Accessed May 6, 2018. Available at SSRN: <https://ssrn.com/abstract=1112630> or <http://dx.doi.org/10.2139/ssrn.1112630>.
- [18] Mei, Jianping, and Michael Moses. 2002. "Art as an Investment and the Underperformance of Masterpieces." NYU Finance Working Paper No. 01-012. 31 May. Accessed May 6, 2018. Available at SSRN: <https://ssrn.com/abstract=311701> or <http://dx.doi.org/10.2139/ssrn.311701>.
- [19] Picinati di Torcello, Adriano, and Cyrielle Gauvin. 2017. *Art as an Asset*. Riga Graduate School of Law. Riga (Latvia): Riga Graduate School of Law, 24 July. Accessed March 15, 2018. <http://www.artlaw.online/en/read-it/articles/art-as-an-asset>.
- [20] Pownall, Rachel A.J. 2007. "Art as a Financial Investment." 5 April. Accessed May 6, 2018. Available at SSRN <https://ssrn.com/abstract=978467> or <http://dx.doi.org/10.2139/ssrn.978467>.
- [21] S&P Global. 2017. "S&P Down Jones Indices." *Index Mathematics. Methodology*. S&P Global. November. Accessed February 17, 2018. <https://www.spindices.com/documents/methodologies/methodology-index-math.pdf>.
- [22] The Wall Street Journal. 2018. Market Data Center. Accessed February 18, 2018. http://www.wsj.com/mdc/public/page/2_3022-djiahourly.html?mod=mdc_uss_pglnk.
- [23] Toda, Hiro Y, and Taku Yamamoto. 1995. "Statistical inference in vector autoregressions with possibly integrated processes." *Journal of Econometrics* 66 (1-2): 225-250.
- [24] Velthuis, Olav. 2013. "Globalization of Market for Contemporary Art." *European Societies* 15 (2): 290-308. Accessed May 6, 2018. doi:<https://doi.org/10.1080/14616696.2013.767929>.
- [25] Yahoo Finance. 2018. S&P 500. Accessed June 9, 2018. <https://finance.yahoo.com/quote/%5EGSPC?p=%5EGSPC>.
- [26] Zarobell, John. 2015. "Three Perspectives on the Globalization of the Art Market." *San Francisco Art Quarterly (SFAQ)*, 19 March. Accessed May 6, 2018. <http://sfaq.us/2015/03/three-perspectives-on-the-globalization-of-the-art-market/>.

REFLECTION OF THE CONCEPT OF SUSTAINABILITY IN TERMS OF ACCOUNTING

Andrei – Mihai Cristea, PhD candidate

University "1 December 1918" Alba Iulia,
Hyperion University of Bucharest

Abstract: *Accounting for achieving sustainability (which also includes managerial accounting of the environment) is promoted by the followers of the theory of effective protection of the environment, for which sustainability means maintaining a balance between the activity Economic and ecological system, a fair distribution of resources and opportunities, not only between current generations, but also between present and future generations, as well as an efficient allocation of resources in time to take into account limitations of natural resources¹. The development of a managerial accounting that incorporates the concept of sustainability is not an easy approach, as it requires the determination of constraints on economic activities, as well as the subordination of economic criteria traditional criteria based on social and ecological values².*

Key words: sustainability, sustainable development, environmental managerial accounting, environmental management system, accounting of sustainability

JEL classification: M41, Q01, Q56

1. Introduction

The two notions of sustainability and sustainable development received a number of definitions from experts, organisations and groups involved in the implementation of governmental concepts or departments and agencies. Thus, according to experts, sustainable development is a journey and not a destination¹, development without destroying² or increasing in harmony with the environment, preserving the resource base for economic well-being and planning for the future of children³.

According to specialized organisations, sustainable development requires a healthy environment, economic prosperity and social¹ fairness, and is the accumulation of continuous economic and social development that does not affect the environment and natural² resources, Improving the quality of life in terms of limiting the existing capacity of eco-systems³.

At governmental level, sustainable development is the implementation of a process that integrates the decisions of environmental, economic and social¹ considerations or the existence on the basis of the income offered by nature, not the erosion of natural capital, consumption of renewable resources within the limit of their ability to regenerate².

The need for a sustainable development has been shaped as a target policy both in the world economy and for nations and Companies (UNCED 1987).

Sustainability (sustainability) refers to the use of natural resources within the limit of their regenerative¹ power, and the qualitative (sustainable) growth refers to the sustainable growth of the welfare of the population and society as a whole, increasing by decreasing or maintaining constant use of natural resources at the same time as the constant decline or maintenance of pollution.

Sustainable development is the development that satisfies the needs of the present generation without compromising the ability of future generations to meet their needs². The definition of sustainable development contains two key notions: the concept of need or necessity and the notion of limitations imposed by the level of technology and the ability of the environment to meet the present and future needs.

2. Systemic approach to sustainable development

Sustainable society is that society that is structured and behaves in such a way that it exists for an infinite number of generations¹. From the perspective of Karr² ' a sustainable society is regarded as a system characterized by stability, the achievement of an inherent potential, capacity of self-regeneration and a minimum need for external support. Thus, both production and consumption must be sustainable.

Figure 1 presents a systemic perspective of sustainable development, which is at the intersection of social, economic and environmental components.

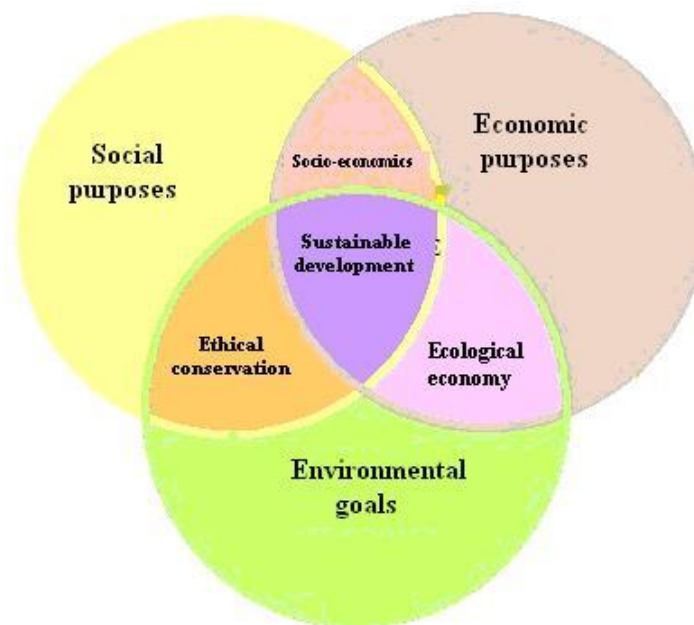


Figure 1. A systemic approach to sustainable development

Source: Sadler¹ (1988)

In the context of sustainable development, the ecological economy strategy must follow several main directions:

1. Resizing economic growth, taking into account a more balanced distribution of resources and the emphasis on qualitative quality of production;
2. Eliminating poverty in terms of satisfying essential needs for jobs, food, energy, water, housing and health;

¹ Sadler, B., *Natural Capital and Borrowed Time: The Global Context of Sustainable Development*, Victoria, B.C., Canada, Institute of the North American west

3. Preserving and enhancing natural resources, maintaining the diversity of ecosystems, overseeing the environmental impact of the economy.
4. The reorientation of the technologies and the control of their risks.
5. Ensuring the quality of economic growth;
6. Decentralisation of forms of governance, increasing participation in decision-making and linking environmental and economy decisions.

Sustainable development strategies must be permanently altered in order to adapt to continuous changes arising from the increase in understanding of the link between natural activities and ecosystems, must contain three main components : identifying priority issues, defining actions to remedy or mitigate the identified problems and ensuring effective implementation and defining the strategic objectives to be made in accordance with the political interests, economic and social.

Sustainable development implies both economic development and integration of environmental protection in national strategies, and it is necessary to define each government's own strategy on ways to ensure sustainable development. This is possible through the development of an effective legislative system, by integrating environmental protection at national policy level, by establishing integrated national accounting systems to take account of the ecological component as well.

3. Accounting for sustainability

Outlining the concepts of sustainability and sustainable development has naturally raised the question of whether businesses can provide a basis for promoting the principles related to them, the answers focusing primarily on eco-efficiency analysis.

The sustainable approach brings a new vision on the elaboration of decisions, which must integrate three dimensions: environment, society and the time horizon.(Fig. 1.3.)

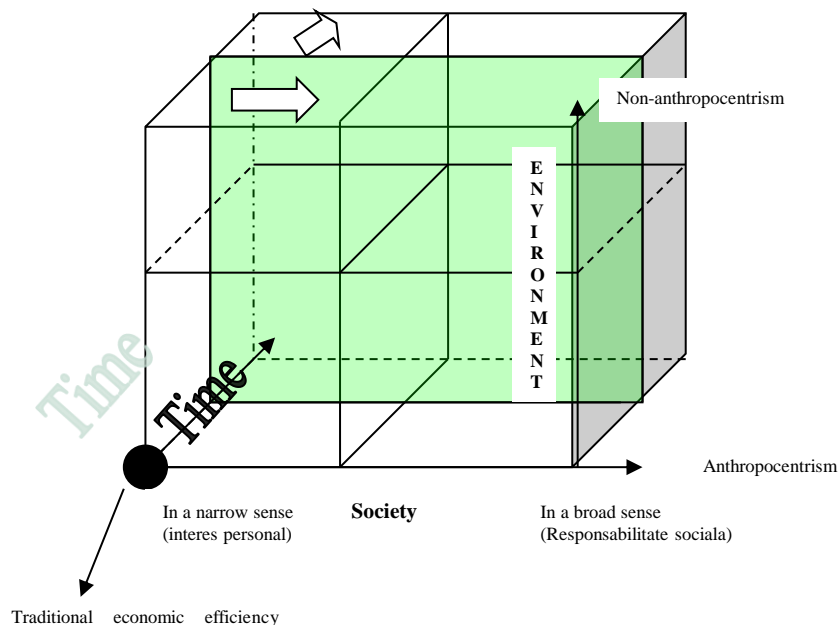


Figure 2. Socio-ecological dimensions of decision making

Source: Milne², 1996

² Milne, M., On sustainability; the environment and management accounting, Management Accounting Research, 1996, No 7, pag. 140

The traditional approach to drafting decisions focuses on short-term decisions in relation to the social area (shorter than a generation) and reported to a limited number of individuals. Sustainable development requires a long-term approach aimed at future generations, and individual values extend to the broad social approach (community, social groups), which generates social responsibility, just as the environment no longer needs Only viewed from the perspective of immediate usefulness but by its intrinsic value.

According to these dimensions, four main approaches (typologies) of environmental decisions have been developed: exploitation (environmental elements are not taken into account), conservation (taking into account environmental externalities), effective protection (naturalistic preservation) and extensive conservation.

The first and last of these approaches are at opposite poles: the exploitation approach completely ignores the environmental problems in relation to economic activity, while the extensive conservation-type approach rejects the idea that decisions about the environment should only be taken on the basis of individuals' preferences, with rules of decision to protect the intrinsic value of nature³.

Although totally opposite, both approaches are reflected in identical accounting treatments, i.e. not taking into account environmental elements in calculating costs. The extensive conservation approach does not allow the accounting of environmental elements, which would lead to their^{3,4} trivialization, and the exploitation approach focuses only on maximizing the usefulness of activities.

The "conservation" approach uses accounting tools from a prospective perspective, such as environmental impact analysis and extensive cost-benefit analysis, which use environmental information as externalities, without integrating them into accounting.

Analyzing accounting literature on how sustainability can be reflected with the help of accounting, you can identify four completely different directions or camps³.

So:

- The accounts must be separate from nature, ecology and sustainability because it could only provide a contamination of the precious life(Maunders and Burritt, 1991; Cooper, 1992);
- Reflecting sustainability in accounting must be done by means of environmental quotas and provisions(Canadian Institute of Authorized Accountants,1993; Federation of European Accountants' Experts, 1993) ;
- The integration of sustainability must be done using environmental management and environmental accounting;
- Accounting and accountancy professionals must support the purpose of sustainability, but the practical way of achieving this is problematic, with new tools, methods and techniques, specially constructed to achieve this thing.

A first approach to the latter attitude was the emergence of the term of sustainable cost calculation, which encompasses the economic, social and environmental aspects of sustainable development. Also, it was proposed to divide the capital into various components with different functionalities: critical natural capital (ozone layer), Renewable natural capital (air, water, soil), and generated capital (machinery, technology and know-how)³. Thus, the main aspects of sustainability – the environment, social and economic components could be allocated to specific categories of capital. The development of the concept of sustainable cost calculation led to the development of a parallel accounting system that was intended to quantify in monetary terms and for a given period, the costs incurred by an organisation to bring the natural environment to the stage At the beginning of the accounting period. Such a system, however, cannot reflect the full spectrum of sustainability, but only an estimate of the variation of the environmental component of sustainability, and the reactions of

organizations towards such a system were reserved and pessimistic, mainly due to additional costs to be generated.

The first attempt to implement a sustainable cost calculation system took place in the year 1996, within a company in New Zealand, and the results were disseminated within the company's first sustainability report, published in the year 2000. This first attempt at the accounting of sustainability was considered by its authors a failure, primarily because of the results obtained which actually accounted for the measure of non-sustainability (in the absence of quantifiable benchmarks of Sustainability). The attempts of the accounting professionals to develop support tools for the development of decisions led to new methods such as the method of accounting of the costs generated by the material flows, the method of life cycle analysis, or Multi-criteria elaboration techniques, which join the expansion of classical methods such as cost-benefit analysis, or the total cost accounting method.

An analysis of how society looks at sustainable development compared to companies, shows that the multitude of activities considered sustainable by society is much lower than the multitude of activities considered sustainable by Companies, the latter must move towards a reorientation of global business strategies for the purpose of granting greater importance to environmental and social areas. This begins to be done in particular in the major corporations of the world, which are increasingly more visible to the social and environmental policies practiced and the results of their implementation.

4. Conclusions

The effective ways that can contribute to the implementation of the environmental aspects of sustainable development are: environmental management accounting, environmental impact studies and environmental management systems, regulated by the standards International in the field. Recent approaches in the area of quantification and assessment of sustainability have generated multi-dimensional models, which try to explain the links between decision-making processes and political dynamics specific to different contexts Social. Multidimensional models appear to be widely accepted with regard to the accounting approach of sustainability due to the complexity of the notion both in terms of scientific uncertainty and due to ideological diversity.³

Accounting for achieving sustainability (which also includes managerial accounting of the environment) is promoted by the followers of the theory of effective protection of the environment, for which sustainability means maintaining a balance between the activity Economic and ecological system, a fair distribution of resources and opportunities, not only between current generations, but also between present and future generations, as well as an efficient allocation of resources in time to take into account limitations of natural resources⁴.

The development of a managerial accounting that incorporates the concept of sustainability is not an easy approach, as it requires the determination of constraints on economic activities, as well as the subordination of economic criteria Traditional criteria based on social and ecological values⁵.

³ Bebbington J., Brown J, Frame B., Accounting technologies and sustainability assessment models, *Ecological Economics* 61 (2007), 224-236

⁴Daly, H.E., Allocation, distribution and scale: towards an economics that is efficient, just, and sustainable, *Ecological Economics*, 6, 1992, pag. 185-194

⁵ Milne, M., On sustainability; the environment and management accounting, *Management Accounting Research*, 1996, No 7, pag. 135-161

5. Bibliography

- [1] Bebbington J, Graz R., An account of sustainability: failure, success and a reconceptualization, *Critical Perspectives on Accounting* (2001), 557-587, pag. 5
- [2] Cooper, C., The non and nom of accounting for (M)other nature, *Accounting, Auditing and Accountability Journal*, No. 5,1992, pag. 16-39
- [3] Daly, H.E., Allocation, distribution and scale: towards an economics that is efficient, just, and sustainable, *Ecological Economics*, 6, 1992, pag. 185-194
- [4] Gray, R., *Accounting for the environment*, Sage Publications, London, 2001
- [5] Hines, R., On valuing nature, *Accounting, Auditing and Accountability Journal*, 4(3),1991, pag. 27-29
- [6] Karr, J, *Protecting Ecological Integrity: an urgent societal goal*, *Yale Journal Int.* 297, 1993, pag. 299
- [7] Meadows, D., Meadows, D., Randers, J, *Beyond the limits to grow*, in *Dancing Toward the future*, summer 1992
- [8] Milne, M., On sustainability; the environment and management accounting, *Management Accounting Research*, 1996, No 7, pag. 135-161
- [9] Norton, B.G., Intergenerational equity and environmental decisions: A model using Rawls' veil of ignorance, *Ecological Economics*, No.1, 1989, pag. 147
- [10] Sadler, B., *Natural Capital and Borrowed Time: The Global Context of Sustainable Development*, Victoria, B.C., Canada, Institute of the North American west
- [11] *** United Nations World Conference Environment and development,(UNCED), 1987, pag. 8

COMPETITION AND ECONOMIC GROWTH. AN ECONOMETRIC ANALYSIS

Cristiana MATEI, PhD Student

School of Advanced Studies of the Romanian Academy (SCOSAAR) - Economic, Social and Legal Sciences Department, Bucharest, Romania

Abstract: *This paper is not about reviewing the theoretical approach (from Smith, Schumpeter and others) regarding the relationship between competition and economic growth. Its purpose is just to test the existence of a relationship between the dynamics of gross domestic product and the intensity of competition, on a worldwide sample, made of 142 countries, between 2007 and 2017. We have proved the existence of a positive and significant impact between the intensity of competition and the dynamics of gross domestic product.*

Keywords: Competition, Gross Domestic Product, Dynamic Panel Data

JEL Classification: D4, F63, C33

Introduction

Competition is considered an essential element of the efficiency of the goods market and is assessed on a scale from 1 to 7 (the highest rank). When including competition among the essential factors of competition, World Economic Forum (2017) considers the following:

"Healthy market competition, both domestic and foreign, is important in driving market efficiency, and thus business productivity, by ensuring that the most efficient firms, producing goods demanded by the market, are those that thrive" World Economic Forum 2017. *Global Competitiveness Report 2017–2018 (GCI)*. Appendix A: Methodology and Computation of the GCI 2017–2018, p. 318, accessed on May 6, 2018, available at <http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf>.

We analyse the relationship between the dynamics of gross domestic product and the intensity of competition, by using data generated by "World Economic Forum" in the context of calculation regarding the "Global Competitiveness Index".

1. Data and methodology

1.1. Gross Domestic Product

The dynamics of gross domestic product is calculated, for each country, as a changes in volume compared to the average value for 2010 (considered to be 100%). The data is retrieved in Annex 2.

All unit root tests applied to GDP series which, as null hypothesis, assume that individual unit root process, *reject* non-stationarity in the model with individual effects and individual linear trends as exogenous variables. The common unit root is rejected by the Levin, Lin, Chu test and is not rejected by Breitung's t -ratio type test statistic. We accept the hypothesis according to which series are generated by stationary innovations around deterministic trends.

1.2. Competition

In order to assess the intensity (level) of competition, we use the data generated by "World Economic Forum" in the context of calculation regarding "Global Competitiveness Index" (data accessed in May 6, 2018, available at <http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/>).

In World Economic Forum valuations, the *competition* sub-pillar of competitiveness is computed as the weighted average of two constituents: *domestic competition* and *foreign competition*. The components are as follows (Table 1):

Table 1: Indicators of competition

1. Domestic competition	
01	Intensity of local competition, [1 = not intense at all; 7 = extremely intense]
02	Extent of market dominance [1 = dominated by a few business groups; 7 = spread among many firms]
03	Effectiveness of anti-monopoly policy [1 = not effective at all; 7 = extremely effective]
04	Effect of taxation on incentives to invest [1 = to a great extent; 7 = not at all]
05	Total tax rate [profit tax (% of profits), labour tax and contribution (% of profits), and other taxes (% of profits)]
06	Number of procedures required to start a business [number]
07	Time required to start a business [number of days]
08	Agricultural policy costs [1 = excessively burdensome for the economy; 7 = balances well the interests of taxpayers, consumers, and producers]
2. Foreign competition	
09	Prevalence of trade barriers [1 = strongly limit; 7 = do not limit at all]
10	Trade tariffs [average tariff rate, %]
11	Prevalence of foreign ownership [1 = extremely rare; 7 = extremely prevalent]
12	Business impact of rules on FDI [1 = extremely restrictive; 7 = not restrictive at all]
13	Burden of customs procedures [1 = extremely inefficient; 7 = extremely efficient]
14	Imports as a percentage of GDP [%]
Source: World Economic Forum 2017. "The Global Competitiveness Report 2017–2018". <i>Appendix A: Methodology and Computation of the Global Competitiveness Index 2017–2018</i> , p.324 and <i>Appendix D: Technical Notes and Sources</i> , pp. 346-347. Available at http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf	

According to the estimates, the highest level of competition is reached in Singapore, with 6.1 points out of maximum 7. The first European country in this ranking is The Netherlands (ranked the 4th, with 5.7 points), followed by Luxembourg and Ireland.

Romania is ranked the 70th (out of 137 countries) with 4.1 points, with a difference of 25.85% compared to the best performing economy (Singapore).

An excerpt from "The Global Competitiveness Index" World Economic Forum, 2017. *The Global Competitiveness Report 2017–2018* is shown in Table 2.

Table 2. Intensity of Competition

Country	Score 1:7	Dist. from best	Country	Score 1:7	Dist. from best
1 Singapore	6.1	0.00%	...		
2 Hong Kong SAR	5.9	2.05%	57 Hungary	4.6	23.71%
3 United Arab Emirates	5.8	4.97%	...		
4 Netherlands	5.7	5.34%	60 Bulgaria	4.6	24.13%
5 Luxembourg	5.7	6.38%	...		
6 Ireland	5.6	7.79%	63 China	4.5	24.85%
7 New Zealand	5.5	8.93%	64 Albania	4.5	24.85%
8 Switzerland	5.5	9.90%	...		
9 United States	5.4	10.04%	69 Zambia	4.5	25.85%
10 United Kingdom	5.4	10.88%	70 Romania	4.5	25.85%
...			71 Senegal	4.5	25.88%
13 Germany	5.3	12.66%	...		
14 Denmark	5.3	12.86%	81 Italy	4.4	27.47%
15 Belgium	5.3	13.13%	...		
...			88 Croatia	4.3	28.32%
25 Japan	5.1	16.16%	...		
26 Czech Republic	5.0	17.09%	93 Moldova	4.3	28.71%
...			94 Nigeria	4.3	28.94%
33 Austria	4.9	18.68%	95 Russian Federation	4.3	28.95%
...			...		
40 Portugal	4.8	20.04%	98 Serbia	4.3	29.19%
41 Slovak Republic	4.8	20.73%	...		
...			106 Greece	4.2	31.26%
47 Poland	4.7	22.07%	...		
48 France	4.7	22.20%	134 Argentina	3.3	45.61%
...			135 Haiti	3.3	46.23%
55 Spain	4.7	23.17%	136 Chad	3.2	47.22%
			137 Venezuela	2.6	56.38%

Source: Data extracted from World Economic Forum, 2017. *The Global Competitiveness Report 2017–2018*. Available at http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_GCI.B.06.01.pdf (accessed May 6, 2018).

Romania's position compared to the main indicators on the basis of which the competitive performances of economies are estimated is presented in Table 3 and shown graphically in Figures 1 and 2.

Its European Union membership has provided a good position for Romania in the international ranking regarding *External competition* (5 points out of 7, ranked 37 out of 137 countries). This position is mainly determined by the "Commercial fees" (6.7 points out of 7, ranked 6 out of 137 countries), "The impact of the FDI rules on business" (5.3 points out of 7, ranked 25/137).

As for *Internal competition*, Romania is positioned in the second half of the international ranking (4.3 points out of 7, ranked 89/137). The lowest score is awarded for "Effect of taxation on incentives to invest". For this criterion, the score = 1 shows that taxation discourages investment, whereas 7 shows that taxation encourages investment.

Romania gets 2.9 points out of 7 and is ranked 121 out of 137 countries. Low scores are also awarded for: "Effectiveness of anti-monopoly policy" (3.4 points/7, ranked 95/137), "Intensity of local competition" (4.9 points/7, ranked 86/137) and "Extent of market dominance" (ranked 76/137, 3.6 points/7; 1 means that the market is dominated by a small number of powerful companies, whereas 7 shows the existence of a large number of companies disputing a relatively small share of the market).

Table 3. Romania's position in international ranking regarding competition (2017-2018)

Competition Index	Romania		Best performance:	
	Score	Rank	Country	Dist. from best
Competition	4.5	70	Singapore (6.1)	25.85%
1. Domestic competition	4.3	89	Singapore (5.8)	25.71%
01 Intensity of local competition, [1 = not intense at all; 7 = extremely intense]	4.9	86	Japan (6.2)	21.74
02 Extent of market dominance [1 = dominated by a few business groups; 7 = spread among many firms]	3.6	76	Switzerland (5.9)	39.32%
03 Effectiveness of anti-monopoly policy [1 = not effective at all; 7 = extremely effective]	3.4	95	Finland (5.7)	40.98%
04 Effect of taxation on incentives to invest [1 = to a great extent; 7 = not at all]	2.9	121	United Arab Emirates (6.1)	53.18%
05 Total tax rate [profit tax (% of profits), labour tax and contribution (% of profits), and other taxes (% of profits)]	38.4%	73	Brunei Darussalam (8.7%)	63.77%
06 Number of procedures required to start a business [number]	6 proc.	53	New Zealand (1)	70.00%
07 Time required to start a business [number of days]	12 days	74	New Zealand (1/2)	94.78%
08 Agricultural policy costs [1 = excessively burdensome for the economy; 7 = balances well the interests of taxpayers, consumers, and producers]	3.8	65	New Zealand (5.7)	33.54%
2. Foreign competition	5.0	37	Singapore (6.4)	22.63%
01 Prevalence of trade barriers [1 = strongly limit; 7 = do not limit at all]	4.6	42	Singapore (5.9)	21.35%
02 Trade tariffs [average tariff rate, %]	1.11%	6	Hong Kong (0.00%)	3.77%
03 Prevalence of foreign ownership [1 = extremely rare; 7 = extremely prevalent]	4.2	93	United Kingdom (6.1)	31.27%
04 Business impact of rules on FDI [1 = extremely restrictive; 7 = not restrictive at all]	5.3	25	Singapore (6.1)	13.92%
06 Burden of customs procedures [1 = extremely inefficient; 7 = extremely efficient]	4.2	68	Singapore (6.3)	33.90%
06 Imports as a percentage of GDP [%]	45.9%	64	Hong Kong (194%)	76.33%

Source: Data extracted from World Economic Forum, 2017. *The Global Competitiveness Report 2017–2018*. Available at:

✓ Competition: http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_GCI.B.06.01.pdf

- ✓ *Domestic competition*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=GCI.B.06.01.01>
- ✓ *Intensity of local competition*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ099>
- ✓ *Extent of market dominance*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ105>
- ✓ *Effectiveness of anti-monopoly policy*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ104>
- ✓ *Effect of taxation on incentives to invest*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ398>
- ✓ *Total tax rate*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=CORPTAXRATE>
- ✓ *Number of procedures required to start a business*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=STARTBUSPROC>
- ✓ *Time required to start a business*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=STARTBUSDAYS>
- ✓ *Agricultural policy costs*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ046>
- ✓ *Foreign competition*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=GCI.B.06.01.02>
- ✓ *Prevalence of trade barriers*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ096>
- ✓ *Trade tariffs*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=TFDUTY>
- ✓ *Prevalence of foreign ownership*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ094>
- ✓ *Business impact of rules on FDI*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ095>
- ✓ *Burden of customs procedures*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ050>
- ✓ *Imports as a percentage of GDP*: <http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=IMPGDP>

(All the series was accessed on May 2018).

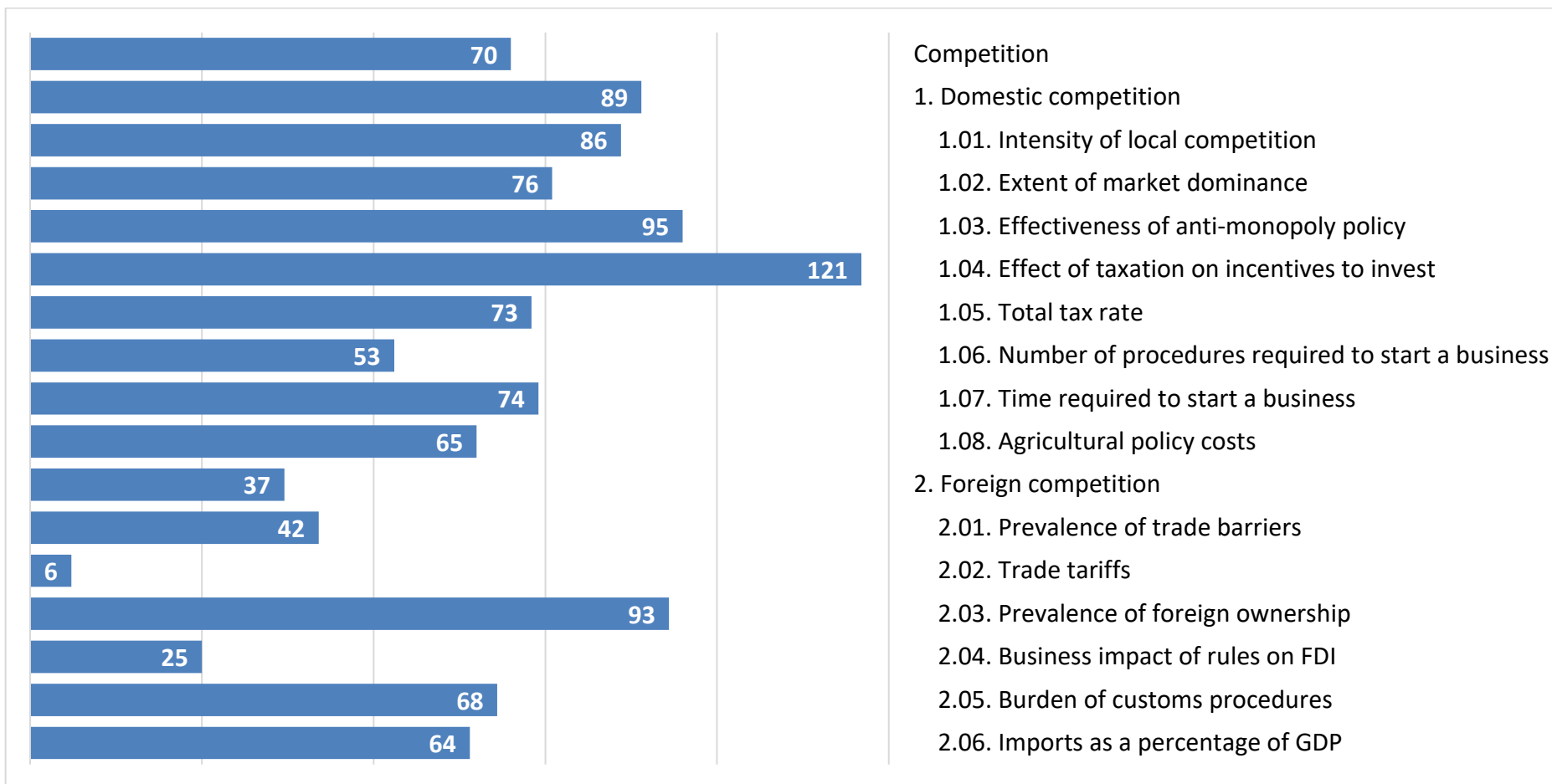


Figure 1. Romania's position in international ranking regarding competition (2017-2018)

Note: Total countries: 137.

Source: Table 3.

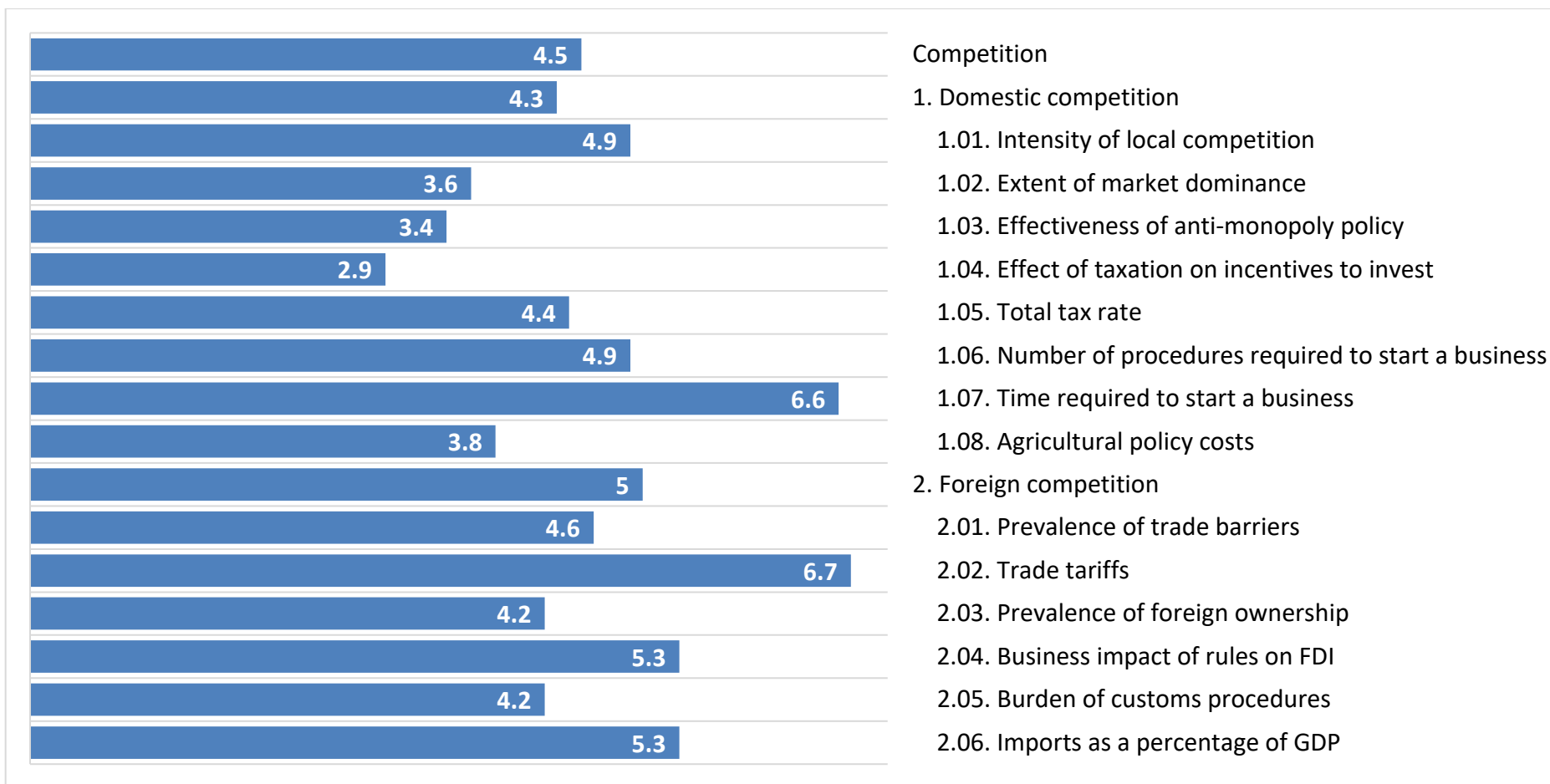


Figure 2. Romania's score in international ranking regarding competition (2017-2018)

Note: Total countries: 137. Score 1 and 7 still correspond to the worst and best possible outcomes.

Source: Table 3.

In order to use time series in econometric analysis, we shall test the nature of the Data Generating Process (DGP), i.e. "the joint probability distribution that is supposed to characterize the entire population from which the data set has been drawn" (Cížek, Härdle and Weron 2005). For this purpose, we apply unit roots panel tests for the data series that estimate the intensity of competition processes in national economies.

As per the data in Annex 2.2., for the model with individual effects, individual linear trends as exogenous variables, two out of three unit roots tests on individual series *reject* the hypothesis of non-stationarity. The common unit root is rejected by the Levin, Lin, Chu test and is not rejected by Breitung's t -ratio type test statistic. We accept the hypothesis according to which series are generated by stationary innovations around deterministic trends.

The series is normally distributed around a mean of 4.42 points (the probability of the null hypothesis in the Jarque-Bera test is 0.06, higher than the standard threshold of 0.05). The distribution normality test is shown in the Figure 3.

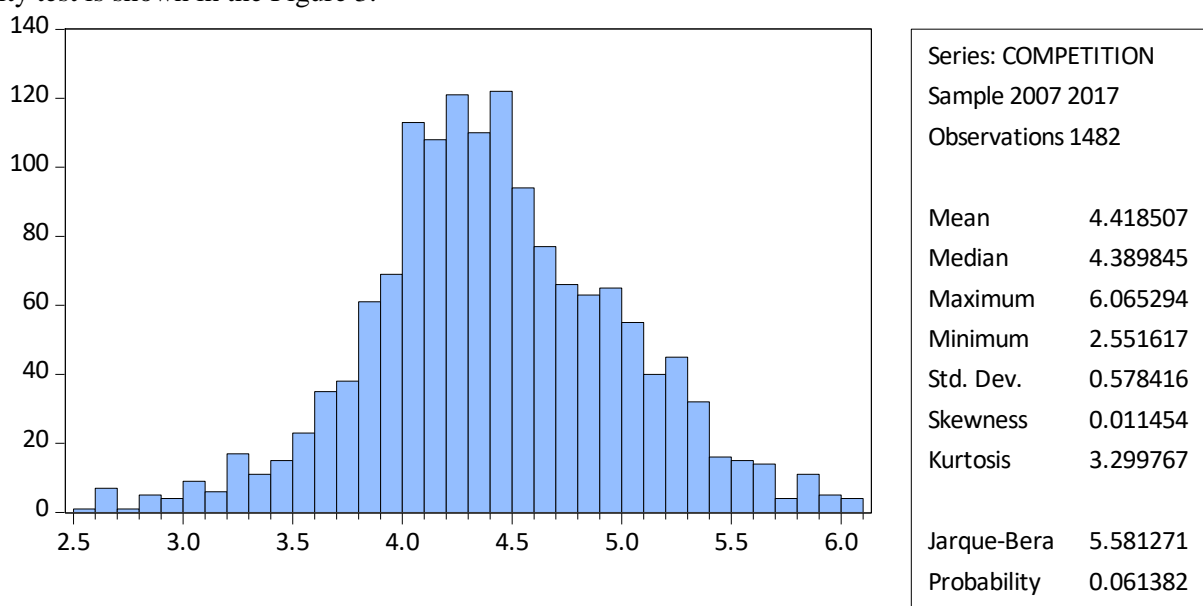


Figure 3. Jarque-Bera test for normality with the distribution of error components in panel data models (2007-2017, 130 countries) for the "competition" series.

Source: Data extracted from World Economic Forum, 2017. *The Global Competitiveness Report 2017–2018*. Available at: http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_GCI.B.06.01.pdf

2. Modelling the relationship between competition and gross domestic product. Panel data analysis

In order to analyse the relationship between the gross domestic product and the intensity of competition we have used dynamic panel data model (Arellano and Bond 1991), specified as follows:

$$PIB_{it} = \alpha_0 + \sum_{j=1}^p \alpha_j \cdot PIB_{i,t-j} + \sum_{k=0}^q \beta_k \cdot CONC_{i,t-k} + \gamma_i + \delta_t + e_{it}.$$

The meaning of the symbols is the following:

- i – index of sample countries (140 countries);
- t – indexes time ($t = 2007, 2008, \dots, 2017$)
- PIB_{it} – gross domestic product of the country i , in year t ;
- $CONC_{it}$ – an index of competition level of the country i , in year t ;
- p – number of lags from autoregressive description;
- q – number of lags from distributed lag description;

α_0	–	constant term from the regression equation;
α_j	–	autocorrelation coefficients of gross domestic product (p is the number of lags);
β	–	coefficient of impact:
$\beta > 0$	–	suggests a direct relationship (a positive impact) between the level of competition and the dynamics of gross domestic product,
$\beta < 0$	–	suggests a negative impact of the level of competition on the dynamics of gross domestic product,
$\beta = 0$	–	suggests the lack of the relationship between the level of competition and the dynamics of gross domestic product,
γ_i	–	individual specific effect (fixed or random), which evaluates the particularities of each country;
δ_t	–	specific effect in time (fixed or random) in time, which evaluates the particularities of each year;
e_{it}	–	idiosyncratic error.

By testing various specifications of the previous relation ($p, q = 1, \dots, 5$), we have selected the following regression equation (dynamic panel, $p = 3, q = 2$):

$$\text{PIB}_{it} = 0.909460 \cdot \text{PIB}_{i,t-1} - 0.198455 \cdot \text{PIB}_{i,t-2} + 0.170355 \cdot \text{PIB}_{i,t-3} + 2.916072 \cdot \text{CONC}_{i,t} + 5.527289 \cdot \text{CONC}_{i,t-1} + 2.900866 \cdot \text{CONC}_{i,t-2} + u_{it},$$

The results (EViews-10) are detailed in Annex 3. All coefficients are significantly different from zero at the threshold of 0.01. The value of the J-statistic test is 40.2999, lower than 50.9985, level corresponding to the 5% quantile from the unilateral distribution χ^2 by 36 degrees of freedom ($42 - 6$, namely the rank of the instruments' matrix *minus* the number of coefficients in the model). Concretely, if we reject the null hypothesis attached to that test (the over-identification restrictions for GMM are valid) the risk of error is 28.58%. At the same time, standard tests for cross-section dependence in panels (Breusch-Pagan χ^2 , Pearson LM and CD Normal, Friedman χ^2 , Frees Q) do not reject the hypothesis of independence: the risk of first order error is by far superior to the critical threshold of 5%.

Conclusion

Consequently, the model which explains the impact of competition on the dynamics of gross domestic product is valid from an econometric perspective. When steady-state is reached, the coefficient of impact is

$$\beta = 2.916072 + 5.527289 + 2.900866 = 11.344227$$

and the previous equation is:

$$\text{PIB} = (0.909460 - 0.198455 + 0.170355) \cdot \text{PIB} + 11.344227 \cdot \text{CONC}$$

$$\text{or } (1 - 0.881360) \cdot \text{PIB} - 11.344227 \cdot \text{CONC} = 0$$

$$\text{PIB} - 95.618856 \cdot \text{CONC} = 0$$

Calculation suggests *a positive relation between* the gross domestic product and intensity of competition worldwide between 2007 and 2017. We do not interpret the dimension of the influence, as variables are calculated in different units of measure: growth percentages compared to 2010 – for the gross domestic product and points on a scale from 1 to 7, for the intensity of competition. Even if the dimension of time series is not very large, the consistency is assured by the cross-section dimension of panel. This allows us to state that *the previous relation demonstrates a positive impact of the level of competition on economic growth.*

References

- Ailenei, Dorel. 1998. *Piața ca spațiu economic*. București: Bren.
- Arellano, Manuel, and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58 (2): 277-297.
- Buneci, Bogdan. 2014. *Concurența. Analiză economică și instituțională*. București: Editura Mustang.
- Cížek, Pavel, Wolfgang Härdle, and Rafa Weron. 2005. "Probability and Data Generating Process (cap. 1.1)." *Statistical Tools for Finance and Insurance*. 3 March. Accessed May 6, 2018. http://sfb649.wiwi.hu-berlin.de/fedc_homepage/xplore/tutorials/xegbohtmlnode5.html.
- Comisia Națională de Strategie și Prognoză. 2018, aprilie. "Proiecției principalelor indicatori macroeconomici, 2017 – 2021." Prognoza de primăvară 2018, București.
- Dinu, Marin, and Cristian Socol. 2006. "De la modelul Solow la creșterea economică endogenă, Reinsertia României în civilizație?" *Revista Informatică Economică* 10(1) (37): 122-127.
- Dobrescu, Emilian. 2002. *Tranziția în România. Abordări econometrice*. București: Editura Economică.
- Furman, Jeffrey L, Michael E Porter, and Scott Stern. 2002. "The determinants of national innovation capacity." *Research Policy* 31: 899-933.
- Grossman, Gene M, and Elhanan Helpman. 1991. "Quality Ladders in the Theory of Growth." *The Review of Economic Studies* 58 (1): 43-61.
- Iordan, Marioara, and Mihaela-Nona Chilian. 2005. "Aspects of Regional Competitiveness In Romania (part II)." *Journal for Economic Forecasting* 64-82.
- Jula, Dorin, and Nicolae Marius Jula. 2013. "Economic Growth and Structural Changes in Regional Employment." *Romanian Journal of Economic Forecasting* (Institute for Economic Forecasting) 16 (2): 52-69.
- Jula, Dorin, and Nicolae-Marius Jula. 2018. *Econometrie*. București: Mustang.
- . 2018. *Economie*. Ediția a 2-a. București: Editura Mustang.
- Jula, Dorin, and Nicolae-Marius Jula. 2017. "Foreign Direct Investments and Employment. Structural Analysis." *Romanian Journal of Economic Forecasting* XX (2): 30-45.
- Jula, Dorin, Dorel Ailenei, Nicoleta Jula, and Ananie Gârbovean. 1999. *Economia dezvoltării. Teoria dezvoltării - Probleme naționale - Dimensiuni regionale*. București: Editura Viitorul Românesc.
- Krugman, Paul Robin, Maurice Obstfeld, and Marc Melitz. 2014. *International Economics: Theory and Policy*. 10th Edition. New-York: Pearson Education.
- Kurtishi-Kastrati, Selma. 2013. "Impact of FDI on Economic Growth: An Overview of the Main Theories of FDI and Empirical Research." *European Scientific Journal* 9 (7): 56-77.
- Lin, Li, Piyaporn Sodsriwiboon, Vahram Stepanyan, and Razafimahefa Ivohasina. 2016. *Romania. IMF Country Report*. Country Report, Washington, D.C.: International Monetary Fund. <https://www.imf.org/external/pubs/ft/scr/2016/cr16114.pdf>.
- Mankiw, Gregory N, David Romer, and David N Weil. 1992. "A Contribution to the Empirics of Economic Growth." *The Quarterly Journal of Economics* 407-437.
- Ndesaulwa, Audrey Paul, and Jaraji Kikula. 2016. "The Impact of Technology and Innovation (Technovation) in Developing Countries: A Review of Empirical Evidence." *Journal of Business and Management Sciences* 4 (1): 7-11.

Paschalis, Arvanitidis, Petrakos George, and Pavleas Sotiris. 2007. *Determinants of economic growth: the experts' view*. Discussion Paper Series, 13(10), University of Thessaly, 245-276.

https://www.researchgate.net/publication/23528914_Determinants_of_economic_growth_the_experts'_view.

Piketty, Thomas. 2015. *Capitalul în secolul XXI*. București: Editura Litera.

Porter, Michael. 2008. *Despre concurență*. București: Editura Meteor Business.

Smith, Adam. 2011. *Avuția națiunilor*. București: Editura Publica.

Vlad, Ionel Valentin (coordonator). 2015. *Strategia de dezvoltare a României în următorii 20 de ani*. Vol. I. București: Editura Academiei.

World Economic Forum. 2017. "Global Competitiveness Report 2017-2018." The Global Competitiveness Index, Geneva, Switzerland. Accessed iunie 2, 2018.

<http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/>.

Annexes

Annex 1: Countries in panel

<i>Symbol</i>	<i>Country</i>	<i>Symbol</i>	<i>Country</i>	<i>Symbol</i>	<i>Country</i>
AGO	Angola	CPV	Cape Verde	IRL	Ireland
ALB	Albania	CRI	Costa Rica	IRN	Iran, Islamic Rep.
ARE	United Arab Emirates	CYP	Cyprus	ISL	Iceland
ARG	Argentina	CZE	Czech Republic	ISR	Israel
ARM	Armenia	DEU	Germany	ITA	Italy
AUS	Australia	DNK	Denmark	JAM	Jamaica
AUT	Austria	DOM	Dominican Republic	JOR	Jordan
AZE	Azerbaijan	DZA	Algeria	JPN	Japan
BDI	Burundi	ECU	Ecuador	KAZ	Kazakhstan
BEL	Belgium	EGY	Egypt	KEN	Kenya
BEN	Benin	ESP	Spain	KGZ	Kyrgyz Republic
BFA	Burkina Faso	EST	Estonia	KHM	Cambodia
BGD	Bangladesh	ETH	Ethiopia	KOR	Korea, Rep.
BGR	Bulgaria	FIN	Finland	KWT	Kuwait
BHR	Bahrain	FRA	France	LAO	Lao PDR
BIH	Bosnia and Herzegovina	GAB	Gabon	LBN	Lebanon
BOL	Bolivia	GBR	United Kingdom	LBR	Liberia
BRA	Brazil	GEO	Georgia	LBY	Libya
BRB	Barbados	GHA	Ghana	LKA	Sri Lanka
BRN	Brunei Darussalam	GIN	Guinea	LSO	Lesotho
BTN	Bhutan	GIN	Guinea	LTU	Lithuania
BWA	Botswana	GMB	Gambia, The	LUX	Luxembourg
CAN	Canada	GRC	Greece	LVA	Latvia
CHE	Switzerland	GTM	Guatemala	MAR	Morocco
CHL	Chile	HKG	Hong Kong SAR	MDA	Moldova
CHN	China	HND	Honduras	MDG	Madagascar
CIV	Côte d'Ivoire	HRV	Croatia	MEX	Mexico
CMR	Cameroon	HTI	Haiti	MKD	Macedonia, FYR
COL	Colombia	HUN	Hungary	MLI	Mali
		IDN	Indonesia	MLT	Malta
		IND	India	MNE	Montenegro

<i>Symbol</i>	<i>Country</i>	<i>Symbol</i>	<i>Country</i>	<i>Symbol</i>	<i>Country</i>
MNG	Mongolia	PRT	Portugal	TCD	Chad
MOZ	Mozambique	PRY	Paraguay	THA	Thailand
MRT	Mauritania	QAT	Qatar	TJK	Tajikistan
MUS	Mauritius	ROU	Romania	TTO	Trinidad and Tobago
MWI	Malawi	RUS	Russian Federation	TUN	Tunisia
MYS	Malaysia	RWA	Rwanda	TUR	Turkey
NAM	Namibia	SAU	Saudi Arabia	TZA	Tanzania
NGA	Nigeria	SEN	Senegal	UGA	Uganda
NIC	Nicaragua	SGP	Singapore	UKR	Ukraine
NLD	Netherlands	SLE	Sierra Leone	URY	Uruguay
NOR	Norway	SLV	El Salvador	USA	United States
NPL	Nepal	SRB	Serbia	VEN	Venezuela
NZL	New Zealand	SUR	Suriname	VNM	Viet Nam
OMN	Oman	SVK	Slovak Republic	YEM	Yemen
PAK	Pakistan	SVN	Slovenia	ZAF	South Africa
PAN	Panama	SWE	Sweden	ZMB	Zambia
PER	Peru	SWZ	Swaziland	ZWE	Zimbabwe
PHL	Philippines	SYC	Seychelles		
POL	Poland	SYR	Syria		

Annex 2. Panel Unit Roots Tests

2.1. Panel Unit Roots Tests for Gross Domestic Product

Series: Dynamics of Gross Domestic Product(GDP, 2010=100%) – AGO, ALB, ARE, ARG, ARM, AUS, AUT, AZE, BDI, BEL, BEN, BFA, BGD, BGR, BHR, BIH, BOL, BRA, BRB, BRN, BTN, BWA, CAN, CHE, CHL, CHN, CIV, CMR, COL, CPV, CRI, CYP, CZE, DEU, DNK, DOM, DZA, ECU, EGY, ESP, EST, ETH, FIN, FRA, GAB, GBR, GEO, GHA, GIN, GMB, GRC, GTM, HKG, HND, HRV, HTI, HUN, IDN, IND, IRL, IRN, ISL, ISR, ITA, JAM, JOR, JPN, KAZ, KEN, KGZ, KHM, KOR, KWT, LAO, LBN, LBR, LBY, LKA, LSO, LTU, LUX, LVA, MAR, MDA, MDG, MEX, MKD, MLI, MLT, MNE, MNG, MOZ, MRT, MUS, MWI, MYS, NAM, NGA, NIC, NLD, NOR, NPL, NZL, OMN, PAK, PAN, PER, PHL, POL, PRT, PRY, QAT, ROU, RUS, RWA, SAU, SEN, SGP, SLE, SLV, SRB, SUR, SVK, SVN, SWE, SWZ, SYC, SYR, TCD, THA, TJK, TTO, TUN, TUR, TZA, UGA, UKR, URY, USA, VEN, VNM, YEM, ZAF, ZMB, ZWE

Sample: 2007 – 2017

Exogenous variables: Individual effects, individual linear trends

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin, Chu (t-stat)	-31.8294	0.0000	142	1246
Breitung t-stat	10.7234	1.0000	142	1104
Null: Unit root (assumes common unit root process)				
Im, Pesaran, Shin (W-stat)	-4.22663	0.0000	142	1246

ADF - Fisher (χ^2 -stat)	506.213	0.0000	142	1246
PP - Fisher (χ^2 -stat)	365.894	0.0007	142	1314

Source: EViews estimations based on International Monetary Fund, section "International Financial Statistics (IFS)", table "Gross Domestic Product, Real, Index" available at <http://data.imf.org/regular.aspx?key=61545864> (accessed May 6, 2018). EViews calculation.

2.2. Panel Unit Roots Tests for Competition (145 countries, 2007 – 2017)

Series: Competition - AGO, ALB, ARE, ARG, ARM, AUS, AUT, AZE, BDI, BEL, BEN, BFA, BGD, BGR, BHR, BIH, BOL, BRA, BRB, BRN, BTN, BWA, CAN, CHE, CHL, CHN, CIV, CMR, COL, CPV, CRI, CYP, CZE, DEU, DNK, DOM, DZA, ECU, EGY, ESP, EST, ETH, FIN, FRA, GAB, GBR, GEO, GHA, GIN, GMB, GRC, GTM, HKG, HND, HRV, HTI, HUN, IDN, IND, IRL, IRN, ISL, ISR, ITA, JAM, JOR, JPN, KAZ, KEN, KGZ, KHM, KOR, KWT, LAO, LBN, LBR, LBY, LKA, LSO, LTU, LUX, LVA, MAR, MDA, MDG, MEX, MKD, MLI, MLT, MNE, MNG, MOZ, MRT, MUS, MWI, MYS, NAM, NGA, NIC, NLD, NOR, NPL, NZL, OMN, PAK, PAN, PER, PHL, POL, PRT, PRY, QAT, ROU, RUS, RWA, SAU, SEN, SGP, SLE, SLV, SRB, SUR, SVK, SVN, SWE, SWZ, SYC, SYR, TCD, THA, TJK, TTO, TUN, TUR, TZA, UGA, UKR, URY, USA, VEN, VNM, YEM, ZAF, ZMB, ZWE

Sample: 2007 – 2017

Exogenous variables: Individual effects, individual linear trends

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin, Chu (t-stat)	-18.9427	0.0000	140	1263
Breitung t-stat	0.54410	0.7068	140	1123
Null: Unit root (assumes individual unit root process)				
Im, Pesaran, Shin (W-stat)	-1.16550	0.1219	140	1263
ADF - Fisher (χ^2 -stat)	330.839	0.0198	140	1263
PP - Fisher (χ^2 -stat)	375.542	0.0001	140	1308

Source: Data extracted from World Economic Forum, 2017. *The Global Competitiveness Report 2017–2018*. Available at: http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_GCI.B.06.01.pdf

Annex 3. Dynamic panel data model for the relationship between the gross domestic product (GDP) and the intensity of competition (140 countries, 2007-2017)

Dependent Variable: GDP

Method: Panel Generalized Method of Moments

Transformation: First Differences

Sample (adjusted): 2011 2017

Periods included: 7

Cross-sections included: 140

Total panel (unbalanced) observations: 802

White period instrument weighting matrix

White period standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(PIB,-2), Constant

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	0.909460	0.029194	31.15240	0.0000
GDP(-2)	-0.198455	0.024642	-8.053651	0.0000
GDP(-3)	0.170355	0.017412	9.783995	0.0000
CONC	2.916072	1.047862	2.782877	0.0055
CONC(-1)	5.527289	0.953646	5.795957	0.0000
CONC(-2)	2.900866	1.117850	2.595041	0.0096

Effects specification: Cross-section fixed (first differences)

Mean dependent var	3.666584	S.D. dependent var	3.629470
S.E. of regression	3.456344	Sum squared resid	9509.268
J-statistic	40.29924	Instrument rank	42
Prob(J-statistic)	0.285792		

Source: EViews

✓ *Competition*: World Economic Forum 2017. *Global Competitiveness Report 2017–2018*. Available at http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_GCI.B.06.01.pdf (accessed in May 6, 2018)

✓ *GDP*: International Monetary Fund Datasets, section "International Financial Statistics (IFS) – Gross Domestic Product and Components selected indicators", table "Gross Domestic Product, Real, Index" available at <http://data.imf.org/regular.aspx?key=61545864> (accessed in May 6, 2018).