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THE PROCESS OF THE STRATEGIC PLANNING OF THE NONPROFIT ORGANIZATION IN SOUTHERN SONORA, MEXICO

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Abstract

This research was presented with the aim of knowing what is being done in terms of strategic planning considering dimensions such as social capital and strategic alliances in nonprofit organizations (NPO) in southern Sonora, Mexico. This document was developed using a quantitative study, descriptive, with non-experimental type design, with a cross sectional, a non-probability sampling method was adopted with convenience type. The population that is registered according to CEMEFI (2017) in the state of Sonora, Mexico has 721 NPO with the participation of 196 in the south of Sonora, but at the time of fixing their address their location was not found 51 organizations and 32 are inactive, so the decision to have a NPO population of 113 for the presentation of results was considered. The implemented questionnaire has a structure with the response mode using a Likert scale with five response options, presents internal consistency, were measured with the exploratory factor analysis test, the Cronbach alpha, KMO, and Barlett test, confirmed by the internal validity and reliability of the instrument as well as through a correlation analysis to measure the dependence of the variable with respect to the other two independent variables. We present the general hypothesis and a graphical model through software SPSS version 21, which is proposed by researchers with the aim of explaining the incidence of the dependent variable strategic planning through the independent variables of social capital and strategic alliances. One of the contributions of this research is that there is a measuring instrument that can be applied with the validity and internal consistency to measure the variables described above and in turn can be replicated not only at the national level but also internationally and also we can offer many persons the opportunity to help the community network of volunteers and promotes the synergy of social participation.

Keywords: Nonprofit organizations, strategic planning, social capital, strategic alliances, instrument, validity, reliability, correlation**,**

JEL Classification: L31, C52, P33, D64

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1. Introduction

When referring to "civil society", "social", "non-profit", "third sector" or "non-governmental" organizations, López Zamarripa, N. (2009), is to speak depending on a social context, a relationship of similarity between different institutions, it is in turn cataloged by their vocation, type of activities, geographic scope and general strategy.

The third sector has been defined as a nonprofit private sector, oriented towards public ends, which seeks to complete government and market actions to meet social needs, whose purpose is the achievement of a common good, addressing the needs and promoting the progressive participation of society, as defined by García, S., Cruz, AG, Pozos, LB, Velázquez, EB, & SM, AC (1997). This type of institutions that belong to the third sector do not have a lucrative purpose, that is, they were created with the main objective of not generating profits or obtaining a financial return, Monzón, J. L. (2006). The third sector is powered by the social institutions that designate the various organizational forms that emerge from society, identified by the promotion of social cooperation and voluntary work, under an altruistic and solidary logic, Rodríguez (2005).

The Non Profit Organizations (NPO) are diverse associations that contribute to the functioning and social reproduction, Gonzalez O. (2005), its composition varies according to each country depending on the specific historical conditions of its formation and development, Rivera A.J. (2000). This type of institutions are the main elements in a social conflict where they try to influence economic structures and State policy, Cohen, J. L., & Arato, A. (2000).

The Non Profit Organizations can be characterized as including religious and charitable associations that mobilize private funds for development, provide food and family planning services while encourage the community organization. In this way, they include independent cooperatives, community associations, public service user societies, women's groups and pastoral associations. Likewise, civic groups that try to become aware of social and environmental problems and try to influence public policy, López Zamarripa, N. (2009)

Currently society requires modern and dynamic social assistance, with simplified procedures and simple regulations. Civil society has not only emerged as an important social actor in many parts of the world, but its nature and composition have also varied enormously.

The aim of this research is to determine the influence of social capital and strategic alliances in the process of strategic planning in non profit organizations in southern Sonora, Mexico, considering that from the literature review no documents have been found that validate the influence of this terminology as a fundamental part in the operation and survival of this type of organizations. This document will consider using a quantitative study, descriptive, a non-experimental type design, with a cross sectional, a non-probability sampling method was adopted with convenience type using the statistical software SPSS version 21. The variables object of study will be

operationalized according to the general hypothesis proposed for the validation of the measurement instrument.

The validity of the instrument also requires the tests of the exploratory factor analysis, the cronbach's alpha, KMO, and Barlett's test as well as through a correlation analysis to measure the dependence of the variable with respect to the other two independent variables for analyze the regression model.

2. Literature review and development hyphotesis

The concepts and empirical studies analyzed on the dependent variable Strategic Planning (SP) and the independent variables Social Capital (SC) and Strategic Alliances (SA) are presented below.

Strategic Planning (SP)

The NPO have been increased and improved the forms of collaboration between organizations to strengthen their voice and develop joint programs given the inevitable transversality of many social interventions, Marbán Gallego, V., & Rodríguez Cabrero, G. (2006). That is why it is important to talk about the term strategic planning, which refers to the deliberate and systematic decision making that includes purposes that affect or should affect the entire company for long periods, Chiavenato, I., & Sapiro, A. (2017); Armijo, M. (2011) assures that the strategic planning consists of a formulation and establishment of priority objectives where strategies are established to achieve them, being a tool for decision making.

Gómez, PN (2009), defines strategic planning as the reason for being of the organization, gives importance to activities and processes, in a turbulent and constantly changing environment appears as one of the essential elements to be able to respond to the growing demands of the environment; the NPO, for the different way of operating these types of organizations, must have a participatory and democratic decision-making process. These organizations are frequent that the strategic plans remain only in a theoretical document without effective incidence in the objectives of the NPO.

The strategic planning in nonprofit organizations reported crucial relationships among strategy components are missing, and links between these components and organizational performance have yet to be made. Stone, M. M., Bigelow, B., & Crittenden, W. (1999). Strategic Planning is to help an organization do a better job; Can help an organization focus its vision and priorities in response to a changing environment and ensure that members of the organization are working toward the same goals, Allison, M., & Kaye, J. (2011).

An empirical study on the strategic planning of NPO in the State of Guanajuato, Mexico, Caldera, DC, Ortega, MA, & Sánchez, ME (2017) considered eights questions with the objective of presenting and analyzing in detail the planning with 86 NPO of this State and identify the areas of improvement and opportunity in which new strategies can be

implemented, and projects that improve their efficiency and effectiveness, and therefore, their performance.

Another empirical study now in the State of Chihuahua, Mexico, Ramos, PJM, Maya, MHRR, & Cisneros, MHCE (2014) summarize that it is necessary to emphasize that the application of the strategic planning process in the 53 NPO of this City, is deficient due to the lack of clear institutional guidelines, since in most of the institutions, it does not go beyond the statement of objectives, strategies and procedures aimed at fulfilling its mission; This is often a reaction to a sponsor request. In addition, there are conceptual limitations derived from a limited vision that focuses on fulfilling the social objective of the organization.

Social Capital (SC)

Properly speaking of community social capital, it focuses on the quality of the relationships between the actors, that is, within a very well defined group it refers to the characteristics of social organizations that facilitate coordination and cooperation within that group (Putnam, Leonardi and Nanetti 1993). Also of particular relevance is the fact that community social capital provides an orienting attitude that directs actions because actors adhere to a system of norms and values (Esser 2008).

Currently there is no well-defined mechanism to assess the work that has been developed by the NPO, there is no methodology for assessing the construction of social capital as well as efficiency and effectiveness in the application of the resources on the part of these in the development of social projects of social co-investment, Álvarez, F. (2015); For studies on social capital should take advantage of its components as well as the synergies, alliances that exist between social groups to take advantage of the capabilities of the NPO to generate a sense of belonging and empowerment within institutions .

Strategic Alliances (SA)

When referring to strategic alliances between organizations, regardless of the direction to which it belongs, assures Aldana, R., & Urribarri, A. (2013) for a organization is very difficult to achieve internal strengthening if it does so an individual basis; That is why it recommends the formation of alliances to increase competitiveness, meet their social goals, share goals, share strategic objetives for organizations that seek to remain in this competitive environment, alliances can be used between private, public, social organizations, government offices , universities, among others.

Guerrero, G., Reficco, E., & Austin, JE (2004) also assure that between organizations and NPO there must be a certain alignment in terms of values, mission and strategy, as well as the management of a Social Alliance imposes demands similar to that a new business unit. Cross-sector alliances (between for-profit and nonprofit actors) present a learning platform for infusing participants with greater incentives to be socially responsible. Arya, B., & Salk, J. E. (2006).

The situations that are seen with the NPO in concepts such as strategic planning, social capital and strategic alliances, the need arises first for the validation of an instrument for

measuring the strategic planning process in the NPO, after which this instrument has been validated that presents an internal consistency, it proceeds to the application of the instrument with the administrators of the NPO located in the southern of Sonora, Mexico, to obtain a document that can be input for the decision making of the NPO administrations or members of the board of directors as well as to continue in future research with other variables.

2.2 Development Hypothesis

Considering the analysis of the theory on strategic planning, social capital and strategic alliances and in accordance with the aim of study of this research, which are non profit organizations in Southern Sonora, Mexico, in addition to validating the instrument also analyze the Model through multiple regression analysis.

The general hypothesis and the graphical model is presented (figure 1) through software SPSS version 21, which is proposed by the researchers with the aim of explaining the influence of the dependent variable of strategic planning through the independent variables of social capital and strategic alliances.

General hypothesis: The social capital (SC) and the strategic alliances (SA) determine the influence in the process of strategic planning (SP) of the non profit organizations in Sourthern Sonora, Mexico.

Hypothesis specific H1: Social Capital (SC) determines the influence in the Strategic Planning process (SP) of non profit organizations in southern Sonora Mexico.

Hypothesis specific H2: Strategic Alliances (SA) determine the influence in the Strategic Planning process (SP) of non profit organizations in southern Sonora Mexico.

(Y): Dependent Variable: Strategic Planning (SP)

(X1): Independent Variable: Social Capital (SC)

(X2): Independent Variable: Strategic Alliances (SA)

Figure 1. Proposed Graphic Model. Source: Prepared by the author.

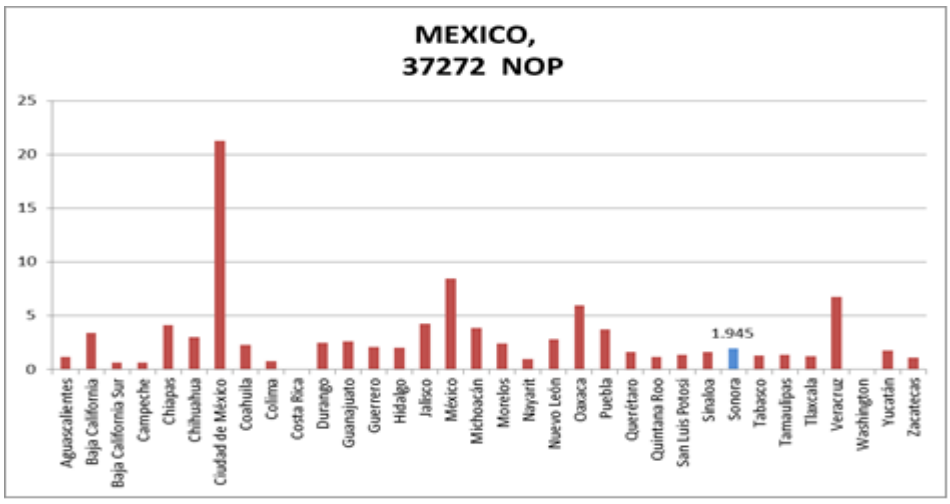
3. Research Methodology

Based of the literature review and in order to comply with the general objective of the research and the verification of the general hypothesis of the proposed theoretical model, the type and design of research is presented below.

3.1 Sample selection and data collection

Based on the page of co-responsibility in Mexico as well as in Centro Mexicano Filantropia (CEMEFI) there is a total of non profit organizations registered at the national database of 37,272 institutions, also for the Sonora State a total of 721 NPO and properly for the Southern Sonora there are registered 196 organizations, for which Sonora represents 1.94% of the national database (Graph 1)

Graph 1. National Database of Non Profit Organizations



Source: Centro Mexicano para la Filantropia, A.C (2017). Prepared by the author

The total of 196 NPO in Southern Sonora, at the time of setting their address, their location was not found in 51 organizations and 32 are in an inactive state, so the decision to have a NPO population of 113 was considered for possible result. For this research the active participation was 61 (54%) NPO in a period of eleven months (April 2017 - February 2018); also 15 NPO (13%) they were located but did not want to participate in this research for personal reasons and 37 NPO (33%) accepted the instrument to answer it but due to lack of time they could not collaborate with the complete delivery of the questionnaire.

To determine the influence of social capital (SC) and strategic alliances (SA) in the strategic planning process (SP) of non profit organizations in southern Sonora, Mexico, a questionnaire composed of 28 items was developed. distributed as follows: 10 items for the dependent variable of strategic planning (SP), 12 items for the independent variable of social capital (SC) and 6 items for the independent variable of strategic alliances (SA), these items were considered by researchers according to the conceptual framework and adapted using a Likert scale with 5 levels where: 1 is (Never); 2 is (Almost never); 3 is (Sometimes); 4 is (Almost always) and 5 is (Always).

For the procedure the following steps was considered:

1. The variables under study were selected based of the review literature and the questionnaire was prepared.

2. To measure the population of the NPO, we consulted the National Database on the page of co-responsibility in Mexico as well as in the Mexican Center for Philanthropy (CEMEFI, 2017) was determined being 196 NPO in Sonora represented by a non-

probabilistic sampling by convenience of 113 institutions, of which the participation active in this process was 61 NPO (54%).

3. The address of each NPO was visited and the data collection was monitored through the structured questionnaire with the administrators of each participating NPO.

4. The data was analyzed through SPSS software version 21 and the Statistical results were analyzed to obtain findings and conclusions.

The data analysis was carried out in the statistical package for the social sciences (Statistical Package for the Social Sciences, SPSS v.21). The data were analyzed under a multiple regression analysis, Hernández, Fernández and Baptista (2014) because this method allows researchers to explain the effect of the relationship between each independent variable (SC and SA) and the only dependent variable (SP) as well as the correlation between the independent variables, this is collinearity.

3.2 Variables

For this research the concepts on which was based were considered under this operationalization of variables as follows:

Table 1: Operationalization of variables

Variable	**Concept**	**Authors**
X1: Social Capital (SC)	The quality of the relationships between the actors, that is, within a very well defined group it refers to the characteristics of social organizations that facilitate coordination and cooperation within that group	(Putnam, Leonardi y Nanetti 1993). (Esser 2008).
X2: Strategic Alliances (SA)	for a organization is very difficult to achieve internal strengthening if it does so an individual basis; That is why it recommends the formation of alliances to increase competitiveness, meet their social goals, share goals, share strategic objetives	Guerrero, G., Reficco, E., & Austin, J. E. (2004), Arya, B., & Salk, J. E. (2006), Aldana, R., & Urribarri, A. (2013)
Y: Strategic Planning (SP)	Strategic Planning is to help an organization do a better job and ensure that members of the organization are working toward the same goals,	Allison, M., & Kaye, J. (2011). Armijo, M. (2011)

Source: Prepared by the author

3.3 Method

The research is considered causal correlation since it aims to determine the influence of the independent variables: Social Capital and Strategic Alliances on the dependent variable: Strategic Planning. It is also a cross section made in 2017-2018. The research is quantitative since it is intended to contrast the objective and research hypothesis compared with the research of other authors Allison, M., & Kaye, J. (2011), Armijo, M. (2011), Aldana, R., & Urribarri, A. (2013), (Putnam, Leonardi and Nanetti 1993). Derived from the nature of the research is considered as a non-experimental study according to Hernández, Fernández and Baptista (2014) because are presented as they happen in the real world.

4. Findings and Discussions

The Nonprofit organizations who participated actively by returning the questionnaire in full were 61 managers. Below is the participation of them considering that the NPO were divided according to their field of action (Cemefi 2017):

Table 2. Field of action of Non Profit Organizations

Field of Action of NOP	**Number of NOP**
Community Centers	14
Cultural	12
Houseware	6
Nursing home for senior	3
Community Kitchens	5
Health	9
Education	12
TOTAL	61

Source. Cemefi (2017). Prepared by the author

The following section shows the results of the statistical analysis of the responses of the 61 instruments applied, which will help to verify the research hypothesis.

The Exploratory Factorial Analysis (EFA) was carried out to verify that the items used in the measurement instrument match with each of the variables to be analyzed and where it is shown that each item is grouped in each variable Rositas (2014).

The EFA allowed to reduce the items by components and a total explained variance of 72.87% represented by 14 items, eliminating 14 of all the variables as follows (seven of Social Capital, three of the variable Strategic Alliances and four of the variable Strategic Planning) these items did not reach the level of correlation higher than 0.40. (Table 3). The results of the EFA are presented:

Table 3. Matrix of main components rotated with varimax method

Items	Components		
SC1	0.792		
SC2	0.853		
SC3	0.869		
SC4	0.790		
SC5	0.769		
SA1		0.902	
SA2		0.901	
SA3		0.937	
SP1			0.771
SP2			0.800
SP3			0.789
SP4			0.821
SP5			0.794
SP6			0.755

Source: SPSS, prepared by the author

The 14 final items of the EFA, the reliability of the measurement instrument was validated by the Cronbach's Alpha test, the results of this test must have a scale greater than 0.60 for exploratory studies; the results of table 4 with the input and output items confirm that they are valid and reliable since the Cronbach Alpha values of each variable have a value greater than 0.60 results consistent with those presented by (Lévy and Varela Mallou, 2003). The results of the Cronbach's Alpha are presented by variable:

Table 4. Results of Cronbach's Alpha.

Variable	Input items	Output ítems	Cronbach's Alpha
Social Capital	12	5	0.873
Strategic Alliances	6	3	0.899
Strategic Planning	10	6	0.877
	28	14	

Source: SPSS, Prepared by the author

The questionnaire is validated internally, since the items refer to the same variable that is to be measured, the above is achieved through the Kaiser-Meyer-Olkin (KMO) and the Bartlett test (Table 5). The results were as follows:

Table 5. KMO and Bartlett's test

Sampling adaptation measure of Kaiser-Meyer-Olkin.		.822
Bartlett´s sphericity test	Aprroximate Chi-square	612.687
	gl	91
	Sig.	.000

Source: SPPS. Prepared by the author

The result of the (KMO) of table 5 presents a value of 0.822 and the Bartlett test was significant at .000. The multiple regression model is performed through the goodness method to show all the variables with and without correlation, the results are the following (Table 6):

Table 6. Summary of multiple regression model

Model Summary[c]				
Model	R	R square	R corrected square	Durbin-Watson test
1	.785[a]	.616	.603	1,752
a. Predictor variable: (Constant) SAX2, SCX1				
c. Dependent variable SPY1				

Source: SPSS. Prepared by the author

The result of table 6 shows a variance explained with an R2 of 0.616, the model is explained in a 61.60% and with a good fit of the model. On the other hand the statistical Durbin Watson presents a value of 1,752 below the established range (between 1.5 and 2.5) which means that the waste is independent.

The F statistic presented in table 7 verifies that there is a significant linear relationship between the dependent variable and the independent variables jointly. In the column "Sig." It has a value of .000, that is, less than 0.05, it indicates that there is a significant linear relationship. The following is the statistical result F and the significance of the model:

Table 7. ANOVA (Analysis of Variance).

ANOVA[a]

Model		Sum of squares	F	Sig.
1	Regression	21.900	75.425	.000[b]
	Residual	15.388		
	Total	37.288		

a. Dependent Variable: SPY1

b. Predictor Variables: (Constant), SAX2, SCX1

Source: SPSS. Prepared by the author

This result presents the coefficients in order to construct the resulting regression equation. The result of the "Variation Inflation Factor" (VIF) is also less than 5, which determines that there is no presence of collinearity in the independent variables with respect to the dependent variable (Table 8)

Table 8. Coefficients

Coefficients

Model		Coefficients not standardized		Collinearity statistics	
		Beta	T	Tolerance	VIF
1	(Constant)	1.363	4.810		.000
	SCX1	.682	7.202	.567	1.765
	SAX2	.009	.097	.567	1.765

Source: SPSS. Prepared by the author

Y = 1.363 + 0.682 (SCX1) + 0.009 (SAX2)

With the coefficients of the betas presented in table 8, the results are the following:

The H1 specific hypothesis is accepted: The Social Capital (SC) determines the influence in the process of strategic planning (SP) of the non profit organizations in Southern Sonora Mexico, where the established by (Putnam, Leonardi and Nanetti 1993 ; Esser 2008) to mention that the actors within a well defined group facilitate coordination and cooperation by adhering to a system of norms and values, and the results for the NPO in southern Sonora were 69% carry out an evaluation of the indicators of individual performance established in the strategic plan as well as periodically verifies the coherence between the institutional policies and the daily

practice of those involved (64%) and regularly evaluate with the people related the quality of information provided to them by the work done (67%).

The H2 specific hypothesis is accepted : Strategic Alliances (SA) determine the influence of the Strategic Planning process (SP) of non profit organizations in southern Sonora Mexico, according to Aldana, R., & Urribarri, A. (2013) for an organization is very difficult to achieve internal strengthening if it does so an individual basis; That is why it recommends the formation of alliances to increase competitiveness, meet their social goals, share goals, share strategic objectives, and about the results of this variable the NPO 63% do not establish alliances and links with other organizations to offer better services to the beneficiaries, also 52% of the participating NPO the same Institution does not establish a regular contact with the different types of users of the organization, nor does it work with a spirit collective seeking to empower all those involved, continue to work alone, they do not take advantage the opportunities that they can form those alliances with other social actors.

Finally table 9 is presented where it shows that there is no presence of collinearity between the variables:

Table 9. Collinearity diagnosis.

Collinearity diagnosis[a]						
Model		E-values	Condition index	Proportions of variance		
				(Constant)	SCX1	SAX2
1	1	2.859	1.000	.01	.01	.01
	2	.091	5.616	.88	.34	.04
	3	.050	7.537	.10	.65	.95
a. Dependent Variable: SPY1						

Source: SPSS, Prepared by the author

The condition index shown in table 9 does not present collinearity problems since the index does not exceed the value 15.

5. Conclusion

Considering that the literature review has not found documents that validate the influence of social capital (SC) and strategic alliances (SA) in the process of strategic planning (SP) in non profit organizations in southern Sonora, Mexico this terminology together, that is, only empirical documents that analyze the process of strategic planning in the NPO (Caldera, D. C., Ortega, M. A., & Sánchez, M. E. 2017; Ramos, P. J. M., Maya, M. H. R. R., & Cisneros, M. H. C. E. 2014; Allison, M., & Kaye, J. 2011).

There were also surveys that analyze by themselves the participation of social capital in the NPO (Álvarez, F. 2015; Putnam, Leonardi y Nanetti 1993; Esser 2008). As well as documents that define what it means for NPO to establish strategic alliances, their

benefits (Guerrero, G., Reficco, E., & Austin, J. E. 2004; Arya, B., & Salk, J. E. 2006; Aldana, R., & Urribarri, A. 2013).

This research confirms the objective described, which was precisely to determine the influence of social capital (SC) and strategic alliances (SA) in the strategic planning process (SP), with the following results: 62% NPO in strategic planning contemplate the definition of achievable goals and measurable goals; 67% establish an evaluation plan and performance indicators both individual and organizational to measure the progress that is achieved in the achievement of goals and objectives considering at all times the people involved in the activities of the annual program (62%) in the same way it is important to mention that although they do carry out the process of strategic planning the NPO in Southern Sonora Mexico, and have very clear what this means is to help an organization do a better job, can help an organization focus its vision and priorities in response to a changing environment and ensure that members of the organization are working towards the same goals, where priority objectives are established for making decisions (Allison, M., & Kaye, J. (2011), Armijo, M. 2011) do not make strategic alliances between companies, government and higher education institutions (63% NPO) does not exist a certain alignment in terms of values, mission and strategy, so it is very difficult for them to achieve internal strengthening if they do it individually, so training is recommended of alliances to increase competitiveness (Aldana, R., & Urribarri, A. 2013).

Likewise, with this research it was possible to have an instrument with validation, correlation and regression analysis, where the results of the Model gave sufficient information when performing the Exploratory Factor Analysis (EFA) to verify that the items used in the measurement instrument coincided with each of the variables to analyze and where it is shown that each item is grouped in each variable Rositas (2014); EFA allowed to reduce the items by components and a total explained variance of 72.87% represented by 14 items, the reliability of the measurement instrument was validated by the Cronbach's Alpha test, being for SC (0.873), for SA (0.899) and for SP (0.877) with these results of this test had a scale greater than 0.60 for exploratory studies, being the ones suitable for the present survey (Lévy and Varela Mallou, 2003).

In addition, the measuring instrument for (KMO) is internally validated, has a value of 0.822 and the Barlett sphericity test is significant at .000. The multiple regression model was performed, which shows a variance explained with an R2 of 0.616, that is, the model is explained in a 61.60% and with a good fit of the model. On the other hand, the Durbin Watson statistic presents a value of 1,752 below the established range (between 1.5 and 2.5), which means that the residuals are independent; the F statistic verifies that there is a significant linear relationship between the dependent variable and the independent variables jointly, "Sig." presents a value of .000, that is, less than 0.05, indicates that if there is a significant linear relationship, the result is also presented of the "Variation Inflation Factor" (VIF) are less than 5 which determines that there is no presence of collinearity in the independent variables with respect to the dependent variable.

Finally the contributions of this research is that there is a measuring instrument that can be applied with the validity and internal consistency to measure the variables described above and in turn can be replicated not only at the national level but also internationally and also we can offer many persons the opportunity to help the community network of volunteers and promotes the synergy of social participation.

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PANEL DATA ANALYSIS OF THE IMPACT OF ECONOMIC AND INSTITUTIONAL FACTORS UPON THE FDI INFLOW IN SEE COUNTRIES

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Abstract

The panel data analysis presented in this paper focuses on the impact of economic and institutional factors upon the attractiveness of the economies of South- East Europe (SEE): Albania, Bosnia and Herzegovina, Bulgaria, Macedonia, Montenegro, Romania, Serbia, Kosovo and Croatia for foreign direct investment (FDI). The analysis was done for a period of twenty years (1995-2015) in order to examine which determinants are significant for increased FDI inflow in the SEE countries on a basis of a holistic approach using multiple regressions. Taking into account both economic and institutional variables, the results of the analysis indicate both of them to be significant for attracting FDI.

Keywords: foreign direct investment; South-East Europe; CEFTA-2006, panel data analysis, economic factors; institutional factors

JEL Classification: F21, F60, C23

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1. Introduction

The level of FDI inflow into an economy is strongly linked to the level of development, economic and political stability, trade openness and other macroeconomic factors. The goal of this paper is to measure the influence of certain economic and institutional variables upon the attractiveness of FDI in the region of South-East Europe. The countries that are included in the analysis are the countries that are members of CEFTA-2006 (Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, and Serbia), and the three countries that became EU members: Bulgaria, Romania, and Croatia.
Improved economic conditions have positive impact upon the FDI inflow, while FDI itself may stimulate economic growth. Economic growth induces growing markets for investors' output, and regional integration increases the scope of easily accessible markets. Macroeconomic stability allows better access to external finances and provides greater stability of currencies, which altogether leads to lower vulnerability to external shocks. The main advantage for investors is predictability of returns on investments.

The conditions for investors improved considerably in the economies of South- East Europe over the past 20 years. Most of the economies have faced a difficult transition period, but in recent years they have embarked on a sustainable growth path. The 2008 global financial crisis had it's own effect over the external vulnerability of these countries with prolonged and slow economic recovery. As a result, GDP per capita in the region lags substantially behind most EU-CEE members (CEFTA-2006 Investment Report, 2017). The region has on average growth of the annual gross domestic product (GDP) of 2.3 % in the period from 2010-2015; which is better than the annual average growth for the European Union by 1.2 %, but less than that of other European and Central Asian economies which is 2.9 % (UNCTAD, 2017).

Political instability in the region has its own effect on significantly setting back the economic development, and the process was compounded by some South-East European economies (Bulgaria, Romania and Croatia) missing out the early waves of EU accession.

Although many challenges remain, the region has made considerable advances to improve the investment climate and offers potentially attractive opportunities for foreign direct investors. One of the objectives of the SEE 2020 Strategy is to increase the annual FDI inflow to the region by at least 103 % (160 % including Croatia).

For the purposes of our analysis we have run multiple regressions using panel data for the period of twenty years, 1995-2015. The paper is structured as follows: in the first section we provide some theoretical background on FDI, as well as literature review on FDI in the region of SEE; in the second section we make a brief overview of the FDI inflows in the countries of South-East Europe; in the third section we explain the model and the results from the regressions; and in the last section we give the conclusion from the analysis.

2. Theoretical background on FDI and literature review

The abundant economic literature on FDI comprises a vast number of different theories created in the period from the appearance of the classical economic school until the development of the latest new trade theories. During the 1970's the economic thought focused on explaining FDI motivation from the position of the model of imperfect competition on the world market. Following the flows of capital on the relation among developed economies, the creators of this concept claimed that FDI had exceptional positive influence upon the economic growth of both the home and the host economy and especially stressed advantages realized by spill-overs of knowledge and managerial skills (Kindelberger & Andretsch, 1983, and Vernon, 1979). Later on, this concept was extended and developing countries were involved in further research and theoreticians claimed that this would lead to the same positive effects upon the economic growth for their economies as well.

The contemporary concepts on FDI were mostly influenced by Dunning's OLI Paradigm (Dunning, 1988) and Porter's Diamond of Competitive Advantages (Porter, 2000). While within the OLI Paradigm the outflow of capital is still an alternative to export of goods, in Porter's theory both of the flows have to continue simultaneously, as they are not substitutes or alternatives to each other in the contemporary global environment. In 1993, Dunnig and Rojec accepted Porter's theory and upgraded it pointing out that FDI support not only the economic growth and development of the home country, but also could support the wellbeing and growth of the host country. They were among the first who applied this model upon the transition economies and related the inflow of FDI with the opportunity of increasing productivity in manufacturing industries that already existed in those countries; the opportunity of bringing innovations and improvements of the existing productions, processes and organizational structures; the promotion of new allocation of recourses among different sectors; the opportunity to get access to new markets; and the acceleration of structural changes within the economy and decrement of costs needed for technological changes (Dunning & Rojec, 1993). In 2001, Kalotay has found that the systemic impact of FDI through privatization has been positive in Central and Eastern Europe and more substantial than was expected at the beginning of the transition process.

Lately there are a considerable number of theories that refer to the influence of economic factors (such as market growth and trade openness of the economy) upon the inflow of FDI (Deichman et al, 2003; Asiedu, 2006; Mohamed & Sidiropulus, 2010). Yet, these theories did not provide any reliable proof that the mentioned determinants are significantly important for attracting FDI.

From the stand point of transition economies, Jadhav (2012) has found that economic factors in BRICS economies are more important than institutional and political determinants for attracting FDI. Market size measured as real GDP, trade openness, natural resources availability, rule of law and voice and accountability have positive effect on total inward FDI in BRICS economies. The research of Gharaibeh (2015) has analyzed that for Bahrain general government consumption expenditure; inflation rate;

economic stability; labor force; trade openness: public education; and population have statistically significant and positive influence on FDI inflows.

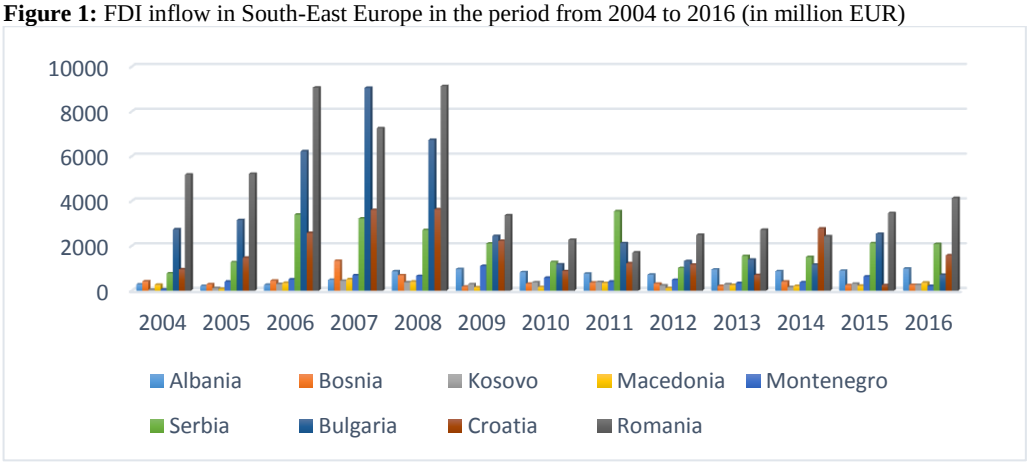
However, institutional framework and its influence upon the attractiveness for FDI is also important. The institutional approach refers to the level of institutional reforms that influence the quality of institutions. Institutional reforms should provide tools for fighting corruption and political instability, as they both degrade quality of institutions and prevent their development (Cleeve, 2008). Bevan and Estrin (2004) have studied the FDI determinants in Western European countries, as well as in Central and Eastern European on bilateral level. They applied the gravity model and found out that announcements on EU accession proposals had an impact on FDI for future member countries. The EU enlargement in 2004 included eight Central and Eastern European economies, followed by Bulgaria and Romania in 2007. This encouraged investment by non-European firms as well as by EU-based multinationals in both manufacturing and services sectors in the new member-states. Jovanovic B. and Jovanovic B. (2017) found out by analyzing 27 ex-socialist countries that investors were discouraged by bureaucracy and bureaucratic impediments rather than financial costs. In 2017, Kikerkova I. et al., applied VECM on FDI and their impact in the Republic of Macedonia and found out economic factors, such as: the rate of GDP growth, trade openness and labor productivity were the leading factors for increasing FDI inflow in Macedonia.

The role of incentives for attracting FDI is analyzed in the academic literature, as well. Cass F.,(2007) investigated the role of fiscal and financial incentives, on one hand, and the policy applied by Investment Promotion Agencies (IPAs) in attracting FDI into European transition economies. Results of different researches led in this field were basically conflicting or with predominantly negative connotation. Most of the authors came to conclusion that the active approach in granting incentives to foreign investors might have strong negative impact upon the corruptive practices within the institutions of the system and might lead to withdrawal of the decision of a foreign investor to effectuate the investment. (Zemplinarova, 1996; Osman, 2000; Cleeve, 2008). Abundant tax relieves usually have a negative impact on the total effect from the attracted FDI, as they increase the costs for the host country to an extent that might overcome the total positive effect of the effectuated foreign investment. It is even more important to point out that the up-to-date research in the area did not provide a proof on the statistically significant relation in attracting FDI neither with regard of institutional determinants nor in regard of financial and fiscal incentives (Assunchao et.al., 2011).
Kalotay (2008) analyzed the FDI inflows in Bulgaria and Romania at the beginning of their EU accession process and found that despite the major labor cost and corporate tax advantages these countries attracted relatively few efficiency seeking projects, mostly in garments and footwear. He further explains that in order to increase and materialize the FDI potential of these countries they need to improve the business environment by strengthening the judiciary system, fighting against corruption and organize crime in Bulgaria.

3. Characteristics of FDI inflow in the countries of South-East Europe

Due to political instability and the many war conflicts, the countries of South-East Europe lost a whole decade of the 90's on macroeconomic stabilization, privatization and transformation of their systems towards a market economy. Since the beginning of the 21st century the political and economic situation within these countries started to change gradually. In the period from 2001-2008 economic reforms and privatization process in the region started to accelerate and the region gradually liberalized trade, especially with the EU. All this led to substantial changes and improvement of the business climate in all of the countries throughout the region. Most of the economic reforms that were implemented in different countries relied on legal reforms in favor of FDI regime liberalization and pursued active policies on attracting foreign investors' attention. These efforts led to an increment of the total FDI inflow, which reached its peak in the period before the world financial crises in 2007-2009. Data in Figure 1, confirm that the crisis in 2008 had a strong negative impact upon FDI inflow in the countries of South-East Europe and cut more than a half of the total inflows of FDI at regional level. The recovery period lasted until 2014, when FDI inflow started to increase again, but it was far from catching up the 2008 levels.

Figure 1: FDI inflow in South-East Europe in the period from 2004 to 2016 (in million EUR)



Source: CEFTA-2006 Investment Report 2017, CEFTA Secretariat, Brussels, 2017, p.77

If we analyze the FDI inflow by country, we can resume the following: in Albania the FDI inflow has increased 3 times (278 mill. Euros in 2004 - 983 mill. Euros in 2016); in Bosnia & Herzegovina the level of FDI inflow has diminished after the crises and could not reach the pre-crisis level; in Kosovo the level of FDI inflow has been low, but higher in comparison to the pre-crisis level; in Macedonia the level of FDI inflow has been volatile throughout the past 12 years, but expresses a slow upward trend though (261 mill. Euros in 2004 - 359 mill. Euros in 2016); Montenegro in the analyzed period has experienced considerable growth of FDI inflow, however after the crisis amounts significantly decreased and were far below the pre-crisis level; in Serbia the situation is slightly better since FDI inflow started to increase in the last two years and nearly reached the level before the crisis; Bulgaria had an upward trend of FDI inflow in the

period before the crisis, however in the period after the crisis the inflow was volatile and decreasing; in Croatia the situation is similar to Bulgaria as after the crisis the country faces volatile FDI inflow; and in Romania the FDI inflow records an upward trend which is significantly lower than the level it had before the crisis (*CEFTA-2006 Investment Report*, 2017, p.7).

Barlett and Prica (2012) suggested that the extent of openness to FDI flows was a major cause of the transmission of the crisis to the region. The 2008 global economic crisis exposed two weaknesses in the South-East Europe investment profile in terms of concentration of foreign direct investment in the financial sector and limited private sector development.

The slow-down of FDI inflow in the region was not caused only by the crisis, but generally it was a result of the completion of the privatization process and the lack of interest of foreign investors to invest in already existing enterprises. FDI inflow within the region created about 8% of the total GDP on average. Although this indicator differs throughout the countries in the region, its average for the region as a whole is significantly above the figures of the same indicator calculated for the countries from Central and Eastern Europe, where it reached 3% of GDP. Foreign investors consider Serbia to be the country with the biggest capacity for attracting FDI within the region. However, Montenegro with 6,290 EUR per capita was the country with highest FDI stocks per capita in 2013, while Macedonia happens to be the least attractive country in the region (Pinto et al., 2016).

Another aspect visible from data in Figure 1 points out that FDI inflow was considerably higher in the countries that became EU member - states than in CEFTA-2006 members. This is completely in line with the finding of Bevan and Estrin (2004) that the announcements on EU accession have a positive impact on FDI for the future member-states.

4. Specification of the model and the results

4.1. Explanation of the model

In order to examine the relationship between foreign direct investments and different economic and institutional variables, a panel regression OLS model is used. The model is described in the following equation:

$$y_{it} = \alpha + \beta_{x_{it}} + u_{it}$$

where $y_{it}$is the dependent variable, α is the intercept term, β is a $kx1$ vector of parameters to be estimated on the explanatory variables, and x_{it} is a $1xk$ vector of observations on the explanatory variables, $i = 1, \dots, N$ and it stands for cross-sectional unit (number of countries), while $t = 1, \dots, T$ and it stands for time period (Brooks, 2014).

The analysis includes nine South-East European countries (Albania, Bosnia and Herzegovina, Bulgaria, Macedonia, Montenegro, Romania, Serbia, Kosovo and Croatia) for the period from 1995-2015. Two separate panel regressions were run in order to

compare relationship between FDI and two groups of factors: economic factors and institutional factors. The first regression evaluates the relationship between FDI and economic factors and the second one the relationship between FDI and both economic and institutional factors. The authors deliberately did not take into account the expectations of becoming full members of the EU (for those which still are not EU members), as they wanted to measure only the impact of endogenous factors of the attractiveness for FDI of the SEE - countries.

The dependent variable is ***foreign direct investment net inflows*** as % of GDP (fdi_{it}), while the independent variables are divided into two groups: economic and institutional factors.

Economic factors include: GDP annual percentage growth (gdp_{it}); trade as percentage of GDP ($trade_{\mathrm{it}}$); GDP per employee measured in PPP in constant terms for 2011 as an indicator of labor productivity ($productivity_{it}$); unemployment as a percentage of total labor force ($unemployment_{it}$), general government final consumption expenditure as percentage of GDP ($government_{it}$); and population growth as annual percentage growth ($population_{it}$).

Data observed in terms of economic variables are in annual frequency for the period from 1995-2015, and are retrieved from World Development Indicators data base that includes World Bank National Accounts Database and OECD National Accounts Database.

In this group of variables the variable *population growth* is included which stands for annual population growth rate. It is the exponential rate of growth of midyear population from two subsequent years in percentages. Population is based on the *de facto* definition of population, which counts all residents regardless of their legal citizenship status. Data are derived from the World Population Prospects of the United Nations Population Division and United Nations Statistical Division. The values are based on the *de facto* definition of population, presented as midyear estimates.

The second equation, besides economic variables, includes **institutional variables** as well. The first variable is: *Political Stability and Absence of Violence Index* ($political_{it}$). This index is published in the Worldwide Governance Indicators, a colossal research project by the World Bank. It measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism (Kaufmann, Kraay & Mastruzzi, 2010). This aggregate indicator originally is published on a -2.5 - 2.5 scale. For the purposes of our research, we have rescaled the Index on a 0 - 100 scale, where 0 (zero) stands for worst, while 100 (hundred) for the best performance.

Additional four indicators are taken from the 2017 Index of Economic Freedom (Miller & Kim, 2017). The Index of Economic Freedom calculates four separate groups of indicators: Rule of Law, Government Size, Regulatory Efficiency and Open Markets. Since we already took in consideration the government debt as an economic indicator, we chose indexes from the rest of the three groups. As a part of the Rule of Law, we

included Property Right($right_{it}$). It measures the degree to which country's laws protect private property rights and the degree to which the government enforces those laws. It also assesses the likelihood that private property will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts. The property right score for each country is a number between 0 and 100, with 100 equaling the private property guarantees by the government.

In the area of Regulatory Efficiency we used two indicators: Business Freedom and Monetary Freedom.

Business freedom ($business_{it}$) is an overall indicator of the efficiency of government regulation of business. The business freedom score for each country is a number between 0 and 100, with 100 equaling the freest business environment. The score is based on 10 factors, all weighted equally, using data from the World Bank's Doing Business Study.
Monetary freedom ($monetary_{it}$) combines a measurement of price stability with an assessment of price controls. Here again the number varies between 0 and 100.

In the area of Open Markets we used the variable: *Financial Freedom* ($financial_{it}$), as a measure of banking efficiency as well as a measure of independence from government control and interference in the financial sector. An overall score on a scale of 0 to 100 is given to an economy's financial freedom through deductions from the ideal score of 100.
Before choosing the panel regression model, pre-tests for panel unit roots were made. The panel unit root tests indicate that most of the variables are stationary (the results somewhat change depending on what type of a test is performed and the deterministic term involved). The first equation has the following form:

$$fdi_{it} = \alpha + \beta_1 gdp_{it} + \beta_2 trade_{it} + \beta_3 productivity_{it} + \beta_4 unemployment_{it} + \beta_5 government\lambda_t + \upsilon_{it}$$

where λ_t is a time-varying intercept that captures all of the variables that affect the dependent variable and that vary over time but are constant in cross-section terms (Brooks, 2014). The total number of observations in the first model equals 108.
In order to prove the robustness of the model, we present the construction of the model, by adding variables one by one. The sign and the significance of the variables is not changed which confirms the robustness of the model.

3.2 Presentation of results

In Table 1 are presented the results from six consecutive regressions. It is visible that the sign and the significance of the variables remain the same in all regressions. When we run the regressions we added additional variables one by one. However, for the purposes of our analysis only the third and the last (sixth) column are of importance as the first indicates the importance of all economic variables in attracting FDI in South-Eastern European countries, and the last column takes into consideration both economic and institutional variables that we analyze.

Table 1. Presentation of the results

	(1)	(2)	**(3)**	(4)	(5)	**(6)**
Log (GDP)	0.161**	0.177**	**0.211*** **	0.215***	0.238***	**0.251*** **
Log (Trade)	0.155***	1.870***	**1.740*** **	1.720***	0.314***	**0.850*** **
log (Productivity)	-0.554***	-0.652***	**-0.665*** **	-0.655***	-0.626***	**-1.428*** **
Unemployment		-0.017***	**-0.020*** **	-0.022***	-0.027***	**-0.018*** **
Government			**0.044** **	0.045***	0.057***	**0.107*** **
Population				0.032	0.006	**0.118**
log(Rights)					0.05	**0.125**
Monetary					0.017***	**0.012*** **
log(Political)						**1.239*** **
log(Business)						**1.325*** **
log(Financial)						**1.250*** **
R-square	0.252	0.269	**0.323**	0.323	0.420	**0.614**
Adjusted R-square	0.240	0.248	**0.296**	0.298	0.373	**0.563**
Observations	133	108	**108**	108	96	**87**

Note: $p < 0.10$, * if $p < 0.05$; ** if $p < 0.01$; *** if $p < 0.001$.

From the results presented in the regression taking into account selected economic factors important for attracting FDI we can see that trade as a percentage of GDP and GDP annual growth are most significant factors. This means that an increment of trade of 1% may lead to increment of FDI of 1.74% in South-Eastern European countries. The influence of general government final consumption expenditure is also positive, but little less significant (at level of 95%) for attracting future FDI inflow in the region. 1% Increase of the general government final consumption may lead to 4.4% increase of FDI. The influence of the other two economic variables: productivity measured as GDP per employee and unemployment as a percentage of the total labor force, appear to be statistically significant but with a negative sign. This indicates that increasing productivity in this group of countries leads to less FDI inflows. In the other way, decreasing productivity in these countries may lead to more FDI. This opposite interaction between FDI inflows and level of productivity measured as GDP per person in these countries may be explained by the low level of industrialization as manufacturing is the major source of innovation and productivity growth. FDI in this region took advantage of previous existing manufacturing base, went to some smaller sectors or shaped new specialization patterns; and the countries from this region are weak and moderately integrated into international trade and production networks (CEFTA Investment report, 2017). As for the unemployment, it may be explained with

the fact that most of these countries face high unemployment but they are still cost competitive in terms of lower wages and unit labor costs.

The results presented in the last column take into consideration the influence of all nine independent economic and institutional variables on attracting FDI inflows in the region. The results in the last phase confirm the positive and statistically significant influence of the same economic variables: GDP annual growth, trade as a percentage of GDP and general government final consumption expenditure as a percentage of GDP. We should underline that the importance of the variable measuring government final consumption expenditure has the greatest impact in attracting FDI inflows in these countries. An increment of 1% of the general government final consumption expenditure may lead to 10.7% growth of FDI inflows in the countries of South-East Europe.

From all institutional factors taken into account it might be confirmed that the influence of the following four factors: political stability and absence of violence index, monetary freedom as a measure of price stability, business freedom as an indicator of the efficiency of government regulation of business, and financial freedom as a measure of efficiency of the banking and the whole financial sector, are statistically significant and have positive influence in attracting FDI in the region of South-East Europe. The values of the coefficients of all four variables are around 1.2 (1.3 for political stability) meaning that a change of 1% in one of the four variables may lead to 1.2% (1.3% for political stability) growth of FDI inflows.

The variable population growth rate and the variable property rights measuring the degree to which national laws in the region protect private property appear to be not significant in attracting future FDI inflows in the region.

5. Conclusion

South-East European countries experienced prolonged recovery from the last global financial crisis, and their economies still have a weak performance. FDI inflow is also lagging behind and in general is not back to the pre-crisis levels measured as a share of GDP. Manufacturing is a major source of innovation and productivity growth in the countries of South-East Europe. Foreign investors took advantage of previous existing manufacturing base through privatization of steel companies, food industry, textiles; or went to some smaller sectors; or have shaped new specialization patterns in slowly emerging medium-high-tech industries. The region's competitiveness is severely hampered by poor infrastructure development in all areas, which limit trade and investment opportunities within the region. All of the Southeastern European countries and especially CEFTA member-states are weakly or moderately integrated into international trade and production value chains.

The purpose of this paper was to analyze and measure the importance of certain economic and institutional variables and their influence in attracting FDI in these countries. The results pointed out that both the economic and institutional variables are important for the increment of FDI inflows in the region. Among the economic variables the General Government Final Consumption Expenditure as a percentage of GDP

appears to be with the greatest influence in attracting FDI inflows. GDP annual growth and trade as a percentage of GDP are also significant and with positive influence but with a lower value of the coefficient.

From institutional variables taken into account we can confirm that the influence of four factors: Political Stability and Absence of Violence Index, Monetary Freedom as a measure of price stability, Business Freedom as an indicator of the efficiency of government regulation of business, and Financial Freedom as a measure of efficiency of the banking and the whole financial sector, are statistically significant and have positive influence upon attracting FDI in the region of South-East Europe.

The results should be taken into consideration on creating better policies in future. Combined with the goals defined in the Berlin Process the regional dimension should be strengthened. The final goal is to enable positive influence upon future FDI inflow in the region and thus support and enhance its economic growth.

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A CRITICAL COMPARISON OF ENVIRONMENTAL ECONOMICS AND ECOLOGICAL ECONOMICS, COMBINED WITH THE CREATIVE VALUE SYSTEM OF DEGROWTH, FOR A MACROECONOMICALLY EFFICIENT AND EQUITABLE SUSTAINABLE DEVELOPMENT

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Abstract

The intersection of the fields of environmental economics and of ecological economics has called for more research in recent literature. Both fields represent turning points from previously held neoclassical approaches which center on rational decision-making of free market forces and value-neutrality, resulting in growth as the principal macroeconomic development goal. On that basis, natural resources were considered subsidiary to man-made ones, as well as substitutable, commensurable and monetizable, with internalizable externalities, provided appropriate pricing within cost-benefit analyses. Environmental economics and ecological economics both resist those tenets, but with different concepts and methods, especially regarding the notions of sustainability and growth. This research investigates them in more depth, by giving a concise yet comprehensive overview of their origins, principles, and differences. Critiques of neoclassical environmental economics and of weak sustainability are listed and analyzed in a way that does not yet exist in the literature. Methodologically, ecological economics is shown to go beyond environmental economics, by conceptually embracing the complex interconnectivity of macroeconomics, socioeconomics and development economics, and by methodologically encouraging a framework of pluralist research approaches and multidisciplinary collaboration. The research then analyses six macroeconomic solution models as to whether these can be recommended for macroeconomic global sustainable development. A special focus will be on the concept of de-growth. The six solution models are divided into two groups, one called "macroeconomic compensation solutions" and a more progressive one "macroeconomic transformation solutions". The conceptual contribution of this research lies in a unique synthesis and formulation of environmental and ecological economics models. Its methodological contribution is a concise combination of three research paradigms that are particularly suited to ecological economics. Its overall contribution offers conceptually sound, methodologically fruitful and practically viable solutions for macroeconomic policy options, to address worldwide economic, ecological and social challenges.

Keywords: Environmental Economics, Ecological Economics, Development Economics, Macroeconomic Development, Strong Sustainability, De-Growth.

JEL Classification: O11, O44, Q01, Q56, Q57.

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1. Introduction and Overview

1.1. Research Calls for Conceptual Clarity and Methodological Mindfulness

Macroeconomic literature has reacted to the increasing global awareness of sustainability issues by discussing the crossroads of the four broad fields, namely 1) macroeconomics, 2) environmental studies, 3) sustainability concerns, and 4) development studies form a variety of disciplinary angles, such as from those of economics, ecology, the physical sciences (especially biology and geography) and the social sciences (especially sociology, politics, philosophy and ethics). Following calls of recent literature, this research unites and clarifies that discussion from conceptual and methodological aspects with a macroeconomic focus, and with methodological considerations of multidisciplinarity. One entire macroeconomic field and one full concept have attracted special attention in the recent literature, namely ecological economics and de-growth (or post-growth). Within macroeconomics, ecological economics is still a dynamically evolving field. The concept of de-growth or post-growth has started to diversify in academic research only in the second decade of the new millennium. This research differentiates them and then advances their understanding to provide a solid conceptual and methodological foundation for the final macroeconomic solution suggestions to the question of how progress and development should be theoretically framed, and practically considered in policy decision making.

1.2. Crossroads of Macroeconomics, Environment, Sustainability and Growth

Environmental economics and ecological economics have different views on sustainability and development, based on different relationships to some basic principles of neoclassical economics. This caused a rift between them that only recently has begun to be reconciled. Hence after briefly outlining the locus and role of the concept of sustainability in macroeconomics and development economics, the evolution of environmental and ecological economics is traced along these stages: neoclassical economics before the rise of the concept of sustainability, the position of neoclassical economics on natural resource management, the shift from neoclassical to environmental economics, the position of environmental economics on sustainability, and the resulting concept of weak sustainability. Criticism of environmental economics and weak sustainability is analyzed in concise yet comprehensive form in a way that does not yet exist in the literature, before outlining the contributions of ecological economics, its differentiation from environmental economics, and its connection to development economics and the notion of growth.

Environmental and ecological economics will be differentiated in a concise yet complete way hitherto not found in the literature, as one of the conceptual contributions of this research. The methodology section will unite the three paradigms of multidisciplinarity, post-normality and co-evolution in a compact yet operationalizable fashion as the methodological contribution. The analysis and discussion section then synthesizes, compares and analyzes altogether six solution suggestions in literature and policy practice, and evaluates them from a macroeconomic perspective, with a special focus on the concept of growth, and with a view to global sustainable development policy and practice. In the conclusions, recommendations are made, and opinions given on how the

rift between environmental and ecological economics could be overcome from a macroeconomic viewpoint, and for worldwide sustainable development.

2. Literature Review

2.1. Sustainability in Macroeconomics and Development Economics

Sustainability considerations have started to play a key role in macroeconomic theory and practice, especially in economic development. The literature provides reasons in form of sociopolitical issues (such as the fast global population growth or unequal wealth distribution), environmental challenges (such as depletion of the earth's ozone layer, acid rain, loss of biodiversity in form of species extinction, toxic pollution, or the depletion of non-renewable energy resources), or climate change (such as the greenhouse effect or global warming) (see Costanza, 1989, p. 1; Munda, 1997, p. 213). Especially the two invasive processes of extraction and waste disposal, with the usually following environmental degradation, gave rise to the concept of "sustainable development" (Munda, 1997, pp. 213-214).

Sustainable development was first officially, politically and internationally defined on a high level in the 1987 *Brundtland Report* (World Commission, 1987, pp. 43-44) as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (see also Dwyer and Edwards, 2013, p. 246; Gowdy and Walton, 2010, pp. 396-397; Romeiro, 2012, p. 70). In the wake of that report, several United Nations conferences reiterated and detailed that principle on a macroeconomic and worldwide level, such as the two famous Rio de Janeiro Conferences ("Earth Summits") on Environment and Development (UNCED) in 1992 and 2012 (see De Lara and Thöny, 2011, pp. 148-149). Another way to phrase the concept of sustainability would be to maximize, at the same time, the biological, economic and social system goals, such as biodiversity, satisfaction of needs and increase of goods and services, as well as cultural diversity or social justice and participation (Munda, 1997, p. 215). This makes sustainability a multidimensional concept. According to multidimensional criteria analysis, different objectives are hard or impossible to maximize at the same time (Munda, 1997, p. 215). Both macroeconomics and development economics have tried to optimize those broad parameters of economic and environmental concerns, even if they often seem to adhere to diametrically opposed interests. Under the umbrella of the concept of sustainability, the fields of environmental economics and of ecological economics differentiated themselves according to some basic tenets of neoclassical economics, discussed below as far as they are referred to in the analysis and the conclusions.

2.2. Neoclassical Economics before Sustainability: Open and Eco-Systems

Some define neoclassical economics as a "closed system" in both ontology and epistemology (Berger, 2016, p. 36). Others differentiate, and define it as an inconsistent system between orthodox economics (with a supposedly closed-systems approach in ontology and methodology) and heterodox economics (with an open-system approach in both), involving an open-systems ontology and a closed-systems methodology (Dow, 2016, p. 103; Martins, 2014, p. 326). Some of the most notable classical economists of the late 18th to mid-19th centuries (Malthus, 1798, p. 5; Mill, 1848, pp. 7-10; Marx,

1867, p. 168; Ricardo, 1817, pp. 264, 273) held that all economic activity is taking place within an open system of environmental conditions and limitations, an insight that reached neoclassical theory for good in the 1970s, when the economy was put forward as an open system, with resources extracted and returned into the environment in different form, such as waste or pollution (Beder, 2011, p. 141; Kneese, Ayres and D'Arge, 1970, pp. 43, 84, 115-118). Nowadays, the economy is mostly recognized as an open system. One decisive differentiation between neoclassical and ecological economics concerns the question whether the economy is a whole, with the environment being merely part of the macro-economy (as conventional economics sees it), or whether the macro-economy is itself part of a larger, enveloping and sustaining whole, namely the entire Earth as an ecosystem, with the economy thus being an open subsystem of the larger "Earthsystem" [sic] (Daley and Farley, 2011, p. 15). "Ecosystem" in this sense would be defined as the entirety of "population dynamics, food webs, energy flows, interactive behaviors, biogeochemical cycles, spatial organization across landscapes, and co-evolutionary processes" (Beder, 2011, p. 148).

2.3. Neoclassical Economics and Natural Resources: Neutrality, Substitutability

Even as an open system, neoclassical economics upholds scientific objectivity and value-neutrality (Dequech, 2007, pp. 280, 300). Based on Newtonian scientific paradigms, rational decisions lead to optimal results, for instance in terms of monetary calculability (Hamstead and Quinn, 2005, p. 145; Venkatachalam, 2007, 550-551). Based on utility theory and the notion of *homo economicus*, human behavior is explained within well-defined free markets, where individuals ensure the best possible allocation of resources by pursuing their own interests, free from government regulations (Hermann-Pillath, 2015, p. 440; Romeiro, 2012, p. 76; Spash, 2013b, pp. 356-357). In this view, natural resources do not constrain economic activity, since technological progress and reproducible human-made (manufactured) capital can replace natural resources. Even if the available natural resources decline per capita over time, technological progress, if high enough, can raise the productivity output per worker indefinitely, thus offsetting their decline. In short, natural resources can be substituted with man-made capital and technological progress (Gowdy and Walton, 2010, p. 397-398; Hamstead and Quinn, 2005, p. 145; Hermann-Pillath, 2015, p. 433; Romeiro, 2012, pp. 66, 73).

2.4. From Neoclassical to Environmental Economics: Subsidiarity, Monetization

Neoclassical economics approaches began considering issues of the environment and of sustainability by founding "environmental and resource economics" as sub-fields of economics after World War II; those two become an independent field in the 1960s (Beder, 2011, p. 140). Yet those environmental and sustainability considerations continued to be subsidiary to the notion of economic growth, defined as the expansion of the social basket of goods and services (Ghosh, 2017, pp. 13-15; Kallis, Martinez-Alier and Norgaard, 2009, p. 18). Hence environmental economics concerned itself with the intersection of neoclassical economic approaches and social sciences, but still using an evaluation system based on a single denominator, mostly monetary value (Cavalcanti, 2010, p. 61). "Value" would relate purely to commodity exchanges following supply and demand curves, not including wider political, moral, ethical, aesthetic, or spiritual

dimensions (Romeiro, 2012, p. 66). Consequently, sustainability was considered a merely economic concept fully explainable with technological progress and consumer behavior (Gowdy and Walton, 2010, p. 397-398, 403).

2.5. Environmental Economics and Sustainability: Internalizing Externalities

Environmental economics incorporated the notion of sustainability, based on internalizing external costs, or externalities (economic effects not market priced, such as environmental degradation or pollution) into the economic calculus by adjusting prices so that the person who buys or uses goods or services and causes external costs must pay for them, making those costs part of the buying or using decision (Beder, 2011, p. 143). Hence environmental economics also relies on the power of the market, by concentrating firstly on the problem of internalizing environmental externalities after pricing them properly, and then on the efficient management and allocation of natural resources. Consequently, environmental degradation results mainly from the failure of markets to evaluate and price the environment efficiently (Romeiro, 2012, pp. 66-67, 74, 76, 81; Spash, 2013b, p. 357). As an example, the problem of global warming was just a failure of adequately pricing the ecosystem service of climate regulation, which would have mitigated the problem by motivating technological solutions reducing the cost of greenhouse gas emissions (Romeiro, 2012, p. 77).

Environmental economics incorporates environmental factors, cost and benefits into its analysis and appraisals of private or public projects, by including them in a traditional cost-benefit-analysis (CBA), and comparing the resulting aggregate benefits and costs; an example for the latter are environmental externalities. These factors can be included in a CBA after having been converted into monetary measures, with environmental and human-made goods being interchangeable and substitutable (Beder, 2011, p. 141). In a rather radical logical furtherance of this argument, the sustainability concept could itself be done away with, since in a perfectly functioning and competitive market economy, with all externalities internalized, the right price signals will ensure Pareto optimal production and allocation of resources, including environmental ones, which would then just be commodities as all other market goods or inputs (Gowdy and Walton, 2010, p. 399). These considerations played a role in the rise to the so-called concept of "weak sustainability".

2.6. Weak Sustainability: Offsetting Economic and Environmental Capital

A combination of neoclassical and environmental economics approaches led to what became known as "the standard economic view of sustainability" (Gowdy and Walton, 2010, p. 397). Called "weak sustainability", it postulates that an economy is sustainable if it saves or maintains for future generations more than the depreciation of human capital (skills, knowledge and technology) and human-made capital (such as buildings, roads, factories or machinery) plus the depletion of natural capital (environmental goods, such as wetlands or woodlands) (Beder, 2011, p. 143; Munda, 1997, pp. 217-218, 228;). Hence development is considered sustainable if the loss of environmental goods is offset by man-made capital. Importantly to note, this offsetting works both ways: on the one hand, losses of environmental capital can be offset by human capital gains; on the other hand, losses of human capital can equally be offset by environmental capital gains

(Gowdy and Walton, 2010, pp. 397-398; Hamstead and Quinn, 2005, p. 145; Romeiro, 2012, pp. 73-74).

Consequently, proponents of the concept of weak sustainability classify human influence on the environment as an exclusively economic problem. Sustainability then merely means a constant or even growing economic output over time, or the maintenance of economic value measured by market prices (Gowdy and Walton, 2010, p. 396-398; Hamstead and Quinn, 2005, p. 145). To ensure that market prices can always be assigned to all forms of capital and types of resources, sustainability itself must be calculated precisely, which can happen provided two conditions are met: first, there must be complete substitutability between the different forms of capital (for example, between natural products and man-made or recycled ones). Second, there must likewise be a complete commensurability of all types of resources, meaning their overall comparability and measurability, which in practice usually happens the in the one-dimensional form of money (Gowdy and Walton, 2010, p. 401; Munda, 1997, pp. 217-218). Sustainability would then be less a biological or physical resource problem but rather one of correct portfolio management (Gowdy and Walton, 2010, p. 399; Hamstead and Quinn, 2005, p. 145).

2.7. Criticism of Environmental Economics: Substitutability

Neoclassical environmental economics and the concept of weak sustainability have been criticized in many ways: neoclassical environmental economics mostly concerning the aspect of substitutability, and the concept of weak sustainability mostly against the aspects of commensurability and monetization. Under this and the next heading, this criticism is listed and analyzed in a way that does not yet exist in the literature in its concise yet complete form. First follow the arguments why natural capital cannot be fully substituted with man-made capital:

1) Natural capital is essential to produce man-made goods: even presupposing technological progress, any increase in capital will always be limited by the available natural resources.
2) Assuming depreciation of capital over time (the degradation of production means, or monetary inflation), natural resources are indispensable to uphold progress (Munda, 1997, p. 218).
3) If natural capital were completely substitutable by human-made capital, there would be no need to transform natural into man-made capital in the first place (Beder, 2011, p. 143);
4) Natural capital complements man-made capital, thus is indispensable (Romeiro, 2012, p. 78);
5) Unlike man-made capital, natural capital is multifunctional in its support of all life functions (Munda, 1997, p. 218);
6) We simply do not know enough about substitutability, or, in the words of most recent research: “There is considerable debate among economists whether technology can mitigate scarcities through development of substitutes” (Korhonen, 2018, p. 115);

7) According to the physical laws of thermodynamics and entropy, energy cannot be fully conserved, conversed or substituted (Hermann-Pillath, 2015, pp. 434, 436);

8) The law of diminishing returns means that weak sustainability is bound to break down as soon as all the available substitutes are exhausted (Beder, 2011, p. 143);

9) Substitutability might work out on paper and in theory, but can lead to obvious negative trade-offs. As an example, a community could continue using up its natural resources and degrading its natural environment, if it increases its wealth and infrastructure by an equivalent amount of economic or monetary value. If it becomes a sterile and dangerous place to live in, its residents are supposedly compensated by their new material comforts and entertainments (Beder, 2011, p. 143).

2.8. Criticism of Weak Sustainability: Commensurability and Monetization

Below follow the arguments why natural resources should not be commensurable or monetizable:

1) As the substitutability discussion has shown natural and man-made resources not being alike, hence they cannot be commensurable, and thus should not be measured by the same standards, or expressed in traditional and common values and units such as money (Müller 2001, p. 415).

2) An exclusive focus on the gross domestic product (GDP) ignores environmental destruction or degradation, does not value natural resources, and counts repairs and remedies as positive GDP contributions, since they involve economic expenses. All this serves to hide rather than to help the social, environmental and distributive costs of economic expansion (Munda, 1997, p. 214).

3) A main reason for the nowadays widely perceived failure of purely neoclassical methodology has been its methodological limitation to quantification and monetization of environmental and sustainability values (Müller 2001, p. 415).

4) A focus on allocation efficiency for environmental policy decisions tends to ignore wider socioeconomic and sociopolitical issues such as equity (Beder, 2011, p. 141; Common and Stagl, 2005, p. 11).

5) The full value of natural resources only becomes clear only after they have disappeared, which is known as the "compositional" or "transparency problem" (Gowdy and Walton, 2010, pp. 396, 398, 401). An example is that of putting monetary value on a species, such as blue whales: this still does not guarantee their survival, and from a purely monetary viewpoint it seems preferable to exterminate them and invest the profit in growth industries rather than in their well-being. In another example, the Amazon rainforest could be removed if the resulting profit is reinvested into other, man-made capital (Beder, 2011, p. 142-143).

6) Cost-benefit analyses are unsuitable to account for cumulate losses over time, such as a slow but steady environmental degradation within a community, which may pass unperceived for a long time, yet can lead to a sudden and complete ecosystem breakdown once a critical threshold is crossed (Beder, 2011, p. 142).

2.9. Ecological Economics and Sustainability: Many Sciences and Denominators

As a reaction to this criticism, in the late 1980s the field of "ecological economics" was established, for broad, ecological, interdisciplinary, and holistic approaches to the study and management of the world. Before settling on its name, the literature discussed these alternatives: "ecology and economics", "economic ecology", "eco-economics", "natural economics", "sustainability economics", "socio-environmental economics", "eco-development", and even "ecolnomics" or "econology" [sic] (Cavalcanti, 2010, pp. 60-61; Costanza, 1989, p. 1; Romeiro, 2012, pp. 65, 67; Spash, 2013b, pp. 352, 359). Hence ecological economics includes natural sciences (biology and ecology) and is based on a multiple-denominator evaluation (including carrying capacity, environmental degradation, or socioeconomic aspects of consumption and destruction) (Dzeraviaha 2018, pp. 15-16; Munda, 1997, pp. 216, 220). Ecological economics was thus defined as "a new approach to both ecology and economics…to make economics more cognizant of ecological impacts and dependencies… [and] ecology more sensitive to economic forces, incentives, and constraints" (Costanza, 1989, p. 1; similarly Dzeraviaha 2018, p. 15). Later it was defined as "a new transdisciplinary field of study that addresses the relationships between ecosystems and economic systems in the broadest sense… differ[ing] from both conventional economics and conventional ecology in terms of breadth of its perceptions of the problem, and the importance it attaches to environment-economy connections" (Costanza, Daly and Bartholomew, 1991, p. 3; Dzeraviaha 2018, p. 15; Munda, 1997, p. 220).

2.10. Differentiation between Environmental and Ecological Economics

Some suggest environmental and ecological economics to be seen on a continuum between pure economy and pure ecology: environmental economics would be situated close to pure economics, while ecological economics would be situated around the halfway mark, and slightly closer to ecology (Cavalcanti, 2010, p. 61). Others imagine environmental economics in the intersection between economy and ecology from an economic perspective, including the field of environmental impact analysis, whereas ecological economics deals with that intersection also from an ecological viewpoint, including resource economics. In addition, ecological economics includes issues mainly ecological issues such as waste heat management, or environmentally friendly technologies such as solar energy (Costanza, Daly and Bartholomew, 1991, p. 4). While the macroeconomic goal of environmental economics is the growth of the national economy, that of ecological economics is the sustainability of the global economic and ecological system. Finally, environmental economics focuses mainly on the human species, while ecological economics contemplates the whole ecosystem, including non-human elements (flora, fauna, and climate) (Beder, 2011, p. 146; Costanza, Daly and Bartholomew, 1991, pp. 5-6).

2.11. Ecological Economics: Economic Subsystem and Development Economics

Ecological economics sees economic and ecological concerns as mutually constitutive and co-evolving. Investigating the interactions between the economy and the environment, it sees the local and national economy as a subsystem of the larger global

and local ecosystem (Romeiro, 2012, p. 78); Venkatachalam, 2007, p. 551). It thus considers the relationship between three systems:

1) the economic system that comprises the economic activities of humans, such as production, exchange, and consumption;
2) the human system that includes all the activities of human beings on earth, such as biological life processes, culture, aesthetics, and morality;
3) the natural system, which in turn encompasses both the economic and human systems (Munda, 1997, pp. 225, 228).

As the economic system cannot comprise all human activities, it must be a subsystem of the human system, and its expansion limited by the size of the global ecosystem. Hence any harmful activities or effects done within or caused by the economic system affect the bigger human system and determine and limit the economic system itself (Munda, 1997, pp. 225, 228). In a wider socioeconomic context, ecological economics holds that development economics should not be framed as a continuously rising, linear process within a Western or Euro-centric understanding of progress. Instead, it should be considered as an evolutionary negotiation of cultural, social, political, economic and ecological debates. Rather than posing the supremacy of either economics or ecology, both are indispensable branches of human development (Munda, 1997, p. 223). Finally, and based on a holistic understanding of development, the concern with growth is only one aspect of many, and is part of the larger notion of sustainability, meaning a preservation of the resources that enable that very growth (Ghosh, 2017, pp. 13-15; Müller 2001, p. 420-423).

2.12. Ecological Economics: From the Limits of Growth to Zero Growth

With the economic subsystem limited by the size of the global ecosystem, the term "scale" is used to describe "the physical scale or size of the human presence in the ecosystem, as measured by population times per capita resource use", and the limits of scale are defined as "the regenerative or absorptive capacity of the ecosystem" (Munda, 1997, p. 225, citing Daly). This begs the question whether there is an "optimal scale" for an economy (Munda, 1997, p. 225; Romeiro, 2012, p. 80-81), as "the scale of the economy compatible with its ecological base", if one is mindful of the concept of carrying capacity, defined by "thresholds of ecosystem resilience" (Romeiro, 2012, p. 78). A widely used images is that of a boat which, surpassing its load limits, will sink (Cavalcanti, 2010, p. 57-58). Another widely used metaphor is that of "spaceship earth" floating in space, and as the largest available economic and environmental system, cannot receive or dispose of material, and thus must survive with the available resources, which are limited in quantity and finite in duration (Mithukrishnan, 2015, pp. 95-96; Spash, 2013a, p. 348; Romeiro, 2012, p. 78). In a "cowboy versus spaceship economy" metaphor, the economic system is either represented by a cowboy on vast and mostly empty frontier plains, who does not have enough critical mass to cause irreversible ecosystem damage, even if subscribing to the slogan "bigger is better". Or, the economic system is represented by a spaceship crew, which can endanger its own survival if it does not handle available resources properly, and hence is mostly concerned with the maintenance and enhancement of the natural capital stock, minimizing material

production and consumption, and measuring success not just in growth or quantitative economic expansion criteria such as the GDP, but in the quality, resilience, coherence and complexity of human, natural, man-made, social and financial capital products and stocks, such as quality of life, well-being and longevity, community stability, or cultural diversity (Hamstead and Quinn, 2005, pp. 144, 150; Romeiro, 2012, p. 78).

Furthering that metaphor, some suggest pursuing and implement "zero growth", before growth inevitably will stop by itself (Romeiro, 2012, pp. 70, 79-80). Based on Meadow et al.'s pioneering work, commissioned by the Club of Rome, *Limits to Growth* (1972, updated 2004), they argue that growth is limited by energy and resource limits. Unlike proponents of "technological optimism", who see such limits to be overcome by human ingenuity, technological development and progress (see Romeiro, 2012, pp. 66-68), "technological pessimism" holds that basic energy and resource constraints will sooner or later stop economic growth. In an analogy from life sciences, natural systems all stop at a certain size due to resource constraints to maintain a healthy level (Costanza, 1989, pp. 2-3). It is pointed out that an ever-increasing average world income and consumption per capita ultimately threatens the entire planetary ecosystem. Besides, economic growth is more relevant for poorer, but less for richer economies (Belinga et al., 2018, pp. 304, 306; Common and Stagl, 2005, p. 194), but even the poorer ones are recommended to avoid the richer ones' mistakes of heavy environmental impacts and footprints (Romeiro, 2012, p. 69).

3. Methodology

3.1. Multidisciplinary Paradigm

In contrast to the traditional evaluation methods of neoclassical economics and environmental economics (consisting mainly of monistic, mathematical and monetary cost-benefit analyses, based on market philosophies linked to consumer behavior), ecological economics recommends a plurality of methodological perspectives for macroeconomic decision-making. Considering value conflicts inevitable, it asks scientists and decision makers to contribute to collaborative frameworks for the interdisciplinary intersection between economic and ecological issues (Beder, 2011, pp. 146, 149; Hamstead and Quinn, 2005, p. 151; Munda, 1997, pp. 228-229). They called that innovation "treat[ing] integrated economic-ecologic systems with a common (but diverse) set of conceptual and analytical tools" (Costanza, 1989, p. 1), and later widened that innovative viewpoint to "a new transdisciplinary field of study…in terms of breadth of its perceptions of…environment-economy connections" (Costanza, Daly and Bartholomew, 1991, p. 3; Munda, 1997, p. 220).

Thus equipped, ecological economists focus on salient recent problems (Beder, 2011, p. 148; Costanza, Daly and Bartholomew, 1991, p. 5). They explicitly include economics, ecology, biology, geography, sociology, politics, philosophy, ethics, and psychology (Herrmann-Pillath, 2015, p. 432; Spash, 2013b, p. 358) in what they call a "multidimensional paradigm" (Munda, 1997, pp. 228-229). On this basis, they propose a "transdisciplinary" methodology for ecological economics (Cavalcanti, 2010, p. 60), in which a "methodological pluralism" allows for a "multiplicity of approaches" that

"transcend the boundaries of the discipline in seeking understanding… [of] new concepts and mental structures which subsume and extend the approaches of even an interdisciplinary approach" (Spash, 2013b, p. 358; Venkatachalam, 2007, p. 551). This enables them for instance to account for complex individual motivations beyond self-interest: people can decide and vote not just as resource-using consumers, but also as environmentally and ecologically concerned citizens, to preserve those resources better (Beder, 2011, p. 142). Multidimensionality and multidisciplinarity are finally also suitable to ensure a not overly anthropocentric view, and to care also for non-human interests, such as other living creatures and collectives, such as animals, plants, and entire ecosystems (Beder, 2011, pp. 142, 146; Common and Stagl, 2005, p. 9).

However, ecological economics acknowledges two downsides of this inter- or transdisciplinarity: first, it might make it harder to achieve methodological unanimity (Dzeraviaha, 2018, pp. 15, 18). Second, it might be unable to overcome political or social barriers to collaboration in solving environmental challenges, and in turning its insights into widespread implementations of effective environmental measures. For instance, the working areas and tasks of government ministries, departments or agencies are often split to deal with stakeholders from different economic sectors, who all have vested interests in avoiding costs imposed on them by their governments, even if they are the ones who impose environmental burdens on the rest of the community (Beder, 2011, p. 149).

3.2. Post-Normal Paradigm

Ecological economics also employs a "post-normal" paradigm, in recognition that in our time of complex globalized issues and challenges, it so happens that most values, stakes, decisions and even facts are interpretable, therefore ambiguous and uncertain, and as a result, often highly contested (Costanza, 1989, p. 3; Munda, 1997, pp. 221-222; Cavalcanti, 2010, p. 58; Hamstead and Quinn, 2005, p. 144; Romeiro, 2012, p. 66). Consequently, values and ethics cannot remain neutral or indifferent either, but instead require conscious and deliberate decisions by all stakeholders, and are flexible to grow or change according to constantly evolving and ramifying scientific progresses and insights. "Optimal" outcomes are thus illusionary; in their place, the best we can do, but indeed should do is to render decision-making processes as fair and transparent as possible.

3.3. Co-Evolutionary Paradigm

Finally, recognizing the interconnected influence of economic, environmental and social issues, ecological economics also postulates a "co-evolutionary paradigm". It was taken from co-evolutionary biology, according to which two closely interacting species can change their genetic traits as a reaction to the dominant genetic traits (and thus the selective pressures) of the other one. In application, economic, social and the entire natural and human development can be considered as a process of adaptation to a constantly changing environment, or as being subject to change, while at the same time this development is itself a source of change (Munda, 1997, p. 223). The co-evolutionary paradigm can be considered as complementing both the multidisciplinary and the post-normal paradigms: depending on the concrete case (such as the cultural or national

locality, the involved stakeholders, their economic pressures, and their ecological preferences), different methodological approaches (multidisciplinary paradigm) might be applied in a flexible way (post-normal paradigm) and can then be adapted over time according to any changed circumstances (co-evolutionary paradigm).

Based on these conceptual and methodological insights, the below analysis and discussion section is divided in two parts, namely in what I call "macroeconomic compensation models" and "macroeconomic transformation models" for sustainable development. As those names indicate, I consider the latter to be the most progressive and recommendable measures for current and future policy and practice. The conclusion evaluates how feasible and recommendable they are from a macroeconomic viewpoint, for efficient and equitable sustainable development.

4. Analysis and Discussion

4.1. Macroeconomic Compensation Solutions for Sustainable Development

4.1.1. Compensation Solution 1: Internalization into Ecological Accounts

Some ecological economists suggest an economic-ecological integration, such as of resource use and pollution emissions (Munda, 1997, p. 216): externalities are not so much accounting problems as processes of shifting costs between individual and institutional participants of unequal power and influence, which traditionally made economic values count for more than ecological ones (Kallis, Martinez-Alier and Norgaard, 2009, pp. 14-17). Hence they internalize externalities (such as environmental damages or reparations) into ecological accounts. Others recommend protecting the environment by internalizing its value concerns, but not into the economic system, but instead into an ecological one (Müller 2001, p. 415). Finally, some consider complementary measures and multi-criteria decision-making processes (Beder, 2011, p. 147).

Internalizing externalities is criticized for mistakenly assuming that the originally inflicted damage is equal to the compensation. In the earlier example of a company polluting a community, the community might also spend the income on something that for them is equally worthwhile than correcting the pollution, so the sufferers from the original pollution would remain disadvantaged. Hence the argument of internalizing costs rests on the assumption that compensation is as good as, or better than avoiding damage from the beginning, and that substitutions are equal to the damage. Yet reality is different: polluters or environmental wrongdoers simply continue their misdeeds if they can financially afford it. They might be forced to reduce costs, but not necessarily in the area where they are charged. In other words, charges are rarely equivalent to the damages they mean to prevent or compensate (Beder, 2011, p. 143). Besides, paying for damages, even if those are alleviated, can still turn out to be the more shortsighted solution. For example, companies might opt for end-of-pipe emission measures (such as installing filters) that are less effective than remodeling their entire plant with cleaner technology, or opt for alternative and displacement actions (such as planting trees in developing nations) instead of reducing their original emissions (Beder, 2011, pp. 144-145). One way to ensure or enforce the internalization of externalities is via rights such as laws and regulations, discussed below.

4.1.2. Compensation Solution 2: Right-based Economic Instruments

Proponents of rights-based economic instruments invoke the "tragedy of the commons", namely that the lack of ownership of public goods and some natural resources (such as the atmosphere, waterways and some land areas) make them especially vulnerable to exploitation or extermination. Measures to protect them can either be laws, regulations, sanctions or charges, or the creation of artificial property rights to ensure their responsible treatment and management. For example, laws can force polluters to heed external costs by imposing limits to what can be discharged or emitted. An example for the internalizing effect of such taxes or charges is that of a firm discharging waste into a river: it could be charged a fee to cover the cost of lost recreational amenities and fish life. Hence the optimal level of pollution is the level at which the cost to the company of cleaning up the pollution equals the cost of environmental damage caused by that pollution. The company will clean up its pollution until any further reduction in pollution would cost more than the remaining charge, or until it is cheaper to pay the charge than reduce the pollution. The he polluter is better off for being able to continue to pollute, and the community is better off for receiving compensation as a Pigouvian tax or punitive charge, which can be used to correct the environmental damage. Practical experiences have revealed a preference for taxation over legislation, but also of free market consumer choices over taxation (Beder, 2011, p. 143-144).

As another rights-based instrument, damages caused can be traded in the "cap-and-trade system" within emission trading schemes, under which rights and permits, for instance to pollution, are allocated to firms which can either use or swap them, depending on their willingness to comply or to pay (Beder, 2011, p. 144). Yet an argument against rights-based instruments is that they are still market-based environmental policies, and thus indirect methods of achieving environmental goals. Rules that change decision-making conditions instead of directly prescribing remedial actions cannot ensure that the changed conditions will cause the desired decisions. In practice, emissions trading is generally preferred to taxation (Herrmann-Pillath, 2015, p. 440); yet emissions trading has so far failed to show significant environmental quality improvements (Beder, 2011, p. 144).

4.1.3. Compensation Solution 3: Ecosystem Services

Ecosystem services are defined as "including provisioning services (such as food, water, fibre and fuel), regulating services (such as carbon sinks, flood mitigation and waste treatment), cultural services (for example spiritual values, aesthetic pleasure and recreation) and support services (for example soil formation and nutrient recycling)" (Beder, 2011, p. 147; similarly Ballet, Marchand, Pelenc and Vos, 2018, p. 21). Hence ecosystem services provide natural capital in form of services to the economy. To be maintained, they must be paid for, usually by governmental institutions, in form of payments for ecosystem services (PES) to landowners and managers to conserve their own properties' ecosystems. Markets for ecosystem services (MES) include for example emissions trading or wetland mitigation banking (Jespersen and Gallemore, 2018, pp. 507, 510; Vatn, 2018, p. 170; Liua and Kontoleon, 2018, pp. 48-49). Some view ecosystem services positively, namely as an interdisciplinary integration of economic and ecological knowledge bases (Beder, 2011, p. 148).

Critics call ecosystem services yet another commodification of natural goods and resources, but now on the level of entire ecosystems. Hence they invoke the arguments against neoclassical and environmental economics (trust in market regulation, individual self-interest, substitutability, commensurability, allocation efficiency, and lack of moral-ethical frameworks) also against ecosystem services. Due to the complexity of ecosystems, such services might even reduce our scientific understanding of them. Also, such services favor a project-by-project approaches that tend to ignore the interconnectivity and interdependence of ecosystems, and foster overly obsequious attitude to those governmental or local institutions that are supposed to support them (Chan et al., 2017, pp. 110, 115; Ishihara, Pascal and Hodge, 2017, pp. 45-46, 50-51). As an example, wetland mitigation banks often assume that the value of a given wetland can be estimated in terms of acreage, and that a wetland in one watershed is equivalent to a wetland in another one, even though wetlands perform specific and different functions for their surrounding ecosystem. In another example, the view of forests as ecosystem service providers in form of carbon sinks has led to the growth of plantations without regard to their impact on local water supplies, biodiversity and people's livelihoods (Beder, 2011, p. 148).

4.2. Macroeconomic Transformation Solutions for Sustainable Development

4.2.1. Transformation Solution 1: Distributional Equity

Distributional equity is suggested as intra-generational equity (within the same generation, such as trying to overcome the global North-South divide) as well as inter-generational equity (between different generation, for instance regarding the use of non-renewable resources) (Hamstead and Quinn, 2005, pp. 148, 152-153; Kashwan, 2017, pp. 139-140, 144-145). An example for intra-generational inequality is *spatial ecological distribution*, such as CO2 (carbon dioxide) or SO2 (sulfur dioxide) emissions and their burdens of breathing problems or acid rain. Examples for inter-generational inequality are *temporal ecological inequality* brought about by the nuclear energy in form of radioactive waste, or the socio-ecological inequality of "environmental racism", when polluting or waste disposal industries are located in, or are transferred to areas of socially disadvantaged population groups (Munda, 1997, p. 216). In such cases, the perpetrators are usually socioeconomically different from the victims. Policy suggestions are appropriate allocation via full-cost accounting (including an economic, social and environmental calculation) and distribution in form of welfare economics. This includes considering not just which resources can be consumed, but also which ones should remain in the ecosystem untouched (Hamstead and Quinn, 2005, p. 148).

4.2. Transformation Solution 2: Strong Sustainability

Part of the literature postulates the concept of "strong sustainability", defined as "sustaining the life support systems of the planet including the evolutionary potential of the biosphere" (Gowdy and Walton, 2010, p. 397). It stresses the retention, improvement and maintenance of existing and future capital, as opposed to economic expansion, and defines "development" as overall qualitative improvement of all capital, rather than the quantitative expansion of just one type (Hamstead and Quinn, 2005, p. 145).

Specifically, it considers certain types of natural capital as essential, unique, non-reproducible and thus not readily substitutable by man-made, manufactured capital. Examples are the radiation protection effect of the ozone layer, the climate-regulating functions of ocean phytoplankton, the watershed protection functions of tropical forests, or the pollution-cleaning and nutrient-trap functions of wetlands, or genetic biodiversity (Beder, 2011, pp. 143, 147). These types of natural capital should be protected and sustained over time in holistic and physical terms, and not just in economic terms (Gowdy and Walton, 2010, p. 398). Their stocks should be monitored and measured, but not just with monetary indicators (Cavalcanti, 2010, p. 58; Gowdy and Walton, 2010, p. 406), and instead directly and physically, for instance in so-called "satellite accounts" (Munda, 1997, p. 226). Advocates of strong sustainability also hold that the current global ecological and social crises require fundamentally different ways to interact with our surrounding ecosystems, instead of the more incremental approaches favored by weak sustainability approaches (Hamstead and Quinn, 2005, p. 145).

4.3. Transformation Solution 3: Sustainable De-Growth

The limits-to-growth argument is taken to the last level with the concept of "sustainable economic de-growth", also called "post-growth", which has started to diversify in academic research only since 2012 (Gerber and Gerber, 2017, pp. 551-552; Weiss and Cattaneo, 2017, p. 220). Sustainable de-growth is not about discarding or decreasing the GDP, since negative externalities (such as loss of biodiversity, environmental degradation, climate change, or cultural erosion) could still be deducted from it, depending on the applied accounting principles. Rather, sustainable de-growth is about creating values and systems of an alternative, smaller-scaled economy, adapted to the physical needs of ecosystems and humans (Belinga et al., 2018, pp. 304, 307; Hamstead and Quinn, 2005, p. 151; Kallis, Martinez-Alier and Norgaard, 2009, pp. 14-17). Interestingly, the global economic crisis of 2008 was considered a special chance to implement such strategies, and such strategies were argued to have been used better in Europe, the USA and Japan than elsewhere. Furthering this insight, some argue that socio-ecological transitions of such type and magnitude should be used to move capital to smaller economies in a socially fair and equitable manner, thus progressively burdening the more privileged social strata, which would be consistent with their responsibility for, and profit gained from the previous pattern of unbalanced wealth buildup (Kallis, Martinez-Alier and Norgaard, 2009, pp. 22-25).

Critics point out that limiting growth and restricting choices of present generations for the sake of future ones are hard to argue for and to achieve in societies built upon economic surplus (Belinga et al., 2018, pp. 309-310; Drews, Antal and van den Bergh, 2018, pp. 265, 267; Gowdy and Walton, 2010, p. 404; Kish and Quilley, 2017, p. 306; Romeiro, 2012, pp. 69, 72; 82). For some, the concept and term of "sustainable growth" is "totally inappropriate", as any growth as well as sustainability considerations are a priori limited by ecological carrying capacities (Cavalcanti, 2010, p. 58). Finally, many are mindful that zero growth or de-growth would have to stop growth without triggering macroeconomic meltdowns or consumer shockwaves. The former can be prevented by formulating and implementing sound macroeconomic policies (which would constitute a form of "environmental macroeconomics") against problems such as unemployment or inequality, or as incentives to technological innovation. People would need some

altruism to accept restrictions for the sake of the environment or wider ecology, especially if those go hand in hand with zero growth. Yet such altruism may be fostered by two realizations: that the alternative would be a macroeconomic collapse of even greater proportions, and that the current level and degree of material comfort could already more than enough for all, so that further growth would be counter-productive and even harmful (Romeiro, 2012, p. 82).

5. Conclusions

If we unite our methodological contributions (the combination of multidimensional, post-normal and co-evolutionary paradigms) with some solution suggestions by the literature (such as strong sustainability), unique models can evolve, or new impulses can be given to existing models, while they can now be holistically evaluated, all of which adds to the overall contribution of this research. To start with, the solution of internalizing externalities is admittedly, a step beyond environmental economics based on neoclassical principles, in that externalities are now internalized specifically into ecological accounts. However, it attracts the same critique as environmental economics based on neoclassical approaches: that it upholds the principles of substitutability and commensurability between economic and environmental resources, whose rejection was one of the basic motivations for founding the field of ecological economics. The weightiest argument seems to be that their practical efficiency remains highly questionable, or even disproven by reality, hence it can be rejected.

Ecosystem services seem to differ in form, but not in effect: rather than internalizing externalities, they keep the externalities external, but the environmental improvement brought by their suggested services seems to be firstly only a matter of degree or shading, and secondly addressing symptoms (servicing a damage done) rather than their causes (avoiding damaging behavior in the first place). Rights-based economic instruments almost by definition concede an economic inequality between environmental perpetrators and the ecological systems or victims which they are supposed to protect. In practice, every company or individual with enough financial means can essentially do any desired harm to the environment, provided they are able to offer the legally stipulated amount of compensation. This might even completely counteract and thwart the purpose of those regulations, since the more economically affluent perpetrators are, the more severe the damage they are able to inflict to the environment and the society, whereas those who are on the opposite end of the socioeconomic scale (victims and ecosystems) are usually the ones most suffering from the consequences.

Distributional equity and strong sustainability both depart from a clear awareness of the differences between environmental and ecological economics. Their holistic approaches mean that their suggestions have no economic or social side effects that would cancel out their positive ecological intentions. Provided real equity, distributional equity would also ensure a population's widespread motivation to design, implement and control measures for maintaining environmental standards, since easy financial release as under rights-based economic instruments would not be possible.

As for strong sustainability, we could demand that all bio-physical indicators or satellite accounts, even if not integrated in monetary terms in national income accounting, should

be explicitly welcome to contentious scientific research and sociopolitical opinion and controversy about their value and place, both in the macroeconomic and in the wider social system. Such transparency would have a similarly motivating effect as in the instrument of distributional equity, as now public access and monitoring would ensure a wide following and support of strong and far-reaching sustainability measures.

Finally, the concept of de-growth is often misunderstood of meaning re-growth or down-growth, that is, as a loss of already available levels of progress and material consumption. As outlined earlier, instead it asks merely for a re-orientation and re-design of our value systems, so that the already available levels of material comfort could be considered as sufficient, contributing to enhanced personal and societal health and thus sustainability of individual, intra-generational inter-generational and international levels of community and cooperation. Hence "growth" as such could still be pursued and achieved by all and for all. It would merely be a different kind of growth, and maybe one that economic philosophers have recommended for ages, for instance inner growth, work-life balance, personal satisfaction and ultimately happiness. There would then be a clear link between de-growth and distributional equity, since a reorientation of our values, where growth can still be pursued, would be based on an equitable allocation and distribution of available natural resources. Such a form of growth might even be considered by many as increasingly fulfilling.

Maybe a final quote from American conservationist John Sawhill, professor and 12th president of New York University (NYU), as well as president and CEO of the global charitable environmental organization *The Nature Conservancy*, best encapsulates these reflections and directions in a nutshell: "A society is defined not only by what it creates, but also by what it refuses to destroy" (quoted in Menon, 2014, p. 18; Swing, 2017, p. 111; and UNESCO and UNEP, 2015, p. 10).

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MODELING MOMENTS OF ORDER THREE AND FOUR OF DISTRIBUTION OF YIELDS

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Abstract

The different ways of assessing risk are numerous in the financial literature. Regulation has made it a function of Value-at-Risk. Recalling the inadequacy of current approaches, the recent crisis is encouraging us to have tools giving more information on losses and gains. In recent years, modern statistics have developed a series of probabilistic tools that today have direct applications in finance. This is particularly the case for the use of the order three and four moments in the Valut-at-Risk calculation. For the study of leptokurticity, or non-Gaussianity, and the asymmetry of the distribution of yields. This work aims to apply this technique to types of financial assets including CAC40 member companies. The analysis of the regulation and its evolution following the economic crisis of 2008 make it possible to define the stakes and the difficulty of the measurement of the risks. The presentation of the concept of moments of order three and four exhibits their properties and shows that they bring more information on the tails of distributions than do the classical moments. The distribution of the returns of these securities makes it possible to show that this is a case of financial assets whose behavior is far from a normal distribution and thus requiring special techniques. Finally, the empirical analysis of CAC40 financial securities over a long period shows the benefit of order three and four moments in stalling laws and building more robust quantile estimators than those built from a law. Normal or by retaining historical distributions.

Keywords: Valut-at-Risk, the study of leptokurticity, and the asymmetry.

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1. Introduction

The theory of finance concerns the study of the prices of financial products and more precisely their temporal evolutions. A financial model is most often based on a representation of the prices of financial assets (or interest rate levels). Such representation can be sought from the perspective of a better understanding of financial markets, or in a prospective development of tools to improve financial management: risk management, asset allocation, creation of new products financial.

Financial modeling always balances the adequacy of observations in financial markets with its convenience of use. Modeling that seeks to produce all the statistical properties of observations generally leads to a complicated model that often becomes difficult to use, theoretical calculations being generally difficult to conduct. On the other hand, excessive simplification of the models makes it possible to carry out numerous calculations, but at the expense of the efficiency of taking into account the structure of the returns. In this paper we simulate the Value-at-Risk based on the Monte Carlo simulation and then calculate the Gaussian Value-at-Risk with different levels of quantiles, and then in the end we move to Value-at-Risk according to approaches (Cornish Fisher, Gram Charlier, and Jonson) who take into consideration the three and four moments of the distribution. We analyze the main statistical properties of the financial series and we propose a coherent modeling of most of these properties.

So is the VaR (concept of ruin) used in insurance and then in the trading rooms (JP Morgan - RiskMetrics) she played a very important role in the analysis of risk and financial reserves. The sophistication of market instruments and their aggregation into more complex portfolios (arbitrage, hedging, multiple asset classes) has stimulated research to improve this tool. It has become indispensable for establishments with complex activities, and the regulator has made it a key element in loss and profile evaluation models. VaR has been criticized for its inadequacies (variety of results according to the laws used, information on the risk very different according to the level of confidence retained, non-additivity). The crisis also highlighted new or insufficiently formalized risks (liquidity, model risk, endogeneity, systemic risk). It also calls for a better understanding of the behavior of assets in the extremities (maximum loss or gain), for this techniques were developed from order statistics in order to build estimators that better take into account the maxima information in distributions. A recourse to the moments of order three and four proves useful for the calculation of a VaR which would contain more information on the realizations of the profits and losses.

Thus, starting from the standard approach of Bollerslev and Zhang (2003), we will include in these models of asset valuation higher order moments (moments of order three and four). Indeed, we will be inspired by the theoretical justifications of Jurczenko and Maillet (2006) to introduce in the calculation models of the VaR, the moments of orders three and four. To better exploit this information provided by the proposed extensions on classical models of valuation with higher order moments (see Jurczenko and Maillet, 2006), Several measures of risk assessment of an asset from homogeneous distributions proposed in the literature of (see Back and Weigend, 1997 and Giot and Laurent, 2004) will be used below to compare different approaches. These are the Gaussian VaR (characterized by the mean and standard deviation of the security's returns), the Gram-

Charlier VaR (the asset returns follow a GC distribution), the VaR-Jonson (asset returns follow distributions from Jonson) and VaR-Cornish-Fisher (asset returns follow Cornish Fisher distributions). Thus, to compare and analyze the reliability of the various proposed alternative VaR measures, several backtesting procedures will also be implemented on the basis of the most used tests. We will use the failure proportion test (Kupiec) which is based on the estimated number of VaR exceedances estimated by the model. We will also use the Christoffersen confidence interval test.

To complete our project we use two titles of the CAC40: Total and Bouygues, chosen for their characteristics different from the moments of order three and four. In the first part, we will study the stylized facts that make it possible to identify the problem of non-normality of autocorrelation, or of volatility. When the second part is devoted to the presentation of VaR. And finally the last part is the subject of a study where modeling (empirical applications), for a period ranging from 02/01/2008 to 28/12/2013.

2. Value-at-Risk and Modeling of the Three and Fourth Moments of Financial Returns Distributions

By definition, VaR is the maximum loss that a portfolio manager may experience during a certain period of time with a given probability. Assuming that this probability is 95%, the margin of error for this maximum loss is only 5% if the cash flow distribution of a portfolio obeys a normal distribution. Suppose also that the random variable X represents the value of the portfolio, with $X \sim N(\mu, \sigma)$. The random variable X can be rewritten in terms of standard normal variable ε centered reduced:

$$Pr(r_h < VaR) = p \quad (1)$$

With $r_h = Ln\left(V_{t+h}/V_t\right)$ the yield of the asset on the horizon h, and V_t the value of the index at time t. By constriction this VaR is a generally negative number. The $\emptyset$ (P) is the quantile function of the normal centered reduced law, with the known value of p and h, the VaR can also be written:

$$VaR = \propto_h + \sigma_h \times \emptyset^{-1}(P) \quad (2)$$

Where $\propto_h$ is the quantile level and σ_h is the standard deviation of yields on the horizon h, and $\emptyset^{-1}(P)$ the quantile function of the reduced normal centered equation.
The value of the VaR reflects the amount of the loss that the investor could not exceed with a certain probability over a specific time horizon. This approximation does not take into account extreme events that may occur that could lead to more severe losses. This leads the investor to make biased decisions based on VaR by underestimating the losses that can be avoided by using other estimation methods.

The extreme events produce irregularities in the yields, but also breaks that are reflected in their distributions by asymmetry and leptocurticity. To account for these phenomena we retain in this study the Gram-Charlier, Cornish-Fisher and Johnson methods, which use the first four moments of returns, and provide the approximate quantities of the

unknown distribution of a portfolio return. . Using the VaR formula, this quantity approximately $\emptyset^{-1}(P)$, the quantile function of the yield distribution.

2.1. Gram-Charlier

The formula of VaR in equation (1) requires the quantile function for the approximate Gram-Charlier density. Which can be inverted numerically to calculate the VaR. the Gram-Charlier approximation is given by:

$$\emptyset_{GC}(P; k_3, k_4) = \emptyset_N - \frac{k_3}{6}[f_N \times (k^2 - 1)] - \frac{(k_4 - 3)}{24}[f_N \times k(k^2 - 3)] \qquad (3)$$

whether $\emptyset_{GC}(z; k_3, k_4) = \left[1 + \frac{k_3}{6}(z^3 - 3z) + \frac{(k_4 - 3)}{24}(z^4 - 6z^2 + 3)\right] \times f_N(z)$

Where $\emptyset_N$ and f_N are respectively the standard normal distribution and density function evaluated at k, $k_3 = E[z^3]$ is the skewness coefficient and $k_4 = E[z^4]$ is the kurtosis coefficient. The VaR of Gram-Charlier is then calculated as follows:

$$VaR_{GC} = \propto_h + \sigma_h \emptyset_{GC}^{-1}(z; k_3, k_4) \qquad (4)$$

2.2. Cornish Fisher

The Cornish-Fisher approach (see, for example, Zangari [1996]) leads to the following approximation:

$$w_\propto = Z_\propto + \frac{Z_\propto^2 - 1}{6}k_3 + \frac{Z_\propto^3 - 3Z_\propto}{24}(k_4 - 3) - \frac{2Z_\propto^3 - 5Z_\propto}{36}{k_3}^2$$

Where w_α is the corrected percentile of the distribution at the α threshold, $Z_\propto = \Phi_N^{-1}(\propto)$ where α is the quantile level, $\Phi_N^{-1}(\propto)$ the quantile function of the normal distribution centered reduced, k_4 the coefficient of kurtosis and k_3 the coefficient of skewness. The Cornish-Fisher VaR is written as follows:

$$VaR_{CF,\propto} = \mu + \left(Z_\propto + \frac{Z_\propto^2 - 1}{6}k_3 + \frac{Z_\propto^3 - 3Z_\propto}{24}(k_4 - 3) - \frac{2Z_\propto^3 - 5Z_\propto}{36}{k_3}^2\right)\sigma$$

With μ the mean and σ the standard deviation of the distribution, so the Fisher VaR can write as follows:

$$VaR_{CF,\propto} = \mu - w_\propto \times \sigma$$

For skewness distributions below zero or negative and where the kurtosis is greater than three, the VaR is shifted to the left relative to the Gaussian VaR and thus allows to take into account the deviations from "normality". By hypothesis this VaR correctly represents the risk if k_3 is close to zero, and if k_4 is close to three. If these two conditions are not satisfied, the result of the Cornish-Fisher approximation will be less relevant. The computation of VaR with the Cornich Fisher approach requires the

knowledge of $\Phi_N^{-1}(\propto)$ by a dichotomous procedure to obtain the probability close to the quantile value.

The approximate quantile functions generated by the Cornish-Fisher approach do not always have desirable properties. It does not always generate a monotonic function for all pairs of asymmetry and flattening. Outside this set, the Cornish-Fisher expansion provides non-monotone quantiles in the tail of the distributions.

2.3. Johnson approch

We present this approach of Johnson from Simonato's method (2010). This approach of Johnson is presented by Simonato (2010) allows to use the first four moments as main input within a model of VaR.

A continuous random variable z with an unknown distribution can be approximated by the methodology proposed by Johnson (1949) from a set of "normalized" translations. This transforms the continuous variable z into a normal standard variable y and has the following general form:

$$y = a + b \times g\left(\frac{z - c}{d}\right)$$

Where a and b are the shape parameters, c is a location parameter, d is a scale parameter and g (.) Does a function whose form defines the four families of the distributions constitute the Johnson system.

$$g(\mu) = \begin{cases} \mathrm{Ln}(\mu) \\ \mathrm{Ln}\left(\mu + \sqrt{\mu^2 + 1}\right) \\ \mathrm{Ln}\left(\frac{\mu}{1-\mu}\right) \\ \mu \end{cases}$$

They correspond respectively to the log-normal family, the unbounded family, the bounded family, and the normal family.

Thus, the process of using the Johnson system comes down to identifying the values of a, b, c and d that are associated with the moments of the distribution.
Hill et al. (1976) propose an algorithm for choosing the appropriate family and the parameter values required to approximate this unknown distribution when we know the first four moments of the function.

Johnson's random variable can express from the inverse of the previous normalized translation:

$$z = c + d.\, g^{-1}\left(\frac{y-a}{b}\right),$$

$$\text{whither} \quad g^{-1}(\mu) = \begin{cases} e^{\mu} \\ (e^{\mu} - e^{-\mu})/2 \\ 1/(1 + e^{-\mu}) \\ \mu \end{cases}$$

Which in the order correspond to the log-normal family, the unbounded family, the bounded family, and the normal family.
The quantities required for the VaR formulas are obtained from the asymmetry coefficient and the flattening coefficient of the standardized yield distribution. Using centered and reduced parameters within the Hill algorithm, we find the values of the parameters a, b, c and d. Once this stage is completed, it is then possible to measure the risk of this distribution.

Digital applications and discussions

We illustrate the usefulness of taking into account the three and four moments in the calculation of VaR from the series of assets Total and Bouygues over a daily period from 02/01/2008 to 28/12/2013 or 1563 observations. These two aspects are chosen because of their different characteristics of moments.

Descriptive analyzes and preliminary tests

The first graph shows the logarithmic changes in the returns of the Total and Bouygues shares.

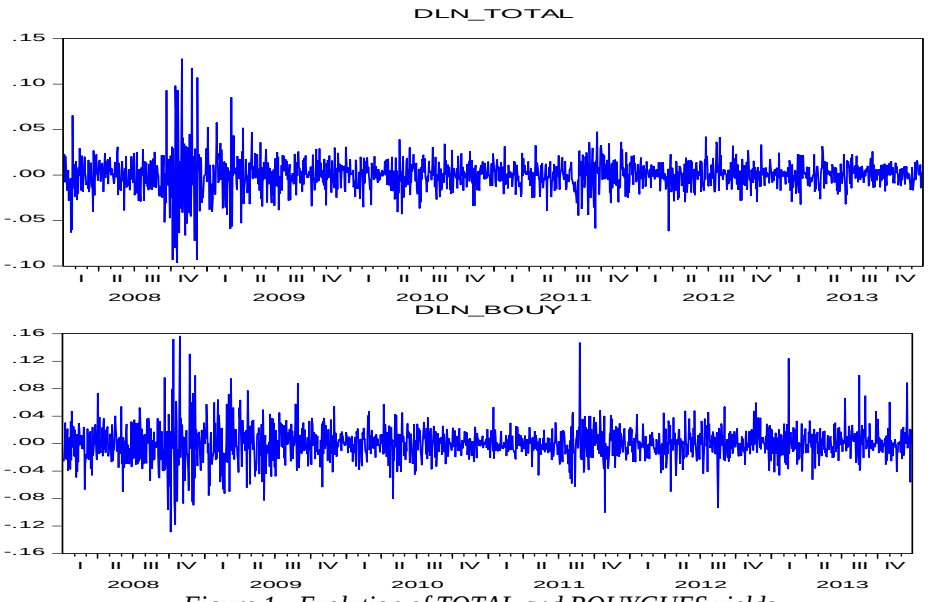


Figure 1 - Evolution of TOTAL and BOUYGUES yields

They exhibit non-stationarity confirmed by unit root tests. To stationarize our series, we retain the first differences in the log of prices that are approximations of the financial returns of our selected securities.

The assets withheld fell sharply following the 2008 crisis. This decline, the largest ever, is the result of a combination of negative performance, unitholder disinvestments, and liquidation of units. The portfolio manager makes purchases and sales on the assumption that changes in asset prices are composed of a market trend and a specific asset factor. It hedges its portfolios by buying undervalued assets and selling overvalued assets.
The descriptive statistics in Table 1 indicate that yields are volatile, leptokuretic and asymmetric: the distributions of returns are not Gaussian distributions. The analyzes of the stationary price series reveal other characteristics of the financial series: no autocorrelation of the returns but autocorrelation of the yields squared, asymmetry and leptokurticity of the distribution of the returns, clusters of volatility. In addition to the highlighting of ARCH effects, GARCH the application of the BDS test rejects the hypothesis of linear structures.

These shortcomings of linear models lead to consider a nonlinear approach to the process generating series of returns. To justify this choice we retain tests that make it possible to test if a series is i.i.d. The test results are given in the appendices for different epsilon values and for different dimensions.

Statistics	Total	Bouygues
Average	0.03527903	-0.000420461
Standard deviation	0.9996982	0.02478897
Min	-1	-0.1287917
Max	1	0.1566574
Skewness	-0.070602	0.4575874
Kurtosis	1.004985	8.315181

Table1- Descriptive Daily Performance Statistic

The moments of order three and four of the two returns are different: the asymmetry is less than o for the title Total, while it is greater than o for the title Bouygues. The Bouygues fruetons are more important than Total's. These differences explain the choice of these titles for this study.

Tests	Total	Bouygues
Autocorrélation	3.11%	3.11%
Autocorrélation au carré	21.12%	21.2%
Jarque–Bera (p-value)	2.2e-16%	2.2e-16%

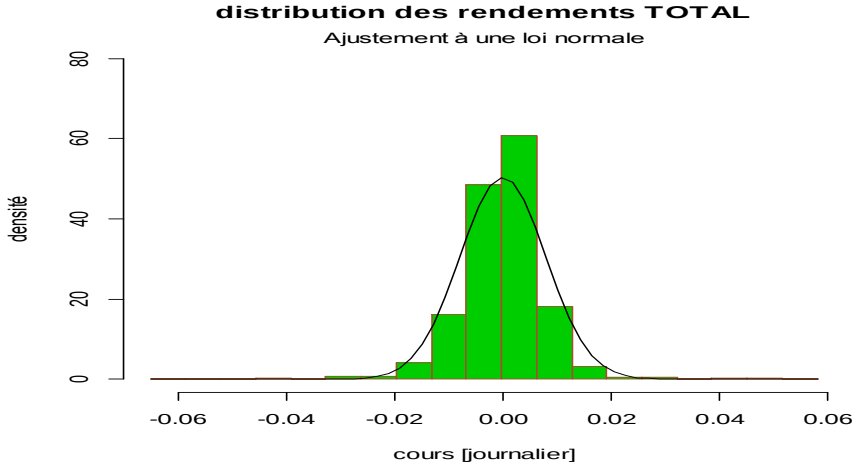
Ljung–Box (p-value)	0.3486 %	0.1559 %
Ljung–Box squared returns (p-value)	0.0%	2.2e-16%

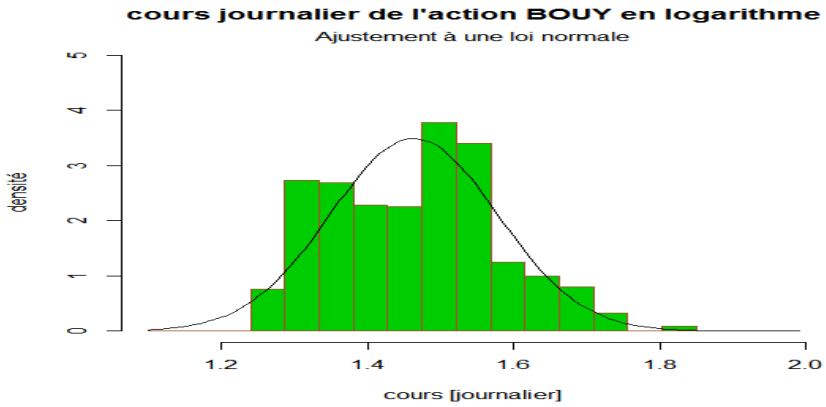
Table 2-Statistical Tests of JB

In general, autocorrelation is used to characterize linear dependencies in residual series (time series corrected for trend and seasonality). Indeed, the trend and the season are deterministic components. Moreover, if the studied series has characteristics that evolve over time, it can be difficult to estimate its statistical properties because one generally has only one realization of the process which is not enough to make the estimate. However, it is very useful to understand how the empirical autocorrelation of a raw series with a trend and / or seasonality will look.

3. Empirical Modeling of VaR

In order to take into account the preceding characteristics of our series of yields, we propose to model their distributions using the approximations presented previously (Gram Charlier, the extension of Cornish Fisher, and Jonson).
The graphs below represent the empirical distribution of returns for each asset, with the adjustment of the normal distribution of the same mean and standard deviation.





These graphs clearly show the problem of leptokurticity at the tails of distributions. To compare our different approximations we use the values of the VaR calculated according to the different approaches.

The quantiles of 1%, 5% and 10% are maximum losses at 99%, 95% and 90% probability respectively. The minus sign means a loss (left part of the distribution). On the other hand, the quantiles of the 90%, 95% and 99% are maximum gains at respective probabilities of 10%, 0.5% and 0.1%. The positive value means a gain (right part of distribution).

	R.Total			**R.Bouygues**		
	Normale	GC	CF	Normale	GC	CF
VaR(1%)	0,04219	-0,212	-0,06	-0,0366	-0,555	-0,61
VaR(5%)	-0,02976	-0,13252	-0,0276	-0,02585	24,67103	0,099887
VaR(10%)	-0,0231	0,022471	-0,0147	-0,02011	16,49001	0,240384
VaR(90%)	0,023609	0,02295	0,0151	0,020324	18,1094	-0,216
VaR(95%)	0,030236	0,13265	0,0281	0,0260568	25,0964	-0,035
VaR(99%)	0,042665	-0,214	0,0692	0,036809	-1,579	0,7676

Table 3 - Normal VaR, GC and CF at 1%, 5%, 10%, 90%, 95%, and 99%

VaR Jonson	Loi	Total	Bouygues
	Normale	-13.009	-879.34
1%	Log-Normale	-6.718	-85.668
	Borné	-23.9	-119
	Non Borné	3.142	389.792
	Normale	-16.188	-1035.6

5%	Log-Normale	-5.399	-73.724
	Borné	-12.77	-96.5
	Non Borné	5.391	473.889
	Normale	-18.555	-104.88
10%	Log-Normale	-4.711	-72.881
	Borné	-9.49	-95
	Non Borné	6.918	480.892
	Normale	-18.607	-1160
90%	Log-Normale	-4.697	-66.530
	Borné	-9.44	-84
	Non Borné	6.951	539.681
	Normale	-16.228	-1180.1
95%	Log-Normale	-5.3859	-65.512
	Borné	-12.7	-82.32
	Non Borné	5.4175	550.230
	Normale	-13.038	-1220.2
99%	Log-Normale	-6.703	-63.577
	Borné	-23.7	-79.1
	Non Borné	3.163	571.267

Table 4 - Jonson VaR under different families at 1%, 5%, 10%, 90%, 95% and 99%

VaR approaches based on the Cornish-Fisher, Gram Charlier, and Jonson developments aim at modifying the multiple associated with the normal distribution in order to integrate the third and fourth moments of the yield distribution. These approaches make it possible to obtain an approximate analytical expression of the quantile of a distribution as a function of its moments.

By limiting the three approaches mentioned above to its first terms, we obtain an analytic expression of the VaR involving the expectation μ, the standard deviation σ, the Skewness and the Kurtosis of the returns.

The tables below show the degrees of asymmetry, the kurtosis levels and the w_α statistic calculated from the above equations (Gram Charlier, Cornish-Fisher, and Jonson approximations) for the 1%, 5% and 5% thresholds. %, 10%, 90%, 95% and 99%.
As can be seen from the tables, excess kurtosis slightly dominates the asymmetry in the calculation of the Cornish-Fisher expansion. By using the 1% threshold as a multiple in the Gaussian VaR equation, the risk of these assets is greatly underestimated.

We also note that the statistics (quantile w_α) of all the thresholds of the Jonson approach are very weak compared to the two previous ones, explained by the dynamism of this approach.

The estimate of losses with VaR Gram Charlier is generally close to the VaR Cornish Fisher. The Gaussian VaR gives losses greater than those of the Cornish Fisher VaR and the VaR Gram Charlier, this is valid for both titles. Cornish-Fisher VaR results in results far removed from Gaussian VaR and overstates losses in all cases.

The results are presented by quantiles (see appendices), for each model. Each asset can be considered as an example of how VaR calculations compare from one model to another.

Quantiles of 1%, 5% and 10%
Quantiles of 1%, 5%, and 10% are maximum losses at 99%, 95%, and 90% probabilities. The minus sign means a loss (left part of the distribution). We grouped the three models (Gaussian, Gram Charlier and Cornish Fisher) under different loss thresholds in the same table, to make our comparison. The differences between the results of the models at the different thresholds are reduced, as regards the securities whose distributions are more or less symmetrical.

Quantiles of 90%, 95% and 99%
For the same purpose as the previous table, but this time we are talking about gains rather than losses. The quantiles of 90%, 95% and 99% are maximum gains at probabilities of 10%, 5% and 1%. The plus sign means a gain (right side of the distribution).

Again, the VaR Gram Carlier and VaR Cornich Fisher are close.
Gaussian VaR gives gains lower than those obtained with Gram Carlier VaR, and Cornich Fisher VaR in most cases and more particularly with highly asymmetric distributions. The Cornish Fisher VaR gives even greater gains than those estimated with Gaussian VaR. The differences are larger for the 99 percent, 95 percent and 90 percent quantile calculations. Same observation on the left and right tails of the distribution: the gaps are accentuated while moving away from the center.

VaR Jonson: Quantiles of 1%, 5% and 10%
Quantiles of 1%, 5% and 10% are maximum losses at 90%, 95% and 99% probabilities. The minus sign means a loss (left part of the distribution). The VaR Jonson calculated according to the families of the following laws: Normal family, Log-Normal family, Borné family, and non-Borne family.

The Jonson VaR calculated according to the log-normal family and the Cornish Fisher VaR are close. The Jonson VaR with the Borné family results in higher earnings than the Jonson VaR of the Non-Borne family in most cases. In general, the results are closer in the case of the Jonson VaR with the Borné family and the Jonson VaR with the Normal family (distributions whose shape parameters are close to zero).
VaR Jonson: Quantiles of 90%, 95% and 99%

The quantile of 90%, 95% and 99% are maximum gains at probabilities of 10%, 5% and 1%. The plus sign means a gain (right side of the distribution). In the calculation of the VaR according to the Jonson models, the differences are larger for the calculations performed at the different quantile levels. Same observation on the left and right tails of the distribution: the gaps are accentuated while moving away from the center.

VaR with Moments of order three and four at the threshold of 5%

While keeping our respective series as such, we assigned different values to the skewness and kurtosis parameters, in order to see the impact of this change on the calculation of VaR. The calculation of VaR for Total and Bouygues yields is made at the 5% threshold.

In the tables (8.1 and 8.2) below we see the results on the different models, we clearly see that, the further away from the position of normality is to say skewness = 0 and kurtosis = 3, plus the risks become uncontrollable.

Skewness	-1			0			1		
Kurtosis	VaR GC	VaR CF	VaR J.log	VaR GC	VaR CF	VaR J.log	VaR GC	VaR CF	VaR J.log
	-0,425	-0,025		-0,406	-0,030		-0,389		
	-0,338	-0,025	0,026	-0,320	-0,030	0,419	-0,302		
	-0,251	-0,024	1,636	-0,233	-0,029	1,738	-0,216	-0,036	
0	-0,165	-0,024	25,18	**-0,147**	**-0,029**	**5,018**	-0,129	-0,035	1,003
1,5	-0,107	-0,023	-	-0,089	-0,029	-4,568	-0,072	-0,035	-0,794
3			8,532					-0,034	-0,962
4,5			-					-0,0342	-1,326
5,5									-1,575

Table 7.1- Total VaR: for moments 3 and 4 fixed

Skewness	-1			0			1		
Kurtosis	VaR GC	VaR CF	VaR J.log	VaR GC	VaR CF	VaR J.log	VaR GC	VaR CF	VaR J.log
	-0,7187	-0,022		-0,688	-0,026		-0,6583		
	-0,5722	-0,022	-0,9993	-0,542	-0,026	-0,0007 4	-0,5118	-0,031	-1,000887
	-0,4258	-0,021	-1,2514	-0,396	-0,026	-2,6476	-0,3653	-0,031	-0,565467
0	-0,2793	-0,021	-23,229	**-0,395**	**-0,025**	**-4,3949**	-0,2188	-0,029	-0,705137
1,5	-0,1329	-0,021	-	-0,249	-0,025	-	-0,0724	-0,029	-
3			-8,4548			-3,9087			-1,019697
4,5			-			-			-
5,5			-7,5822			-3,9762			-1,235757

	-0,0216	-0,151	-0,025	-0,1213

Table 7.2- Bouygues VaR: for moments 3 and 4 fixed

The color values are the results of the different models in accordance with the criteria of normality.

Gaussian VaR is the one that gives the lowest loss estimates, especially for the most extreme quantiles, except where the distributions are symmetrical (shape parameter close to zero).

The development of Cornish Fisher is not satisfactory. Cornish Fisher VaR systematically gives higher estimates of losses and gains than Gram Charlier VaR and VaR calculated using the Jonson models. Jonson VaR models are generally close to each other. In a word we can say the approach developed from extension of Jonson is close to reality.

Backtesting

The classic approach used by many authors is to provide VaR forecasts taking into account the long position, ie for negative returns. However, the forecast capacity of the models that are proposed must be evaluated in long position but also in short position. Actors participating in the financial markets are not only curious to know the maximum loss that may be caused by a fall in the price of the assets they hold, but they can, in a short position, worry about the maximum increase in the price of an asset that they intend to acquire. We present the results of backtesting tests in short and long positions, for conditional and unconditional coverage, both in the sample and out of the sample.

Rather than compare the calculations of a model to the realizations, we make the decision to proceed by simulation by generating a quantity of scenarios as important as desired. We implicitly assume that the Jonson approach computed according to the log-normal law family is the true model because it is the one that uses the most information about the distribution tails. We then measure the errors that other methods of calculating VaR produce. If these calculation methods generate significant errors, this will validate the relative contribution of the moments of order 3 and 4.

In this backtest, we will test the validity of the VaR levels computed above by simulating data in the law of each title estimated through the three- and four-order moments and calculating the number of times, on average, where the VaR are exceeded. The standard deviation of these overshoot numbers is also calculated.

We produce N = 1000 data for each asset and calculate the average values of the exceedances and the corresponding standard deviations.

These analyzes are performed for quantiles of 1%, 5%, 10%, 90%, 95% and 99% respectively.

Backtesting Application

The tables below show, by quantile, the mean and standard deviation of the number of VaR exceedances specified for each model.
Surcharge for quantile of 5%

Action	VaR Gaussienne		VaR G. Charlier		VaR C. Fisher		VaR Jonson	
	Average	S.Dev	Average	S.Dev	Average	S.Dev	Average	S.Dev
Total	0,505	0,49997	0,562	0,4961	0,505	0,4999	0	0
B&Y	0,505	0,49997	1	0	0,552	0,4972	0	0

Table-8.1: Comparative table of VaR at the 5% threshold

Gaussian VaR underestimates or overestimates losses depending on the case. Losses are generally overestimated in the case of the Bouygues share, whose distribution is highly skewed.
The development of Cornish Fisher generally overestimates losses (overruns often greater than 0.5).
NB: By construction of the simulation, the number of overruns for the Jonson VaR is zero. This is only a numerical consequence of the simulation, so we notice that this model has not recorded any overruns.

Surcharge for quantile of 95%

Action	VaR Normale		VaR G. Charlier		VaR C. Fisher		VaR Jonson	
	Average	S.Dev	Average	S.Dev	Average	S.Dev	Average	S.Dev
Total	0,528	0,526	0,562	0,49614	0,527	0,49927	0	0
B&Y	0,49921	0,499	1	0	0,5	0,5	0	0

Table-8.2: Comparative table of VaR at the 95% threshold

Gaussian VaR most often overestimates earnings (overruns often less than 0.5). The results are more in line with the true model for the most symmetric distribution (Total case in particular).
The Cornish Fisher VaR gives unsatisfactory results with overruns sometimes significantly higher or lower than the expected level meaning alternatively underestimation or overestimation of earnings except for Total at a more or less symmetrical distribution.
The overflow tables for quantile residues are listed in the Appendices.

Gaussian VaR model error is important, leading in most cases to underestimate losses and overestimate gains. The backtest also leads to the rejection of VaR estimates made from the Cornish Fisher development as this model tends to overestimate losses.

4. Conclusion

This research work has focused on many elements that come into play when designing and evaluating a risk measure in finance. The crisis reminded us of a simple teaching but that the habit of prosperity had managed to conceal: quick and safe enrichment does not exist. Growth in the value of goods is limited by time and risk.

Value-at-Risk (VaR) is commonly used by regulators and practitioners to manage exposures to market risks. In the different sections, we studied the performance of different methodologies used to measure VaR. In this way we have found that among our different methodologies, the approach using the normal law is the least accurate and without any surprise. Applied research has developed formulas to compensate for the inability of Gaussian VaR to adapt to the asymmetric distribution of returns on financial assets. Notably, the Gram Charlier method, the development of Cornish Fisher and the extension of Jonson are corrections of the Gaussian VaR formula of introducing kurtosis and skewness into its expression.

Considering it necessary to identify a model that adapts correctly to the shape of the tails of distributions, we have exploited the properties of tools developed by modern statistics, the moments of order three and four. Their properties make it possible to better capture information on extreme values. The estimation of the models makes it possible to build a more robust indicator of the VaR. It is a Parametric Jonson VaR set on the log-normal family that has four parameters.

The use of Johnson's methodology with the third and fourth order moments manages to better measure the risk than the normal law in general. These results are consistent with the literature and demonstrate the relevance of using it rather than the normal law.
In addition, several backtests show that: Jonson VaR is a more accurate model than Gaussian VaR and gives results that are both fairer and more stable than the Cornish Fisher VaR and the Grlier Charlier VaR. The VaR Jonson is therefore a great progress. The calculation of the VaR is then very theoretical and the real losses are higher than expected. Taking into account the disappearance of the market in the VaR models would thus constitute a significant progress.

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ELECTRONIC MONITORING OF OFFENDERS IN SLOVAKIA: INFLUENCED BY THE EU?

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Abstract

This paper summarizes the context and aims of electronic monitoring (EM) of offenders in Slovakia and explores related influences, particularly support from the EU. Building on the results of a significant investigation of Slovak language, sources, the paper briefly reviews both the optimistic and more skeptical expectations of Slovak academic authors on achieving the objective of increasing the number of house arrests sentences. The reported results of the authors` own research from Eurostat and the World Prison Brief databases, suggest that the political decision to introduce EM of offenders in Slovakia can be justified. The paper concludes by summarizing the role of EU structural funds in financing the introduction and implementation of this program. The paper builds on and briefly reviews the published output from the research project 'Interdisciplinary approach to EM of accused and convicted persons in the Slovak environment' (IAEMPS).

Keywords: electronic monitoring (EM), Slovakia, European Union, influence, cost effectiveness, IAEMPS project.

JEL Classification: J18, K14, K33.

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1. Introduction

Slovakia launched its first permanent national program of electronic monitoring (EM) of offenders in January 2016. Even though this important topic was covered in several academic papers in 2016 – 2017 (see Section 2), they were all published in Slovak, and we are unaware of any paper published in English. Moreover, none of the papers cover the role of the European Union (EU) in supporting the preparation and launch of this first Slovak national EM program. This paper fills that gap by reporting our research in this area.

Our research project entitled 'Interdisciplinary approach to EM of accused and convicted persons in the Slovak environment' (IAEMPS) aims to explore and evaluate new theoretical and practical approaches to EM of accused and convinced persons across a broad spectrum of scientific methods. Its key objectives are to analyse and evaluate the process of resocialization of EM convicted persons, to explore and explain the impact of EM on crime prevention, and to assess the efficiency and cost effectiveness of the Slovak national EM program. Although primarily concerned with Slovakia, the Slovak national IAEMPS research project, which runs from July 2016 to June 2020, also covers the European and wider international context of EM.

2. Literature review

This section reviews relevant literature on electronic monitoring of offenders across the world generally as well as specifics of this problem in the Slovak republic

2.1. The genesis of EM of offenders in the World and in Europe

She also mentions that "Graham and McIvor's (2015) international literature review usefully brings together the available international evidence on EM" (Ibid., p. 4).

In his latest paper about the state-of-the-art in this field, the most quoted author in academic papers about EM, Nellis (2014) stated that EM has been practiced in Europe for a quarter century, with at least twenty-seven countries making use it during that time, and many more seeming likely to adopt it in the future. However, as Nellis (2014) also stated, few European countries have used it on a very large scale, compared to prisons and other community sanctions, and therefore nowhere has EM had a transformative effect on penal practice. Germany has been the most reluctant user of EM in Western Europe, while the Scandinavian countries have arguably made the most creative use of EM, with the aim of supporting rehabilitation services for offenders under conditional prison sentences.

In one of the most recent texts dedicated to providing an overview of the state-of-the-art in EM in Europe, Beyens (2017, p. 4 & 8) mentions 'Mike Nellis's assertion about the rehabilitative use of EM in Europe'. In this regards, Beyens wrote that "based on the evidence we have on only four European jurisdictions and with the knowledge that England and Wales mainly use EM as a stand-alone order (Hucklesby and Holdsworth, 2016) the picture is mixed. It can also be concluded that EM entails a specific form of 'supervision', which is mainly focused on short term goals of respecting time schedules, primarily leading to instrumental compliance based on the deterrent effect of EM and

being incapable of effecting longer term changes in attitudes and behaviour (Nellis, 2016)" (Ibid., p. 8).

Apart from the statistical data, some other relevant information accompanying it can be found in the SPACE I survey's results published by the Council of Europe Annual Penal Statistics (Aebi et al., 2018). We discuss the relevant information from this official source regarding Slovakia in the following section.

2.2. EM of convicted and accused persons in Slovakia

Introduction of EM of offenders in Slovakia was initiated by the Manifesto of the Government of the Slovak Republic for the 2012-2016 election period. This committed the Ministry of Justice to commit a significant part of its capacity to alternative forms of punishment and to increase its emphasis on crime prevention (Burda, 2013; Borseková & Krištofík, 2016). House arrests: the main alternative form of punishment to imprisonment, were introduced into the Slovak Penal Code in 2005 (Act no. 300/2005 coll.), and into the Code of Criminal Procedure in 2006 by Act no. 300/2005 coll., (Škrovánková, 2016). But house arrests were little used, mostly due to insufficient opportunities to control processes of resocialisation of offenders. Eventually this led to pressure to introduce EM to close this loophole (Vrobelová, 2014). In 2013 The Ministry of Justice therefore launched a pilot project of EM for convicted and accused persons (Strémy, Kurilovská & Vráblová, 2015).

The permanent EM program was set up by the Act no. 78/2015 on the control of the execution of selected [legal] decisions by means of technical instruments (Hyžová, 2016; Šimunová, 2016; Siváčková, 2017). This Act was adopted on 17April 2015 and became fully applicable on 1 January 2016. Both the first pilot and the first permanent Slovak national EM programs have been covered in several conference papers and journal articles published in the Slovak language within the IAEMPS project. See for example Klátik 2016a, 2016b, 2017b, 2017c; Borseková & Krištofík 2016; Vitálišová & Vaňová 2016; Klátik, Hruška & Žuffa 2017; Orviský & Valentovič 2018; Elias 2018. Additional conference papers and journal articles prepared within the IAEMPS project are noted in section 4 of this paper.

Together with the paper by Šimunová (2016), the most recent edition of the SPACE I survey results report by the Council of Europe (Aebi et al., 2018) are the only English language sources that we are aware of on this issue. The SPACE I survey report states that "The prison service has been currently testing the use of [an] "electronic monitoring system" to control the stay and movement of imprisoned persons during selected activities (e.g. during work of convicts working outside of the prison, during permitted prison leave performed by convicts). However, from 1st January 2016, it is possible to control the sentence of home confinement or other restrictions and obligations imposed as alternative punishments by technical means ("electronic monitoring"). Electronic monitoring as a sentence does not exist in the Slovak Republic" (Aebi et al., 2018, p. 44). The journal article by Šimunová (2016) dealt with the alternative sanctions eligible in Slovakia on a more general level, summarising relevant statistical data and outlining the reasons why alternative sanctions pose "the challenge to get over the stereotypes connected with judge's conveniences".

Hyžová (2016, p. 105) stated that "on the basis of expertise and information from abroad about the EM, we anticipate advantages … primarily in financial savings in sentencing, reduced relapse rates, increased chance for resocialization, protection of the family, restraint of breach of the peace at sports events, cultural and other social events, and others". The authorities anticipated that the introduction of EM would lead to an increase in sentences of house arrest (Vitálišová & Vaňová, 2016). Siváčková (2017) believed there would also be fewer custodial sentences. However, the Supreme Audit Office (2017) reported and criticised the fact that in 2016 only 25 cases resulted in EM monitored sentences. This was only 1,25 % of the envisaged 2000 monitored offenders per year (Dianiška & Strémy, 2017). Moreover, only eight of these sentences concerned electronically monitored house arrests (Klátik, 2017a). It was much less than for the other relevant instruments of restorative justice: for example, the roughly 3000 sentences of compulsory labour, or the 1300 fines (Dianiška & Strémy, 2016).

3. Research Methodology

The aim of this paper is threefold: (1) to explain the context of the Slovak national program of EM of offenders, (2) to summarize the scientific knowledge about the aims of this program, and (3) to explore related influences, especially support from the EU. The results concerning the first partial aim, already presented in section 2.2 above, were obtained by analysing the literature. The results were accompanied by reference to the nine papers which are all deliverables of the IAEMPS project noted in the Introduction.

In order to present the summary of the aims of the Slovak national EM program set out in section 4.1 below, we used the analysis and synthesis of the earlier results of the IAEMPS project research that have been presented in the five scientific papers (Klátik 2017a, 2018; Mencerová 2017, 2018 and Slivka Bedlovičová 2018). We also refer to Škrovánková (2016) whose paper was unrelated to the IAEMPS project. We have also reviewed and quoted the document of the Slovak Ministry of Justice accompanying the relevant draft Law proposal within this part of our analytical work.

We have used our own analytical research activities in order to explore the European context of the Slovak national EM program. We have analysed the data from the Eurostat's 'Crime and criminal justice' online database (Eurostat 2017) and the data from the World Prison Brief database published by the Institute for Criminal Policy Research (2018). As a final step, we reviewed the content of the documents of the Slovak Ministry of Justice (2015) and Supreme Audit Office (2017) and extracted and analysed all the information relating to potential influence or support from the EU on the aims, content and financial background of the Slovak national EM program.

4. Empirical results and Discussion

4.1. The aims of EM introduction in Slovakia

As we have already explained in section 2.2, the key Law introducing the EM of offenders in Slovakia was Act no. 78/2015 on the control of the execution of selected [legal] decisions by means of technical instruments. In the document accompanying this draft Law proposal submission to the Government, the author of this draft Law proposal, i.e. the Ministry of Justice (2014, Dôvodová správa, všeobecná časť [The reasoning statement, general part], pp. 2 – 3) stated that it aimed to achieve the objectives of the:

- increased safety of citizens by means of introducing electronic services,
- improved social inclusion of convicted persons and decrease of recidivism,
- increased efficiency of work performed by probation and mediation officers,
- decreased costs of punishment enforcement,
- increased trust in alternative forms of punishment,
- protection against domestic violence.

Opportunities to achieve the first and the last of the above-mentioned aims have been analyzed within the IAEMPS project by Klátik (2017a). In a conference paper entitled 'Strengthening the protection of victims of domestic violence electronic individual monitoring', he explains that the main obstacles to achieving these two aims of EM are the shortage of judicial time and of the competence of the judiciary to impose the alternative sanctions using EM.

Opportunities to achieve the second of the above presented aims of EM introduction in Slovakia, i.e. a decrease of recidivism, has been dealt with in the IAEMPS project by three researchers. Mencerová (2018) focused on examining the impact of EM monitoring of persons on the reduction of recidivism. Based on an analysis of the causes of non-fulfilment of the expected results of the Slovak EM program in its first two years of application, she formulated some recommendations on the prevention of re-offending. The research by Klátik (2018) focused on inspecting executions of judgments imposing bans on participation in public events, explains the rationale of spectator violence and outlines the purpose of the sentences prohibiting convicted persons from attending sport, cultural or other public events during the period of execution of the electronically monitored sentences. Mihók (2018) summarized the results of the foreign researches aimed at assessing effectiveness of selected EM programs in the U.S. and Europe in terms of reducing recidivism. He reviewed and summarized the results of foreign research activities focused on the efficiency of work performed by probation and mediation officers and on the decreased costs of punishment enforcement, i.e. the third and fourth Slovak EM program's aims. The issue of cost effectiveness of EM programs vis-à-vis imprisonment in the EU has also been dealt with in the IAEMPS project by Krištofík et al. (2017).

The opportunities to achieve the last two of the above presented aims of the Slovak EM program have also been analysed within the IAEMPS project. Mencerová (2017) questioned the purpose of the conversion of the remainder of imprisonment into electronically monitored house arrest, i.e. whether it is possible to perceive this new

institution as an alternative to conditional release from prison (as stated in the explanatory memorandum to the Act on Control of Execution of Certain Decisions by Technical Devices), taking into account the fulfilment of all the legal conditions stipulated for such conversion in practice. She explains that the judges and the other authorities may be influenced by some practical implications of the relevant Laws which decide whether an electronically monitored house arrest could be applied earlier or later than its alternative, i.e. conditional release from prison, based on the length of the relevant sentence at stake. She argues that the different aims of both these alternative institutions should be known and taken into account when making a more appropriate choice between them, i.e. instead of choosing the institution which can be applied earlier in consequence of the length of the sentence. Bedlovičová (2018) focused her research on the possibilities and conditions of using EM in connection with allegations against those offenders for whom criminal prosecution has been conditionally suspended. She explained how the introduction of EM could help to achieve better effectiveness and efficiency by using conditional suspension of criminal proceedings in order to divert criminal proceedings into the direction of restorative justice.

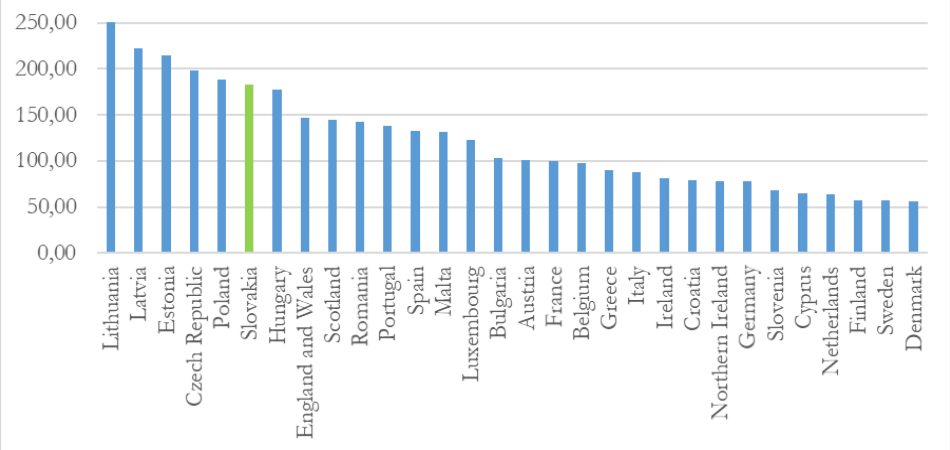
4.2. The European context of EM introduction in Slovakia

Part of the desk research activities of the IAEMPS project concerned the European context. In their 'exploratory study based on European evidence', Borseková at al. (2017) reviewed a large number of foreign academic papers with an aim "to analyse and evaluate an approach towards EM in European countries as an alternative form of punishment". This research resulted in an understanding that there were different reasons behind introductions of EM of offenders in Europe, which cannot be generalised. "National programmes of offender EM in Europe resemble 'live organisms' in that they adjust their aims, intentions and methods to respond to a changing 'social climate'" (Borseková at al., 2017). Therefore, another research activity of the IAEMPS project, whose results have been presented by Krištofík et al. (2017), concerned an overview of available data about average daily expenses per inmate in penal institutions vis-à-vis the average daily cost per electronically monitored offender. In parallel to economic benefits, represented in some European countries as the main/sole reason/rationale of the EM introduction, EM has been perceived as an instrument to help offenders complete their rehabilitation programs and thus decrease the risk of recidivism. Nevertheless, from the review of the existing academic and official literature, the researchers of the IAEMPS project came to the hypothesis that for the largest group of the EU member states, introduction of EM of offenders has been a response to these interlinked factors: increased numbers of prisoners, high occupancy rates of prisons reaching or even exceeding 100 %, and the growing costs of national prison systems. It should be noted that we were unable to verify or deny this hypothesis by surveying the literature. To do so by conducting our own field research would take us far beyond the financial and personnel capacities of the IAEMPS project.

For the purpose of this paper, we have decided to find out what was the position of Slovakia in the EU with regards to both the numbers of prisoners and the occupancy rate

of prisons at the time the EM program was introduced into Slovakia. In Figure 1 below, we present the results of our own analysis of the data available in the Eurostat's 'Crime and criminal justice' online database (Eurostat 2017) on the numbers of prisoners per hundred thousand of inhabitants in the EU member states. This figure shows that Slovakia had the sixth highest number of prisoners per capita in 2015, i.e. in the year when the Laws allowing for the EM of house arrests were approved. It also illustrates that the number of 'prisoners per capita' in Slovakia was significantly higher than in the majority of the EU member states: about twice the level of those countries in the middle of the distribution. Moreover, this value in Slovakia was about 25 % higher than in England and Wales (the eighth 'worst' country in this ranking), which is the oldest jurisdiction to introduce and significantly use EM house arrests as an alternative to imprisonment with the aims of decreasing the costs of the prison system and reducing the high occupancy of prisons. This finding can help to understand the political decision to introduce EM of offenders in Slovakia.

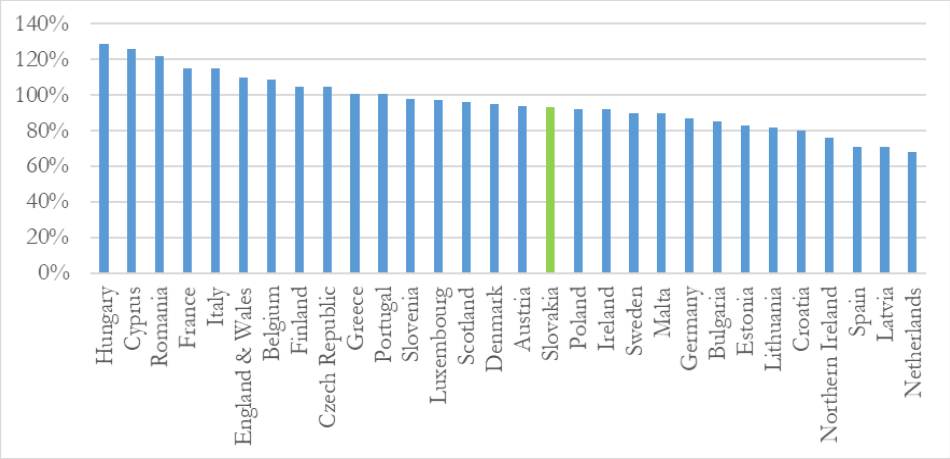
Figure 1. Prisoners per 100.000 inhabitants in 2015



Source: Eurostat 2017 ([crim_pris_cap], accessed 17 July 2017).

In Figure 2 below, we present the results of our second own analytical research exercise, aimed at finding out the position of Slovakia in a ranking of the EU member states with regard to the occupancy of prisons. We have used the data from the World Prison Brief database, published by the Institute for Criminal Policy Research (2018), from which we have extracted the data of the EU member states.

Figure 2. Occupancy of prisons in the EU.



Source: World Prison Brief 2016 data[1], accessed 14 May 2018)

Although Slovakia ended up in the middle of this ranking, Figure 2 shows that the occupancy level in the EU is very high in the majority of the EU member states. This finding can help us to understand why at least twenty-seven European countries had already made use of EM of offenders by 2014 and many others seemed likely to adopt it in the future (Nellis, 2014).

4.3. The influence of the European Union

In order to achieve the aim of this paper, we have decided to analyse the documents of the Ministry of Justice (2014) accompanying the draft Slovak EM Act submission to the Government in order to find out what was the role of the EU in introducing the EM of offenders in Slovakia by means of this Law. Due to Slovakia's membership of the EU, all its draft laws must be compatible with the entire scope of the EU Acquis communautaire. This compatibility must therefore be dealt with in the documentation accompanying every draft law before its submission to the Government, and in particular to the Parliament. In case of the Slovak EM Act, the Ministry of Justice (2014, Doložka zlučiteľnosti [Compatibility clause, p. 1]) mentions only one European Directive amongst the EU Law that Slovakia was obliged to transpose to the EM Act – the EU Directive on the protection of individuals with regard to the processing of personal data and on the free movement of such data. This implicitly means that, at the time of the Slovak EM Act preparation in 2014, the EU gave a carte blanche to its members with regard to preparing and implementing national EM programs, as long as the EU Directive concerning personal data processing would be sufficiently transposed into the EM legislation.

In our review of foreign academic literature, the only European Law that we have found in relation to EM was the Council of Europe's (CoE) in Recommendation CM/Rec

[1] Available at: http://www.prisonstudies.org/highest-to-lowest/occupancy-level?field_region_taxonomy_tid=14 (accessed 14 May 2018).

(2014)4 of the Committee of Ministers to member States on electronic monitoring. See for example Nellis (2014). The CoE Recommendations are "a type of non-binding 'soft law' which may be used by member states to guide and critique their national policies, and by the European Court of Human Rights to inform its legal judgement" (ibid., p. 502). The fact that this CoE Recommendation has been amongst the basic documents used in drafting the above mentioned Slovak EM Act is confirmed in the documentation accompanying the submission of its draft to the Government (Ministry of Justice, 2014, Dôvodová správa, všeobecná časť [The reasoning statement, general part], p. 3). In the same place, the Ministry also mentions that the Slovak EM Act could support implementation of the Slovak legislation into which the 'Council Framework Decision 2008/947/JHA on the application of the principle of mutual recognition to judgments and probation decisions', as amended by the Council Framework Decision 2009/299/JHA, has been transposed (Ibid.). Lulei et al. (2013, p. 114) mention that the Council Framework Decision 2008/947/JHA was the first EU Law in the field of probation measures and alternative sanctions, and also that its transposition into the EU member states' national legislation faced significant challenges and delays. Within our review of official and academic literature, we have been unable to find any other EU, European or International laws transposed or used in a different way in preparation or implementation of the Slovak EM Act.

However, already in the first phase of the of the IAEMPS project, we found out from our document survey that the Slovak pilot EM of Offenders project has been part of a larger project supported by the grant of 22 million € from EU funds (Andrejčíková, 2014). We have dedicated our own desk research of the relevant official documents to find out more information about this important aspect of the support from the EU for the national EM program launch in Slovakia. In the official report by the Supreme Audit Office (2017), we found that as early as 2012 the Ministry of Justice procured the feasibility study for the national project to launch and implement EM in Slovakia. The revised and updated feasibility study of the first Slovak national EM project has been a part of the project pipeline of the Operational Programme entitled Informatisation of Society, implemented in Slovakia in relation to the EU Structural funds programming period 2007 – 2013 (Ministry of Finance, 2013, p.2). The project was implemented in April 2014 - December 2015 and its costs totalled 27 255 057 €, out of which 26 896 257 € were covered from the EU structural funds grant and the remaining 358 800 € were covered from the state budget funds attributed to the Ministry of Justice (Supreme Audit Office, 2017).

5. Conclusion

This paper had three objectives: (1) to summarize the context of the Slovak national program of EM of offenders, (2) to summarize scientific knowledge about the aims of this program, and (3) to explore the influence of support from the EU. We have briefly summarized both the official information and academic evidence that underpins the aims of the Slovak EM national program. On increasing the number of house arrests sentences, we noted that prior to the program launch some academic sources were optimistic, but others were pessimistic. The latter pointed to the very low figures of EM punishments in 2016 using the EM Law(s) adopted in 2015. The Supreme Audit Office (2017) also criticised the fact that the number of EM sentences in 2016 was only 25, i.e.

only 1,25 % of the envisaged total number of 2000 monitored offenders per year. Moreover, only eight of these sentences concerned electronically monitored house arrests (Klátik, 2017a).

We have presented the results of our own research in the Figures 1 and 2. These show Slovakia`s relative EU position in respect of two key measures used in the academic literature to justify the introduction of EM of offenders. We consider that Slovakia`s 2015 position of having the sixth highest value of prisoners per capita in the EU, and recording a 93 % occupancy of prisons in 2016, can both help explain and justify the political decision to launch the pilot phase of the first national EM program in 2015, and its full implementation in 2016.

Our examination of official documents showed that at the time of the Slovak EM Act`s preparation in 2014, the EU gave a carte blanche to its members with regards to preparing and implementing national EM programs, as long as the EU Directive on personal data processing was adequately incorporated into the EM legislation. Thus the EU provided no common legislation (Acquis communautaire) defining the common aims, principles or boundaries to the national legislation on EM of offenders. We have noted that even though the EU has already adopted the Acquis aimed at implementing the principle of mutual recognition of judgments and probation decisions, there is evidence in the academic literature of significant challenges and delays to this first EU Law in the field of probation measures and alternative sanctions. We have also shown from the relevant Slovak official documents, that 98.7 % (26 896 257 € out of the 27 255 057 €) of the costs of the Slovak EM project was paid from the EU structural funds.

This is the first summary research paper from the IAEMPS national research project that will run from July 2016 to June 2020. As noted the project explores the influences, particularly support from the EU, on the introduction of EM of offenders in Slovakia. We welcome any feedback that could help us achieve this project`s aims, outlined above.

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DIFFERENTIATION OF FOOD PRICES IN THE EUROPEAN UNION

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Abstract

The purpose of the paper is to analyse the differentiation of food prices in the European Union. The analysis is based on data from Eurostat, that periodically compares prices of consumer goods and services in households in the EU-28. As regards food products, the comparative analysis covers prices of approximately 440 comparable products. For each country, Price Level Index (PLI) is calculated with respect to food, non-alcoholic beverages, alcoholic beverages and tobacco, to compare price levels in different countries with the average food price level in the EU. PLI values are calculated taking into account the ratio of Purchasing Power Parity (PPP) to the official exchange rate in each country against EUR (for countries outside the euro area), which makes it possible to compare the prices of the same food products in one common currency. The analysis of the differentiation of prices of food product in particular groups in the EU was based on differentiation coefficients, calculated for particular food product groups. The comparative analysis of food price differentiation was carried out for all EU-28 countries. The analysis covers the period of 2004-2017.

The analysis shows that PLIs of food and non-alcoholic beverages vary significantly between particular EU Member States. At the same time, prices of these products in the "new" EU Member States (EU-13) are much lower than in the "old" Member States (EU-15). Gradual levelling of food prices in the EU can also be observed. The convergence of food prices, despite being a long-term process, means that cost-price advantages gradually cease to be a key determinant of international competitiveness for producers from the EU-13 countries. Due to globalization and European integration, the importance of non-price competitiveness factors is systematically growing. This phenomenon compels food producers from particular countries to seek new sources of competitive advantages on the demanding EU market.

Key words**:** Food, Prices, Differentiation, Convergence, European Union.

JEL classification**:** E31, O13, Q11, Q13.

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1. Introduction

The classic market mechanism, which describes causal relations between particular elements of the market, i.e. supply, demand and prices, works only in conditions of perfect competition. When prices get stiffed or are affected not only by changes in supply or demand, the market mechanism is restricted. The market mechanism can be restricted by total stiffening of prices by the state or by setting minimum and maximum prices. More often, however, the market mechanism is disturbed as a result of monopolistic or monopsonistic activities, when an increase in supply is not accompanied by a drop in prices, and an increase in demand is not accompanied by their increase. In the short term, the likelihood of changes is also influenced by financial and material constraints related to production capacities, availability of inputs, low degree of their mobility or a seasonal nature of their production (Wrzosek, 2002). Due to differences between the European Union (EU) countries in the degree of monopolization of markets and in the extent of financial and material restrictions, as well as due to the emerging differences as regards state interference, despite the Common Agricultural Policy (CAP), food prices in the EU turn out to be rather varied.

Contemporary markets are more or less imperfect, and geographically – very large and distant from each other, which often leads to some sort of price differentiation. Segmentation of markets is also enhanced by the existence of state borders and trade barriers, the operation of market regulation instruments as well as the lack of a single currency. The specific characteristics of particular markets, resulting e.g. from historical or cultural constraints, are also important. It is also often the case that also particular companies apply price differentiation strategies, i.e. to obtain additional profits, they sell the same products in different markets at different prices. Where these markets represent particular countries, international price differentiation exists (Szczepaniak, 2014, p.p. 102-115).

Convergence (approximation, levelling) of prices occurs most often in the context of economic integration. It results from changes taking place in the integrating markets, related to removing trade barriers, harmonization of tax systems, greater price transparency and exchange rate risk reduction. Economic integration of markets should help reduce differences in prices of the same products. Particularly strong price convergence in the integrated area occurs with respect to commercial goods in sectors that until now were characterized by significant trade and non-trade barriers. Unification of prices is a source of benefits for countries with high prices, in which convergence leads to their lowering (beneficial for consumers), as well as for low-price countries, for which convergence means higher prices (beneficial for producers).

The theoretical reasons for price convergence are based on the law of one price which provides that "on a competitive market with no transport costs and official trade barriers (such as customs duties), identical goods sold in two different countries must be sold for the same price when prices are expressed in a common currency" (Krugman and Obstfeld, 2007, p. 127). This law gives grounds for the movement of goods from countries in which they are cheaper, to countries where they are more expensive, but only until the prices of these goods in both countries are levelled out. Issues related to the law of one price can be found in works of numerous economists; e.g. according to A. Marshall – the more ideal the market is, the stronger tendency occurs to pay the same

price for the same good in different areas of this market, while according to G.J. Stigler – the market is an area where the prices of the same goods tend to level out taking due account of transport costs and various trade barriers (Wolszczak-Derlacz, 2007). This law applies irrespective of whether the markets in question are part of one country or belong to different countries. If different currencies are used in these countries, then this law implies that the prices of the same goods converted into the same currency should be identical (Wolszczak-Derlacz, 2008).

The basic assumptions underlying this approach in food markets are described in detail by N. Minot (2010) who points out that in competitive markets, free of transport costs and official trade barriers, homogeneous goods are sold at the same price. Otherwise, price differences would make arbitration possible. Analysing the role of European integration in the process of food price integration, N. Minot assumed that this convergence occurs when price dispersion (differentiation) decreases over time.

The Single European Market (SEM), in which the free movement of goods, labour, services and capital has been ensured, has also contributed to price convergence, while being proof of the effectiveness of this market. One can even say that price convergence, and thus the decline in dispersion, is the most synthetic measure of market integration. On the other hand, despite increasing convergence, price differentiation between particular EU countries continues to exist, which testifies to the continuing segmentation of the SEM.

2. Purpose and method

The purpose of this paper is to analyse the differentiation in food prices between particular European Union Member States. The comparison of prices in the EU food consumer market, i.e. at the last link of the food chain, has been causing many problems for years. These problems result e.g. from insufficient availability of data, heterogeneity of compared products or diverse regulatory systems. This analysis is based on data derived from Eurostat that periodically compares prices of services and goods consumed in households in 38 countries, including the 28 EU Member States. As regards food products, the comparative analysis covers prices of approximately 440 comparable products. Statistical tools that make it possible to compare prices at the aggregate level in particular countries (in time and space) include Price Level Indexes (PLI) calculated for each country with respect to food, non-alcoholic beverages, alcoholic beverages and tobacco. PLIs make it possible to compare price levels in particular countries relative to the average level of food prices in the EU. PLI values are calculated taking into account the ratio of Purchasing Power Parity (PPP) to the official exchange rate in each country against EUR (in the case of countries outside the euro area), which makes it possible to compare the prices of the same food products in one common currency (Eurostat, 2017, 2018). A PLI value higher than 100 means that in a given country the prices of products in a given group are higher than the EU average, while a PLI value below 100 indicates lower prices in a given country than in the EU, and thus competitive advantages of food producers in this country due to such lower prices[1].

[1] Full description of the methodology applied by Eurostat is available at: http://ec.europa.eu/eurostat/cache/metadata/en/prc_ppp_esms.htm, 21.09.2018.

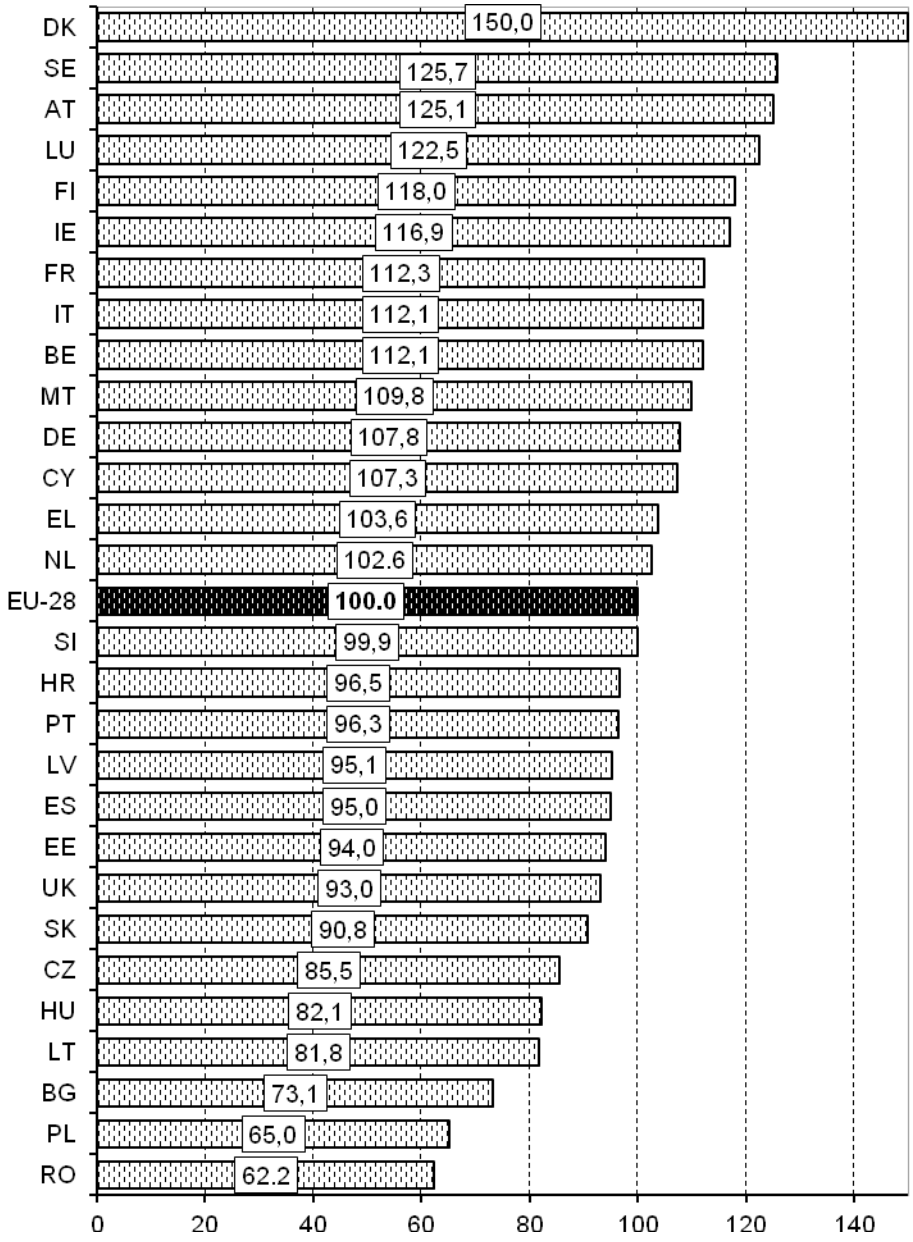
The analysis of the differentiation of prices of particular food product groups in the EU was based on differentiation coefficients, calculated for particular food product groups. The higher the differentiation coefficient, the greater the dispersion of prices in a given group of products. On the other hand, the lower the differentiation coefficient, the smaller price dispersion around the average.

The comparative analysis of food price differentiation was conducted for 28 EU Member States. The period covered by the analysis includes primarily 2017, but in some cases it was extended to 2004-2017.

3. Differentiation of food product prices in the European Union in 2017

The classification of EU Member States according to the PLI of food and non-alcoholic beverages (the basic category among food products) indicates significant differentiation of prices of these products between particular countries. In 2017, the lowest value of this index was recorded in Romania (61.6%), while the highest one – in Denmark (150.0%). This means that a comparable basket of food and non-alcoholic beverages in Denmark was more expensive than the EU-28 average by 50.0%, while in Romania it was cheaper than the EU average by 38.4%. Prices of food and non-alcoholic beverages in Denmark were therefore almost two and a half times higher than in Romania (Figure 1).

Figure 1. Price level indexes of the food and beverages in the EU countries in 2017 (EU-28 = 100)



Country symbols: AT – Austria, BE – Belgium, BG – Bulgaria, CY – Cyprus, CZ – Czech Republic, DE – Germany, DK – Denmark, EE – Estonia, EL – Greece, ES – Spain, EU-28 – European Union, FI – Finland, FR – France, HR – Croatia, HU – Hungary, IE – Ireland, IT – Italy,

LT – Lithuania, LU – Luxembourg, LV – Latvia, MT – Malta, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SE – Sweden, SI – Slovenia, SK – Slovakia, UK – United Kingdom.

Source: Own elaboration based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

Depending on PLI values for food price and non-alcoholic beverages, all European Union countries can be divided into four groups of countries. In 2017, this division was as follows:

- Group I (≥ 120% of the EU average): Denmark, Sweden, Austria and Luxembourg. This group includes countries where the price level is equal to or higher than the EU average by 20%. It is a group of countries where the prices of food and non-alcoholic beverages are the highest, and thus the least competitive on the EU market.
- Group II (< 120% and ≥ 100% of the EU average): Finland, Ireland, France, Italy, Belgium, Malta, Germany, Cyprus, Greece and the Netherlands. In this group of countries the level of prices of food and non-alcoholic beverages is equal to the EU average or higher, but by less than 20%. These are the "old" EU Member States (EU-15), where food prices do not provide competitive advantages either, but to a lesser extent than in those in group I.
- Group III (< 100% and ≥ 80% of the EU average): Slovenia, Croatia, Portugal, Latvia, Spain, Estonia, the United Kingdom, Slovakia, the Czech Republic, Hungary and Lithuania. Countries in this group achieve relative competitive price advantages (prices are lower than the EU average by up to 20%), but they are not high. This group includes some of the "new" Member States (EU-13).
- Group IV (< 80% of the EU average): Bulgaria, Poland and Romania. It is a group of countries where prices of food and non-alcoholic beverages are lower than the EU average by over 20%, and therefore they have the most competitive prices. This group includes the remaining "new" Member States.

The analysis of PLIs of food products shows that the level of these products' prices in the "new" EU Member States (EU-13) is much lower than in the "old" Member States (EU-15), but in both groups of countries these prices are very varied. In 2017, the most expensive food among the EU-15 countries was in Denmark, Sweden, Austria, Luxembourg, Finland and Ireland, while the cheapest – in the United Kingdom, Portugal and Spain (Tables 1 and 2). In Denmark, cereals, cereal products and bread, as well as oils and other fats were particularly expensive. In Sweden, the most expensive food products included fruit, vegetables, potatoes and processed products thereof, as well as meat, cereals, cereal products and bread. In Austria, cereals, cereal products, bread and meat were also very expensive. In Portugal and Spain, meat and meat products as well as fish and fish products were the cheapest. Non-alcoholic beverages were the most expensive in Denmark, Finland and Ireland, alcoholic beverages – in Finland, Ireland, Sweden and Denmark, while tobacco – definitely in Ireland and the United Kingdom. The relatively cheapest non-alcoholic beverages were sold in Spain, Italy and France, alcoholic beverages – in Spain, Germany, France, Luxembourg and Portugal, while tobacco – in Greece, Spain, Luxembourg, Portugal, Austria and Italy.

Table 1. Price level indexes for food, beverages and tobacco in the EU-15 countries in 2017 (EU-28 = 100)

Country	Food	Non-alcoholic beverages	Alcoholic beverages	Tobacco	Household final consumption expenditure
Austria	126.7	113.5	100.3	85.8	108.3
Belgium	112.3	109.4	103.4	103.9	110.7
Denmark	148.0	170.1	143.5	102.9	141.5
Finland	117.2	125.8	176.9	108.6	122.2
France	114.1	96.2	89.8	125.6	108.8
Germany	108.2	104.9	86.8	104.7	105.0
Greece	102.8	114.3	126.5	79.4	84.3
Ireland	116.0	125.4	166.6	207.6	125.4
Italy	114.0	94.6	101.9	90.9	101.1
Luxembourg	124.3	111.3	95.8	84.1	126.9
Netherlands	102.4	104.7	107.6	110.0	112.3
Portugal	95.1	113.2	98.2	85.6	85.1
Spain	95.6	88.9	84.7	83.4	92.3
Sweden	127.0	115.3	144.4	115.4	125.5
United Kingdom	91.7	105.8	137.1	193.8	116.6

Source: Own elaboration based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

Table 2. Price level indexes in the group "food" in the EU-15 countries in 2017 (EU-28 = 100)

Country	Food	Including:					
		bread and cereals	meat	fish	milk, cheese and eggs	oils and fats	fruits, vegetables and potatoes
Austria	126.7	143.4	138.8	136.1	108.0	130.4	124.0
Belgium	112.3	112.7	123.2	118.4	117.2	116.3	97.9
Denmark	148.0	168.2	138.3	136.5	133.7	154.1	138.8
Finland	117.2	126.4	120.8	121.5	115.7	89.0	123.9
France	114.1	114.5	131.8	112.0	93.1	99.9	121.9
Germany	108.2	103.7	121.6	113.3	97.5	115.2	115.1
Greece	102.8	115.9	88.3	110.4	128.0	122.1	79.9
Ireland	116.0	108.5	104.6	101.4	125.0	109.1	131.3
Italy	114.0	120.5	116.0	107.5	122.0	95.7	109.6
Luxembourg	124.3	119.0	141.1	118.0	125.0	119.5	119.8
Netherlands	102.4	92.3	117.9	107.6	99.2	98.7	108.9
Portugal	95.1	95.7	80.4	93.5	101.2	101.1	94.2
Spain	95.6	105.7	87.2	90.6	96.2	85.7	99.9
Sweden	127.0	130.4	133.1	121.2	117.2	129.3	138.1
United Kingdom	91.7	82.1	91.6	89.3	97.0	87.0	95.2

Source: Own elaboration based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

In 2017, the highest food prices among the EU-13 countries were recorded in Cyprus and Malta (food was more expensive there than the EU average), and this concerned the vast majority of product groups, i.e. cereals, cereal products and bread, fish and fish products, milk and dairy products as well as oils and other fats (Tables 3 and 4). Prices of oils and other fats were also rather high in many countries (including Latvia, Slovakia, Slovenia, Estonia, Lithuania and Bulgaria). The lowest food prices were recorded in Romania, Poland and Bulgaria, followed by Lithuania, Hungary and the Czech Republic.

In Romania, cereals, processed cereals and bread, as well as fruit, vegetables, potatoes and processed products thereof were the cheapest. In Poland, meat and meat products, milk and dairy products as well as oils and other fats were the cheapest. In Bulgaria, the lowest prices of fish and fish products were recorded. Non-alcoholic and alcoholic beverages were the most expensive in Malta, Latvia and Estonia. Non-alcoholic beverages were the cheapest in Romania and Poland, while alcoholic beverages – in Bulgaria, Romania and Hungary. Tobacco was the most expensive in Malta and Cyprus, and the cheapest – in Bulgaria, Croatia, Poland and Lithuania.

Table 3. Price level indexes for food, beverages and tobacco in the EU-13 countries in 2017 (EU-28 = 100)

Country	Food	Non-alcoholic beverages	Alcoholic beverages	Tobacco	Household final consumption expenditure
Bulgaria	71.7	90.0	64.9	50.9	48.4
Croatia	95.5	105.9	98.6	56.9	67.0
Cyprus	107.5	105.9	101.2	78.7	88.5
Czech Republic	84.5	96.3	86.5	65.0	69.0
Estonia	92.4	112.4	123.2	68.8	78.5
Hungary	81.2	91.3	77.8	65.0	62.0
Latvia	92.8	121.2	111.2	63.3	72.4
Lithuania	80.0	104.9	103.3	62.1	64.6
Malta	107.9	127.6	108.4	96.7	82.3
Poland	63.7	78.3	85.2	61.9	56.2
Romania	61.6	69.7	71.0	69.6	52.2
Slovakia	89.0	110.2	80.9	65.2	69.1
Slovenia	101.0	90.4	101.6	68.6	85.3

Source: Own elaboration based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

Table 4. Price level indexes in the group "food" in the EU-13 countries in 2017 (EU-28 = 100)

Country	Food	Including:					
		bread and cereals	meat	fish	milk, cheese and eggs	oils and fats	fruits, vegetables and potatoes
Bulgaria	71.7	59.9	58.2	63.4	91.0	111.0	69.4
Croatia	95.5	98.1	82.1	92.8	97.5	104.3	96.5
Cyprus	107.5	116.3	88.7	110.4	142.0	112.2	91.5
Czech Republic	84.5	80.3	81.5	109.6	90.1	106.0	75.9
Estonia	92.4	92.9	82.0	104.7	95.5	114.4	93.1
Hungary	81.2	73.7	71.4	92.3	89.2	109.6	81.7
Latvia	92.8	86.5	74.4	86.6	111.8	128.6	93.8
Lithuania	80.0	79.7	66.7	76.7	94.8	111.4	76.9
Malta	107.9	107.2	94.0	110.9	116.6	129.5	107.9
Poland	63.7	62.9	56.7	64.8	66.9	77.2	64.7
Romania	61.6	52.5	59.2	65.4	90.2	84.1	48.1
Slovakia	89.0	89.1	73.6	93.8	98.0	127.2	89.9
Slovenia	101.0	104.0	100.7	101.2	103.0	114.7	96.3

Source: Own elaboration based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

The analysis of PLIs of food products in particular EU countries in recent years indicates that despite their apparent convergence, those PLIs were quite stable. More noticeable changes occurred only in a few cases and did not have a major impact on the relations between particular countries, i.e. the relatively most expensive countries have been in the same group of countries for many years, just as the cheapest ones still remain in the same group of countries. The level and differentiation of prices can certainly be associated with the competitiveness of particular markets. An additional thesis is also possible that that prices of consumer goods (thus also food) depend to a large extent on the prosperity level, which is manifested through GDP per capita expressed in the purchasing power standard (Szczepaniak, 2017, p.p. 2-6). This thesis is confirmed by the

fact that prices in countries with a higher level of prosperity are much higher than in less prosperous countries.

4. Convergence of food product prices in the European Union in 2004-2017

According to A. Lindenblatt and S. Feuerstein (2014) the degree of price convergence depends on the applied degree of data aggregation. The authors claim that convergence of prices of aggregated products is possible, but they do not foreclose differences at the level of particular product groups (and vice versa). This thesis was the ground for analysing the dispersion of prices of basic food product groups. The analysis indicates that prices of food products within the European Union are gradually levelling out. This is evidenced by the widespread, though varied, decline in the value of the differentiation coefficient of PLIs of all analysed products, observed in 2004-2017 (Table 5). The process of convergence of food product prices was particularly evident in the first years after the enlargement of the European Union by new Member States. Currently, the process of convergence of prices of this product group is much slower, and in the case of some product groups it has even slowed down.

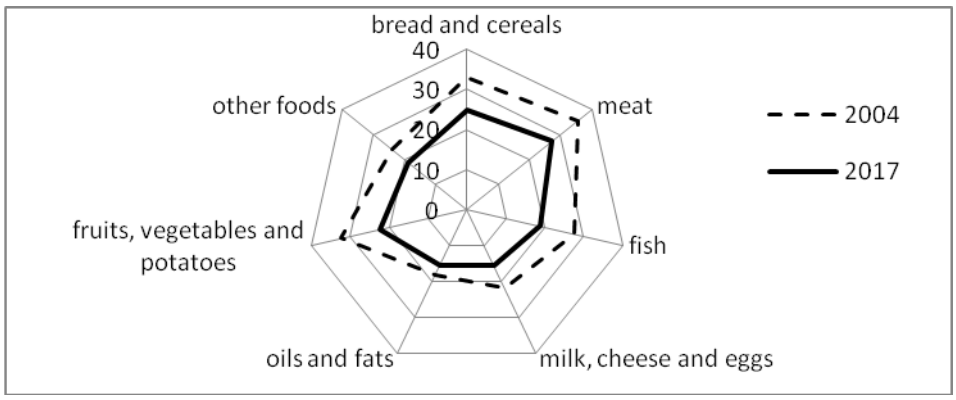
Table 5. The variation coefficients of price level indexes for food, beverages and tobacco in the EU in the period of 2004-2017 (in %)

Specification	2004	2007	2009	2011	2013	2015	2017
Food and non-alcoholic beverages	27.5	22.1	20.2	18.8	18.9	19.5	19.0
including:							
Food	28.1	22.6	20.7	19.2	19.4	20.0	19.6
bread and cereals	32.9	27.3	25.4	24.8	25.4	24.9	25.0
meat	35.7	32.6	27.2	27.2	27.4	27.2	27.3
fish	27.6	26.4	20.8	18.7	18.5	16.8	18.8
milk, cheese and eggs	21.9	19.6	19.7	19.1	17.1	17.1	15.7
oils and fats	18.2	15.5	15.4	14.4	13.4	14.1	15.6
fruits, vegetables and potatoes	32.4	24.6	24.8	22.1	22.5	23.1	22.5
Non-alcoholic beverages	24.8	20.3	20.4	20.0	18.7	18.1	17.4
Alcoholic beverages	30.9	25.7	22.0	24.8	25.5	28.5	25.5
Tobacco	53.3	50.3	42.5	38.3	39.5	42.8	40.2
Household final consumption expenditure	33.2	26.5	25.3	26.3	27.8	29.4	28.1

Source: Own calculation based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

In 2004-2017, prices of products belonging to the "food" group converged by 8.5 p.p. Among the subgroups in this category, the greatest decrease in the differentiation of prices was recorded with respect to cereals, cereal products and bread, fish and fish products, meat and meat products, as well as fruit, vegetables, potatoes and processed products thereof (Figure 2). The smallest dispersion of prices was observed in the case of oils and fats as well as milk, cheese and eggs, but these products were characterized by a relatively low price differentiation already in 2004. In the majority of cases, price convergence took place mainly in the first years of the analysed period – in the subsequent years this process was much weaker.

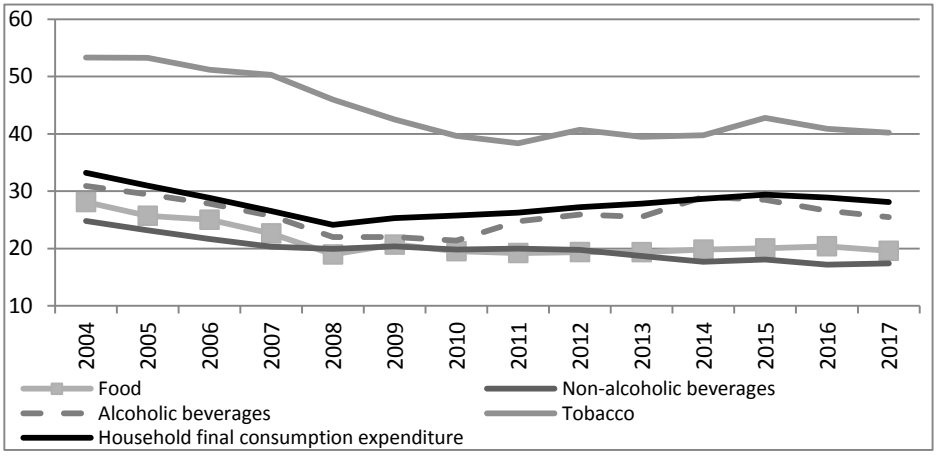
Figure 2. The variation coefficients of price level indexes in the group "food" in the EU in years 2004 and 2017 (in %)



Source: Own calculation based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

The differentiation of prices of all consumer goods and services in the European Union is higher than that of prices of food, non-alcoholic beverages and alcoholic beverages (but smaller than in the case of tobacco and tobacco products), although price convergence was observed also in this case (Figure 3). However, this process lasted only until 2008; since then the dispersion of prices of consumer goods and services in the EU market has increased again (so has that of prices of alcoholic beverages). Throughout the analysed period, the differentiation of prices of food products in the EU market, measured through the differentiation coefficient of the PLI, decreased more than the differentiation of prices of all consumer goods and services.

Figure 3. The variation coefficients of price level indexes in the EU in the period of



2004-2017, by product groups (in %)

Source: Own calculation based on Eurostat data, http://appsso.eurostat.ec.europa.eu/nui, 04.10.2018.

5. Summary and conclusions

In recent years, gradual convergence of food product prices within the European Union has been observed, proving the effectiveness of the Single European Market and the progressing economic integration of particular Member States' markets with the EU market. Convergence of food product prices in EU countries is an argument in favour of moving away from the price as a basic element affecting the competitive position of economies.

The spatial differentiation of food prices in the European Union countries in the analysed period decreased. The period of operating in the structures of the European Union and the common currency were factors conducive to lower price differentiation. Deeper economic integration and elimination of the exchange rate risk resulted in a higher level of price convergence.

The greater homogeneity of food prices in the EU-15 countries suggests the positive impact of integration on the "law of one price", and the relatively low price volatility also indicates the limits of the price convergence process. It can be thus concluded that the further price convergence in EU countries will depend on the degree of convergence of prices in the EU-13 countries with the EU average. It should be emphasized, however, that complete elimination of dispersion of food prices in EU countries is not possible. Apart from the degree of economic integration, it is associated with significant differentiation in the sizes and development level of food markets in particular countries.

The convergence of food prices in the European Union, despite being a long-term process, means that cost-price advantages gradually cease to be a key determinant of competitiveness for producers from the "new" Member States. Due to globalization and

European integration, the importance of non-price competitiveness factors is systematically growing. This phenomenon compels food producers from particular countries to seek new sources of competitive advantages in the EU market. This applies particularly to food producers from the "new" Member States, despite the fact that, as shown by the convergence analysis, they still have significant price advantages over competitors from the "old" Member States of the European Union.

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DIVERSITY OF PRODUCTION POTENTIAL OF ADVANCED TECHNOLOGY SECTOR WITHIN THE EU COUNTRIES

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Abstract

From many years there is a significant growth of meaning of the sector of advanced technology in national economies. Enterprises which belong to this sector are intensively using the knowledge, are the source of inventions, innovations, produced and used by them technologically advanced goods are determining the effectiveness of the whole economy. It decides mainly in a large degree about a possibility of competing in a global scale, not only by the enterprises but as well of regions and nations. For this reason, research problem was about determining the degree of differentiation of production potential of the sector of advanced technology within EU countries. From the conducted research it follows that the biggest number of subjects and hired people within this sector are in the western Europe. In the lead are Great Britain, France and Germany.

Keywords: Advanced technology industry, production potential, European Union

JEL Classification: O33, O52, P16

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1. Introduction

The source of competitive advantage of countries realizing innovative model of economic growth is usage of the leading technologies and production of products characterized by the highest quality. The innovative economic growth is involved by the most economically advanced countries of the world. Due to this fact they get additional impulses for the making of the competitive advantage and strengthening their leading position in global economy. Therefore, production of advanced technology industries did significantly improve in the past decades, and the high-tech products are the fastest growing sector of international trade (Srholec, 2007, p. 250). Lee and Tang (2013, p.18) claim that the sector of advanced technologies is the key factor to gain the long-term economic growth and keeping the permanent competitive advantage. Besides that, in the literature of subject there are some controversial results of research (Varum et al., 2009, p. 405) in this area the meaning of the advanced technologies sector is widely accepted. Fagerberg (2000, pp. 393–411) and Michael (2003, pp. 427-448) stated that within the countries which were able to increase the share of advanced technology sector the bigger growth of productivity was noted in comparison to other countries. Nordhaus (2005, p.5) and Bogliacino et al. (2012, p. 57) are adding that besides that it is connected with the higher than in the other sectors, intensity of research and development works. Similar approach is presented within the European Report of Competitiveness (EC, 2013, p. 20), in which the meaning of this sector in the process of building the competitiveness of European economy is highlighted. Harbi et. al. (2009, pp. 465-480) claim also that the sector of advanced technology may be the important factor of the growth of less evolved countries. Gomułka (2015, p. 394) point out the significant meaning of diversity between the national economies and resulting from them conditions which include the possibilities of growth in dependence of the level of technological advancement. He highlights that the growth of GDP *per capita* in the most technologically advanced countries subjected to fluctuation, but this trend also may be found as stable and common for all of those countries which may indicate the slight small dependence from the economic policy. He also concludes that the growth of GDP *per capita* in countries of less advanced technology was diverse and unstable in time, what may be connected with its dependence from economic policy. Notes he also, that within the countries which are technologically well developed, the capital and labor costs and the work for research and education were growing few times faster than expenditures for the conventional production which as a consequence did influence the "technological revolution". He also highlights that expenditures for research and education have the main meaning for long-term growth of economy and have the quality character. As a consequence, he claims that within the global economy there was visible growth of its duality, which projected on the phenomenon of development divergence between high and less technologically advanced countries. Presented evidence of the meaning of the sector of advanced technology in the economic development of countries were the impulse to conduct the research which aimed to determine the diversity of production potential of the sector of advanced technology within the EU countries.

2. Research methodology

Scope of the research was the sector of advanced technology which included the enterprises of high technology and as well the services which are high – tech. To the sector of high technology were included: production of basic pharmaceutical substances and medicines and other pharmaceutical products, computer productions, electronic and optical products, making of the aircrafts, spacecrafts and similar to that machines. High tech services were: the activity connected with the production of the movies, video recordings, TV recordings, sound and music recordings as well with movies, broadcasting of public and subscribed programs, telecommunications, software and advisory activities in the field of computer science and related activities, information service activities, research and development works.

Production potential of sector may be considered by the use of many measures. In this article the most common in the literature were used which are: the number of subjects, number of hired and value of production generated within the sector of advanced technologies. In this study, guided by the possibility of access to the empirical data, the most actual results about analyzed sector were used. The source of such information were data from Eurostat base.

The level of production potential of the sector of advanced technology within EU countries was evaluated by the use of two parameters of taxonomic meter which are: arithmetic average ($\overline{x}$) and standard deviation (S) of accepted indicators. The results were divided into four groups:

- countries of high level of diagnostic variable: $W \geq \overline{x} + S$,
- countries of medium level of diagnostic variable: $\overline{x} + S > W \geq \overline{x}$,
- countries of low level of diagnostic variable: $\overline{x} > W \geq \overline{x} - S$,
- countries of very low level of diagnostic variable: $W < \overline{x} - S$.

Indicators of the dimension of production potential of advanced technologies sector were the basics of creation of classification of EU countries. It was made by the determination of the development pattern – of abstraction country which was characterized be the highest level of presented diagnostic variables. Next the distance of every country was measured according to the formula:

$$d_i = \sqrt{\frac{\sum_{j=1}^{m} (z_{ij} - z_{0j})^2}{m}}$$

where: d_i – distance between country and pattern, z_{0j} – maximum value of the variable j, m – number of variables. Obtained results were converted by the use of following formula:

$$W = 1 - \frac{di}{\max\{d_i\}}$$

where: W – the level of indicator for the accepted level of dimensions of production potential which is the number of subjects, number of employment and value of production of the advanced technology sector. It enabled the presentation of data in a way that bigger values testified about more favorable level of analyzed phenomenon (the country which is a pattern will always get value 1).

3. Results of the research and discussion

Production resources of advanced technology sector within the EU countries, identified by the number of subjects and involved labor resources were diverse. There is significant concentration within few countries. The total share of four biggest countries (Great Britain, France, Germany and Italy) in terms of the number of enterprises of advanced technology sector was during the 2012-2014 in the average of 51,61% (table 1). The average level of the number of subjects of the advanced technology sector was in Netherlands, Poland, Sweden and Spain. Share of these countries in the number of enterprises of researched sector was almost over 2-times lower than the previous mentioned. It is worth to highlight that altogether they were about 76,53% of the subjects of advanced technology sectors within the EU countries. The number and share of the enterprises of this sector within the rest of the countries was relatively small.

Table 1. The number of subjects of advanced technology within the EU Countries.

Lp.	Specification	The number of subjects of advanced technology in year:			Average during 2012-2014	Share during 2012-2014 (%)	Level	Total percentage
		2012	2013	2014				
1	European Union (28 countries)	-	1 016 440	-	-	-	-	-
2	United Kingdom	162 896	176 069	186 761	175 242	17,34	high	51,61
3	France	119 072	130 856	144 825	131 584	13,02		
4	Germany	100 724	105 609	121 397	109 243	10,81		

5	Italy	106 235	104 362	105 837	105 478	10,44		
6	Netherlands	64 095	82 647	86 026	77 589	7,68	medium	24,92
7	Poland	64 009	68 831	76 741	69 860	6,91		
8	Sweden	53 845	53 851	-	53 848	5,33		
9	Spain	49 345	49 430	52 784	50 520	5,00		
10	Hungary	35 053	33 444	36 679	35 059	3,47	low	23,47
11	Czech Republic	33 965	33 992	34 900	34 286	3,39		
12	Belgium	26 962	29 505	29 183	28 550	2,83		
13	Austria	18 211	18 602	19 009	18 607	1,84		
14	Romania	16 262	17 078	18 274	17 205	1,70		
15	Denmark	14 725	15 128	15 763	15 205	1,50		
16	Portugal	14 674	14 890	15 194	14 919	1,48		
17	Slovakia	12 247	12 782	14 880	13 303	1,32		
18	Greece	12 752	12 762	12 401	12 638	1,25		
19	Finland	9 338	9 720	9 823	9 627	0,95		
20	Bulgaria	8 843	9 620	10 333	9 599	0,95		
21	Slovenia	7 390	8 064	8 890	8 115	0,80		

22	Croatia	5 645	5 753	5 927	5 775	0,57		
23	Lithuania	4 410	5 106	5 465	4 994	0,49		
24	Estonia	3 368	3 827	4 003	3 733	0,37		
25	Latvia	2 612	3 117	4 971	3 567	0,35		
26	Luxembourg	1 820	1 939	2 019	1 926	0,19		
27	Ireland	-	-	-	-	-	-	-
28	Cyprus	-	-	-	-	-	-	-
29	Malta	-	-	-	-	-	-	-

Source: Own calculation based on data from Eurostat http://ec.europa.eu/eurostat/data/database (10 .10. 2018 r.)

Considering the changes of the number of enterprises during the analyzed years the general trend was noted, about slight but systematical growth of their numbers. In the layout of the member countries such phenomenon was inhomogeneous. The biggest growth of the subjects' number of advanced technologies was on Latvia, France and Netherlands and in Germany and Slovenia. It is possible also to indicate the countries in which the number of enterprises of advanced technology was slightly smaller – it was within Greece and Italy. Presented changes did not however influenced the countries ranking.

The important component of production resources of the sector is also the number of hired employees (table 2). The highest positions in this ranking were taken by countries of the highest number of subjects which are: Germany, Great Britain, France and Italy. The total share of these countries in the number of hired within the sector of high – tech was 56.67%. The average level of employment was in Spain and Poland. The level of involvement of labor resources in Spain was 2-times smaller, and in Poland over 3-times smaller than in Germany and Great Britain. In the listed countries during the years 2014-2016 the average workforce hired within advanced technology sector was about 69,52% within the EU countries. Similarly, to the number of enterprises there was noted the gradual growth of employment within the advanced technology industry in the most of EU countries. The biggest change in this range was noted in Croatia, Estonia and Slovakia. Relatively meaningful growth of labor expenditures was in Bulgaria, Austria and Portugal. Presented changes did not affected substantially on the positions of the countries in the ranking of employment and on the potential of production measured like that within the EU countries.

Table 2. The number of hired people within the sector of advanced technology in EU countries (thousand people)

Lp.	Specification	Number of hired people within the sector of advanced technology during year:			Average during 2014-2016	Share during 2014-2016 (%)	Level	Total percentage
		2014	2015	2016				
1	European Union (28 countries)	8537,8	8739,1	8899,2	8725,4	100,0	-	-
2	Germany	1648,4	1627,7	1670,4	1648,8	18,90	high	56,67
3	United Kingdom	1439,3	1489,7	1507,3	1478,8	16,95		
4	France	1021,5	1059,2	1062,5	1047,7	12,01		
5	Italy	761,4	767,5	779,5	769,5	8,82		
6	Spain	629,1	656,0	656,6	647,2	7,42	medium	12,85
7	Poland	468,9	487,0	466,8	474,2	5,44		
8	Netherlands	291,8	306,0	335,0	310,9	3,56	low	30,48
9	Czech Republic	238,2	229,2	242,0	236,5	2,71		
10	Sweden	230,3	235,5	236,8	234,2	2,68		
11	Romania	206,5	224,4	225,7	218,9	2,51		
12	Hungary	193,0	196,9	223,1	204,3	2,34		
13	Belgium	198,6	198,6	196,7	198,0	2,27		
14	Austria	166,9	165,7	182,5	171,7	1,97		
15	Denmark	150,4	154,9	155,9	153,7	1,76		
16	Ireland	138,9	147,1	150,0	145,3	1,67		
17	Finland	143,6	142,7	138,1	141,5	1,62		

18	Portugal	122,9	123,0	125,2	123,7	1,42		
19	Bulgaria	97,0	112,8	116,1	108,6	1,25		
20	Slovakia	88,4	99,2	103,3	97,0	1,11		
21	Greece	89,8	85,7	90,4	88,6	1,02		
22	Croatia	48,9	51,9	57,6	52,8	0,61		
23	Slovenia	46,9	54,3	50,3	50,5	0,58		
24	Estonia	28,1	32,7	34,8	31,9	0,37		
25	Lithuania	27,1	30,6	33,3	30,3	0,35		
26	Latvia	29,8	29,5	27,9	29,1	0,33		
27	Malta	11,1	10,7	11,4	11,1	0,13		
28	Cyprus	10,5	10,5	10,7	10,6	0,12		
29	Luxembourg	10,5	10,1	9,3	10,0	0,11		

Source: Own calculation based on data from Eurostat http://ec.europa.eu/eurostat/data/database (10.10. 2018 r.)

Level of the resources in sector of advanced technology of EU countries and the right usage of them should find a reflection in obtained production results. The most common result of economic processes is the value of sold production. The share of individual countries of EU in the creation of discussed sector was as well as the number of subjects and employment significantly diverse (table 3). The highest value of production of the sector of advanced technology was noted in Germany, Great Britain and France. To the group of countries of medium level of production value was included Italy, Spain and Netherlands. Total share of listed countries in the union production was 76.30 %. It was the consequence of big involvement of previous mentioned, production resources within this sector.

Table 3. Value of sold production of the advanced technology sector within EU countries (mln euro)

Lp.	Specification	Value of production in the sector of advanced technology in year:			Average during 2012-2014	Share during 2012-2014 (%)	Level	Total percentage
		2012	2013	2014				

1	European Union (28 countries)	-	-	-	-	-	-	-
2	Germany	266 652	280 619	290 862	279 378	20,38	high	55,39
3	United Kingdom	255898	251 887	275 255	261 013	19,04		
4	France	219608	215 308	221 656	218 857	15,97		
5	Italy	150591	146 718	142 116	146 475	10,69	medium	20,91
6	Spain	71339	69 842	69 678	70 286	5,13		
7	Netherlands	62770	61 208	85 394	69 791	5,09		
8	Sweden	61697	:	:	61 697	4,50	low	23,70
9	Belgium	47 386	50 418	52 485	50 096	3,66		
10	Poland	33367	33 862	34 594	33 941	2,48		
11	Denmark	31499	31 257	34 193	32 316	2,36		
12	Finland	:	:	26 104	26 104	1,90		
13	Czech Republic	24 530	22 800	22 822	23 384	1,71		
14	Austria	20756	22 447	23 285	22 163	1,62		
15	Hungary	21613	19 644	19 468	20 242	1,48		
16	Portugal	12988	12 701	12 440	12 710	0,93		
17	Slovakia	10805	10 347	10 692	10 615	0,77		
18	Romania	9929	10 172	11 024	10 375	0,76		
19	Greece	8087	7 623	6 934	7 548	0,55		
20	Slovenia	4766	4 883	4 987	4 879	0,36		
21	Croatia	3799	3 995	3 970	3 921	0,29		

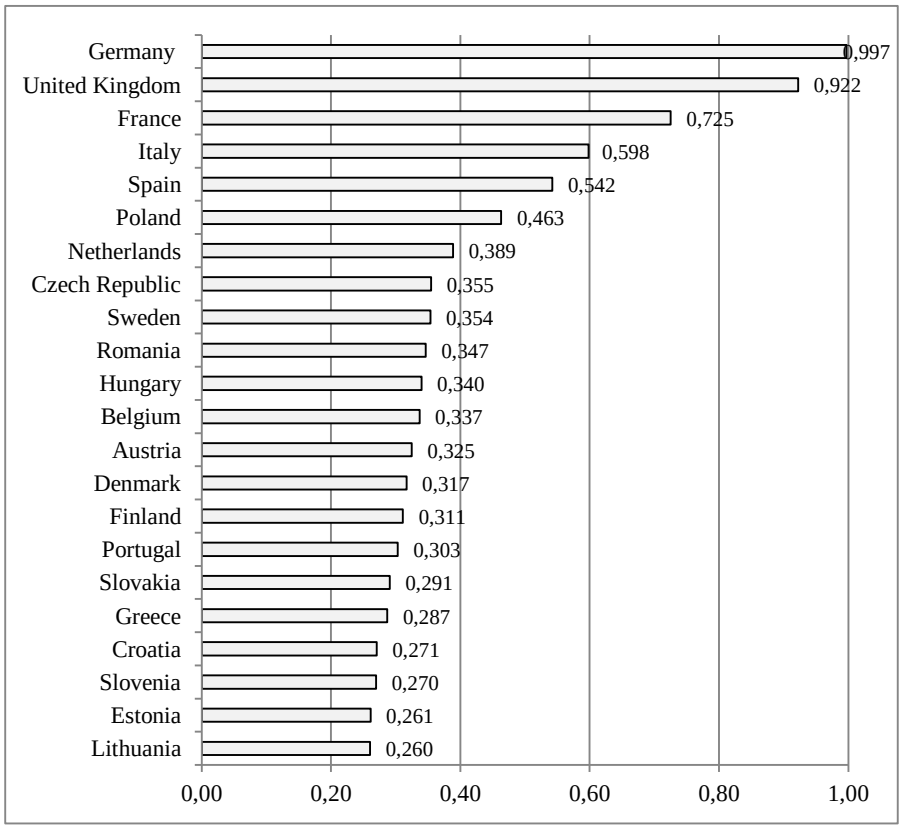
22	Estonia	3096	3 174	3 309	3 193	0,23		
23	Lithuania	1541	1 596	1 768	1 635	0,12		
24	Bulgaria	-	-	-	-	-	-	-
25	Ireland	-	-	-	-	-	-	-
26	Cyprus	-	-	-	-	-	-	-
27	Latvia	-	-	-	-	-	-	-
28	Luxembourg	-	-	-	-	-	-	-
29	Malta	-	-	-	-	-	-	-

Source: Own calculation based on data from Eurostat http://ec.europa.eu/eurostat/data/database (10.10. 2018 r.)

Changes in the value of production in EU countries within the analyzed years were most diverse. The biggest growth in production value was noted in Netherlands (36%). Also, the big growth was noted in the sector of advanced technology (over 10%), in Austria, Romania and Belgium. Unfavorable situation in this spite was in Greece, Hungary and Czech Republic – within these countries the reduction of the value of the production during analyzed years – accordingly of 14,3%, 9,9% and 7,0%. Presented tendencies of changes of the value of sold product of advanced technology, as well with the case of employment and number of enterprises did not cause relevant differences in the position in rankings which they got.

Previously presented partial indicators were the basis for the construction of synthetical measure of production potential of the sector of advanced technology of the countries from EU. Due to the incompetence of data, the indicator was measured only within these countries of EU in which it was able to analyze all of the variables. The clear leaders in this regard were countries such as: Germany, Great Britain (figure 1). High level of production potential of the sector of advanced technology was noted also in France.

Figure 1. Synthetical indicator of production potential of sector of advanced technologies within EU countries



Source: Own study based on tables 1-3

The average level of synthetical indicator was noted in Italy, Spain and Poland. It is worth to mention that some of the countries form central-eastern Europe took high places in this rank. It concerns mainly besides mentioned early Poland, but as well Czech Republic, Romania and Hungary. To sum up presented data, it needs to be stated that production potential of the EU countries results from their size and population. As an example, Luxembourg, Cyprus and Malta are not among countries with the high level of such indicators. According to that, both the number of subjects as well with the number of hired people and the value of production of the advanced technology sector is significantly lower than in comparison with the other EU countries.

4. Conclusion

Changes which are occurring in the present world indicates the growth of importance of the fields which are based mainly on the intensive usage of knowledge. Belongs to them

at most subjects belonging to the industries and services high-tech. Presented analysis points out that among EU countries the highest production potential of the sector of advanced technologies was noted in Germany, Great Britain and France. However, it should be emphasized that it is the result from (among many others) size of the countries and the number of hired people within them. Complementing the conducted research should be analysis the meaning (share) of the sector of advanced technologies within the national economies of the countries.

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THE IMPACT OF IP NONDISCLOSURE ON AND SUCCESS FACTORS INRESEARCH-BASED / ACADEMIC ENTREPRENEURSHIP

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Abstract

For many years commercial products that developed out of university research are a topic of raising interest in academia. The major focus of existing investigations about commercialised academic research is put on developments with patent, thus formal intellectual property (IP) protection. Focus of this study is on unpatented research outcomes and their commercialisation at the example of a balance support tool. Further the study looks at other factors that have an impact on academic entrepreneurship. Whereas – so reveals the study – the pure existence of a patent attracts investors, it does not seem to influence the quantifiable success of a business. Product characteristics, the team behind, the product's applications, market size and also the work with the academic research institution behind including its network have a major impact on the business's outcome in numbers. Further influencing factors are the cost absorption of the product as well as feelings and luck of the entrepreneurial team. The aforementioned research results are findings of a qualitative single case study with additional interviews, and thus do not claim completeness and need to be tested on a larger quantitative scale.

Keywords: University spinouts, IP protection, patents

JEL Classification: I11, O32, O34

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1. Introduction

So far it is clear, that different forms of entrepreneurship exist, including the creation of a new free standing start-up, the development of new business concepts within existing companies and the development of new entrepreneurial ventures out of university-developed technology (Pittaway, 2012). This study specifically investigates the last mentioned form, the commercial exploration of outcome of university studies. This type of entrepreneurship is also known as Academic Entrepreneurship (AE), the new company is a spinout; if the initial research has been undertaken at an academic institution it is a university spinout. Main focus of this study are the factors that have a significant impact on the success of the founded company; specifically to what extent IP-nondisclosure has an influence.

The case study

The research study is a medical technology single case study investigating the spinout process of a product developed out of research at Maastricht University. The invention by Prof. Kingma a renown otorhinolaryngologist and specialist in the field of the vestibular system is a medical device helping patients who lack a feeling of balance. The invention helps sufferers to overcome spatial discoordination caused by vestibular loss.

Given the growing interest of academic institutions to capitalize on the developed intellectual property Maastricht University – as many others – has a so called technology transfer office that focuses specifically on such monetary return of research (Lundqvist & Middleton, 2013). For this case study Maastricht University supported the cooperation of the researcher with the TTO over a period of 11 months with a business developer and also a range of consultants. Further, to involve policy making – which is of growing importance in research-based entrepreneurship (Wright, Clarysse, Mustar, & Lockett, 2007) – the regional development agency (RDA) also got involved and covered some of the research expenses.

The Research question

Given the growing interest in the field of Academic Entrepreneurship this study is investigating aspects that impact the quantifiable business success. Core focus of the study is to close the research gap that emerged, given that current research primarily focuses on the spinout development of research products whose IP has been formally protected by a patent. This focus is paramount because handling IP is moving away from solely claiming patents and moving towards a collective protection strategy (Smith & Hansen, 2002).

Thus, the following research question evolved:

What are the key success factors for the commercialisation of university inventions and how does IP protection in form of nondisclosure influence quantifiable business outcome?'

2. Literature Review

Academic entrepreneurship (AE)

AE is growing in popularity (Djokovic & Souitaris, 2006) and is a field of increasing economic interest for several years (Steffensen, Rogers, & Speakman, 1997). Like for

entrepreneurship, there is also no common definition for AE. Whereas e.g. Roberts (1991), an experienced and academically renown specialist in the field of high technology entrepreneurship in the USA (MIT Sloan School of Management, 2014), defines that AE includes that the entrepreneur was involved as a researcher in the development of the product at the research institution; Pirnay, Surlemont and Nlemvo (2003) explain that the entrepreneur must be linked to the university – yet, their paper does not clarify in which way. Both definitions are too narrow and too limited for this study, because the connection of the entrepreneur to the university is not fundamental. What is here perceived to be crucial though, is, that a new business is created which commercializes on an invention created at a research institution. New opinions including "informal and non-commercial activities" (Abreu & Grinevich, 2013) to also form part of AE have not been given importance in this study. For the purpose of these investigations AE and spinouts are defined as follows:

Research-based entrepreneurship is the foundation of companies out of academic research with the goal of exploiting the created intellectual property (e.g.: Di Gregorio & Shane, 2003; Djokovic & Souitaris, 2006; Roberts, 1991; van Geenhuizen & Soetanto, 2009).

Stakeholders

To define who the stakeholders of AE are, first a definition of stakeholders is necessary: "Stakeholders […] are the individuals and constituencies that contribute, either voluntarily or involuntarily, to […] wealth-creating capacity and activities, and that are therefore […] potential beneficiaries and/or risk bearers." (Post, Preston, & Sachs, 2002, p. 19). In this study the following stakeholders have been investigated with the purpose of getting to a list of factors that have a positive impact on the quantifiable success of university spinouts:

- Entrepreneur (Malik & Mahmood, 2012; Meyers & Pruthi, 2011; Shane, 2004)
- Customer (Friedman & Miles, 2006; Meyers & Pruthi, 2011)
- Researcher Team (Malik & Mahmood, 2012; Roberts, 1991; Shane, 2004)
- Specialists (Shane, 2004)
- TTO (Lockett, Siegel, Wright, & Ensley, 2005; McAdam, Miller, McAdam, & Teague, 2012) & university leadership (Meyers & Pruthi, 2011)
- RDA (McAdam et al., 2012)
- Sources of Finance (Friedman & Miles, 2006; McAdam et al., 2012; Shane, 2004)
- Consultants (Lockett et al., 2005)
- Competition / competitors (Friedman & Miles, 2006)

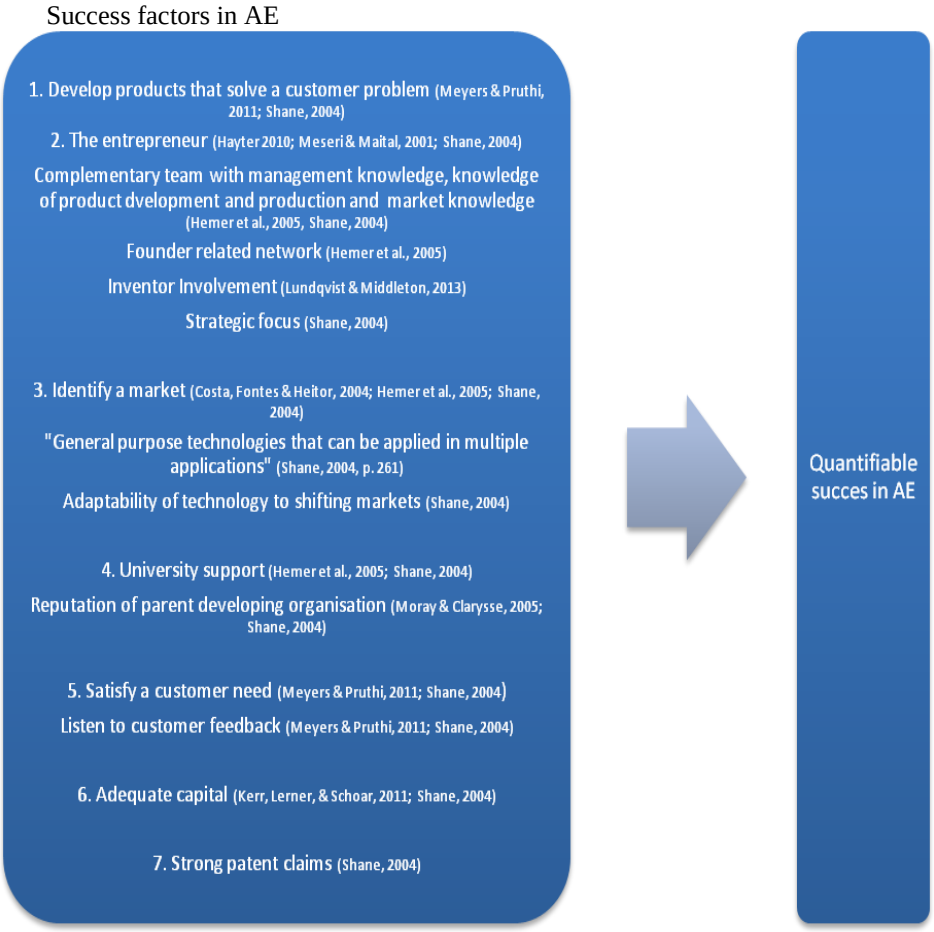

Figure 1: Influences on quantifiable success in AE, literature
(main source: Shane, 2004; other references: Costa, Fontes, & Heitor, 2004; Hemer et al., 2005; Kerr, Lerner, & Schoar, 2011; Lundqvist & Middleton, 2013; Meseri & Maital, 2001; Meyers & Pruthi, 2011; Moray & Clarysse, 2005)

Research unveils that a variety of factors affect the success of spinouts (Hemer, Walter, Berteit, & Göthner, 2005; Shane, 2004) – to know how and what they influence, success as such needs to be defined. Success cannot be measured only quantitatively or in financial terms, it is defined by the entrepreneurs that commercialise on the inventions and manage the businesses (Hayter, 2010). Success is to "harmonise or coordinate a conglomerate of heterogeneous and partly diverging goals of the societal groups interested in the enterprise" (Hemer et al., 2005, p. 4). Consequently, there are varying forms of success, considering the different expectations of the involved parties. For the sake of this paper success has been defined as quantifiable commercial success.

Out of Shane's book chapter, "The performance of university spinoffs" (2004, pp. 240–276), a range of factors influencing AE have been listed and are visualised in figure 1. The visualisation though is not limited to Shane, but also refers to further literature especially focusing on technology transfer. In this way, the figure intends to give a broader overview of the factors that influence success in AE. Thus, seven groups of influences have been found in the literature to affect quantifiable success in AE. Meyers, Pruthi (2011) and Shane (2004) mention in their publications that first and foremost products need to solve a customer problem. Several authors (Hayter, 2010; Hemer et al., 2005; Lundqvist & Middleton, 2013; Shane, 2004) discuss the entrepreneur or management team and the skills that are required for successful commercialisation. It can be summarised out of the literature that an entrepreneur or management team of a new company needs to have technical, managerial as well as market knowledge. Technical knowledge due to e.g. inventor involvement (Lundqvist & Middleton, 2013) is rarely lacking, management knowledge, however, sometimes seems to be an issue (Costa et al., 2004). As supposed to happen with the AVS, students taking over the role as lead entrepreneurs can be a good complement to the management team. This also helps to avoid having the researcher with no business knowledge to become managing director which also is least preferred by the parent university (Lundqvist & Middleton, 2013). It is common sense that strategic focus is important in entrepreneurship; Shane explains that this also applies to AE (Shane, 2004). The market is also a frequently mentioned aspect in the literature, either referring to the necessity to identify it (Costa et al., 2004; Hemer et al., 2005; Shane, 2004), or to the fact that the about to be commercialised technology should be adaptable to a developing one and applicable in several ones (Shane, 2004). Furthermore the contact to the parent organisation and particularly its network (Moray & Clarysse, 2005; Shane, 2004) do have an effect. Customer satisfaction and feedback (Shane, 2004), which is so far sometimes not given the necessary importance (Meyers & Pruthi, 2011) also has a major impact. Adequate capital refers to suitable investors and sources of money covering the cash necessities of a new business (Kerr et al., 2011; Shane, 2004). The protection of IP is an important aspect in entrepreneurial firms exploiting newly developed ideas (Smith & Hansen, 2002). Shane (2004) goes as far as stating that strong patent claims are vital for the success of a spinout, a statement to be challenged here.

IP protection and its importance

Literature looks at IP protection primarily in the form of patents (Shane, 2004), but there are also other forms of IP protection such as copyrights and trademarks (Bradley, Hayter, & Link, 2013). Let it be as it may, first the patent: A patent is defined as: "a government authority or licence conferring a right or title for a set period, especially the sole right to exclude others from making, using, or selling an invention" (Oxford Dictionaries, 2014). It turns out that patenting is not always the best and most valuable way to protect IP. As IP can always be copied (Smith & Hansen, 2002), the business which is holding the patent is responsible to monitor infringements. Thus, holding a patent may come with a lot of costly obligations – especially since all the knowledge behind the patent is disclosed already at the time of patent application (Markman, Gianiodis, & Phan, 2009); if a patent is not granted, then all data has been disclosed to the public and thus also to the competition for nothing. Smith and Hansen (2002) in a non AE context explain that non-disclosure is also a way to protect the IP. In contrast to

that, Shane (2004, p. 259) finds out in research interviews with MIT spinoff managers though, that patents are perceived as the key business success factor. In support of that, they further explain that "it takes real aggressive, competitive IP management […] to succeed" (Shane, 2004, p. 259). Smith and Hansen explain that a patent is only worth its cost if a company can capitalize on it (Smith & Hansen, 2002). As previously pointed out, there is currently very limited research on AE if no patents exist. This study aims to make a first qualitative attempt to explore the importance of patents in AE, and – by doing so – it makes a first step towards closing this gap of knowledge.

3. Methodology

Academic research in the field of entrepreneurship is still relatively new and theories are not yet fully developed (Pittaway, 2012). Thus, this study is oriented more towards exploration so that theory – which is to be tested in future more quantitative research – can be generated. The here discussed investigations are of purely qualitative nature and hold – given the length of eleven months – some longitudinal elements. Throughout the study triangulation was applied wherever possible. The techniques that were combined included interviewing, collecting, examining, observing and feeling. The above-mentioned techniques were chosen in combination to maximize the outcome of the multiple realities of human cognition. The data was not only interpreted in order to objectivize the quantifiable impact of IP non-disclosure, but also to lead to a list of factors significantly impacting the quantifiable success of AE. Observation, focus groups and semi- as much as unstructured interviews were held with all stakeholder groups discussed in section 2.2. To structure the qualitative input of about 40 research subjects table 1 has been developed.

Table 1: Subject grouping

	Internal	**Related**	**External**
1. Specialists	**4.**Researcher (I-S1) **5.**Research Assistant (I-S2) **6.**Research Technician (I-S3)	**7.**Focus group of technical specialists and professors (R-S)	**8.**Focus group with 2 craniosacral specialists and 2 physiotherapist Osteopath (E-S1a-d) **9.**Osteopath (E-S2) **10.** Orthopaedist (E-S3) **11.** Otorhinolaryngologist (E-S4)
2. Business side	**12.** Longitudinal observation Business developer TTO (I-B1) **13.** Manager TTO (I-B2)	**14.** Advisor from investment bank (R-B)	**15.** Kamer van Koophandel (E-B1) **16.** RDA (E-B2)
3. Academic Entrepreneur	**17.** Business developer that takes a current product further (I-AE)	**18.** Previous MU spinout manager (R-AE1) **19.** CEO of a Medtech	**20.** 2 CEOs of software-based medical companies (see, E-AE1-2) **21.** 7 CEOs of non-software-based medical companies **22.** Operations manager

		Company (R-AE2)	medical company (E-AE5a)
4. Consultants	**23.** Group interview with 2 Medtech consultants (I-C1a, I-C1b) **24.** Medtech consultant (I-C2) **25.** Self-Employed Business development Consultant (I-C3)	**26.** Senior Sales manager (R-C1) **27.** 1 Tax advisor (R-C2)	**28.** Start-up Consultant Germany (E-C1) **29.** Retired Entrepreneur and President of stock listed companies (E-C2) **30.** Consultant focusing on medical catalogue Germany (E-C3)
5. Finance	**31.** Informal Investor that was about to invest (I-F1) **32.** Financial accountant (I-F2)	**33.** Interregio Conference (R-F1) **34.** European Venture Contest, Denmark (R-F2)	**35.** Senior Venture Capital Manager (E-F1) **36.** Senior Consultant medical Consulting company (E-F2) **37.** CEO and Angel Investor (E-F3)
6. Patent lawyer			
7. Entrepreneur			

4. Discussion

The results revealed that there are many factors which influence the success of a university spinout; some of which have already been mentioned in the literature (see figure 1). The investigations in combination with the literature have shown that there are eight major influencing factors affecting quantifiable business success in AE (see figure 2).

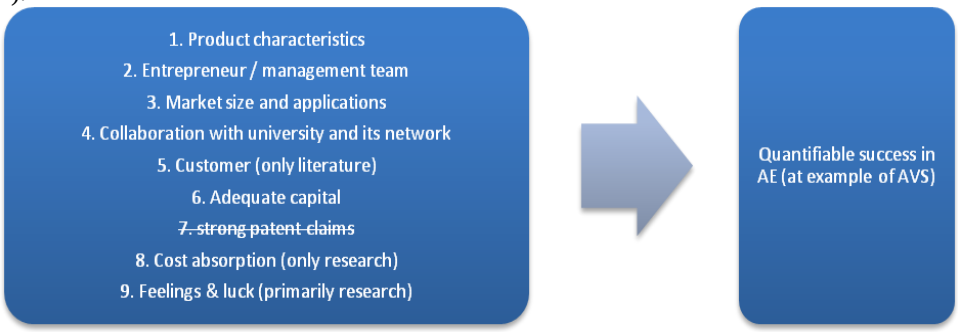

Figure 2: Influences on quantifiable success in AE, literature and research

As Shane (2004) already explained, different product characteristics (see 1. Product characteristics, figure 2) are important for the success of a university spinout. Whereas Shane (2004) specifically elaborated on the solution of customer problems, this was only one of many product features that were mentioned by the participants of this audit. Features, which were specifically mentioned, were the reliability of the product (R-S, E-

S1a, E-S1b, R-C2, E-C1) and that the product as such proves to work (R-S, E-C1, I-F2, I-S2). According to manifold respondents (I-B1, I-C2, R-C2, E-C1, E-C2, E-F1, E-F3) the product was supposed to be promising. This, admittedly, leaves space for wide interpretation. With such statements, subjects referred to product characteristics but also to feelings as in point 9. 'Feelings & luck' (figure 2) which is explained later on. In accordance with the literature (Hayter, 2010; Hemer et al., 2005; Shane, 2004) it was also found that the right entrepreneur (see 2. 'entrepreneur', figure 2) or as the literature points out management team is a vital aspect affecting prosperity (E-AE9, R-C1, E-C2, I-F2, EF1, EF3). Whereas, Hemer et al. (2005) point towards the founder related network, this, in this small study, has not been mentioned by any of the investigated attendants. One of the academic entrepreneurs (I-AE) notably discussed the university's network – or as he specifically states, the one of the TTO to be key to success – a point taken up in 4. 'Collaboration with university and its network'. Enthusiasm and passion of the entrepreneur which was also mentioned a few times (R-AE1, E-AE5, E-AE9, R-F2), again refers to point 9. 'Feelings & luck' (figure 2). Feelings came up several times in this study; going large scale at the right time – a statement that was repeated independently by several respondents (I-B1, E-AE3, E-AE5a, E-AE6, E-F1, I-C3) is also closely linked to it. The right time is difficult to be defined, thus, luck – as mentioned by E-AE9 and EC2 – is part of the story. Just like Hemer et al. (2005) and Shane (2004) numerous respondents talk about the market (see 3. 'Market size and applications', figure 2) to be a major point. Whilst the mentioned authors explain that the identification of a specific customer segment was critical, the investigated subjects specifically pointed towards the size of the potential target group (I-C2, R-C2, E-C1, E-C2, I-F1, I-F2, E-F2, E-F3). Remarkable is the fact, that market size is not mentioned by any of the entrepreneurs as success determinant, that financiers and consultants, however, see it as paramount. In accordance with Shane (2004) multiple applications and the adaptability to several audiences were seen as helpful (E-C2, R-F2, E-F1). As already indicated, the (see 4., figure 2) collaboration with the university and its network is important. Moray and Clarysse (2005) already explained beforehand that the reputation of the parent developing organisation is crucial. This was a point that has not been mentioned in the research; notwithstanding I-AE pointed towards the network of the TTO, which can be understood as the network of the university – one that is larger if the university has an outstanding reputation. Given that this study does not research customers (point 5. figure 2), statements about their influence on success cannot be made. Nevertheless, the foundation in the literature (Meyers & Pruthi, 2011; Shane, 2004) makes one assume that this holds true. E-AE9 in fact explained that adequate capital at the right time is necessary for successful commercialisation which is in accordance with the literature (Kerr et al., 2011; Shane, 2004). Point 7. 'Strong patent claims' of figure 2 has intentionally been stroked through in this final visualisation. It is an outcome of this study that patents are not a major success-influencing factor. Nonetheless, patents can have an influence on the commercial success of an invention if certain conditions are met. The consultation with specialists has added a further point to the debate: 8. 'Cost absorption' (see figure 2). Several of the subjects – namely R-S, E-S3, E-S4, and E-C1 – pointed out that it is important that the product is affordable. E-S3 and E-S4 further explained that coverage by the health care provider is positively correlated. Last but not least, the study displayed a further aspect which was mentioned implicitly by some respondents and which was not found in the literature specifically relating to AE: 9.

'Feelings & luck'. As many of the participants stated, belief and the right feelings of the entrepreneur or the commercialising team are indispensable (statements such as: E-C2: "You have to have a clear vision and you will find a way!"); luck as explained is also part of the story.

5. Conclusion

Key success factors in Academic Entrepreneurship (AE)

The field of AE is evolving is also of raising academic interest. This study shows that a range of aspects influence university spinouts and in particular their quantifiable success. Following these recommendations does not guarantee success but is advantageous for commercial success of new university spinouts.

1. Product characteristics

For successful large-scale commercialisation a promising product that solves an existing problem is necessary. The product needs to function well and be reliable; if medical application is the goal, medical validation is indispensable.

2. Entrepreneur / management team

A passionate management team or entrepreneur with technical and managerial skills is necessary. Experience and an own network can be advantageous

3. Market size and applications

To have a high success likelihood the primary market of the product should be large and calculations should allow for a margin of error. Already at the point of commercialisation several alternative market applications should be known as plan B to either increase success or to have a backup plan if the commercialisation of the primary application fails.

4. Collaboration with university and its network

The parent academic institution has a large network, which was grown over the years. Collaboration with the university does not only allow for tapping a well-grounded source of knowledge but also gives access to a network, potentially larger than one's own in the respective field.

5. Customer

All stands or falls with the customer. Customer feedback is crucial and customer satisfaction as in any business very important. Listening to the customer does not only secure continued collaboration but also reveals potential needs which can be exploited commercially in the future.

6. Adequate capital

The right type and amount of capital at the right moment in time are necessary for maximum exploration of the commercial potential of a product.

7. Cost absorption

The customer is only willing to pay a certain price. Cost absorption massively influences the success potential of a product; spinout products have to either be in the affordable range or should be covered by funding other than from the end-user. This might be trivial but the case has shown that affordability and cost coverage tend not to be given the required importance.

8. Feelings & luck

Positive feelings of the entrepreneur and investors are vital. Only if there is belief, there can be a vision and only if there is a vision there is a potential to persuade investors. At the end of the day luck is also part of the story, but, as one of the entrepreneurs states: "You can force the luck!"

The impact of IP non-disclosure

This study revealed that patents are not decisive for the quantifiable success of a university spinout. In fact, several subjects confirmed and stressed that the costs of not only filing a patent and its regular fees are not the biggest expenses linked to holding a patent. In addition, a patent holder must have the financial strength to protect the patent by monitoring the market for violation and legally defending the patent at court. Only advantage of patents in such a stage – no matter its fees – is the positive marketing towards investors. Excluding the potential naivety of fund-givers it seems that non-disclosure of IP is the way to go. Patenting implies full public disclosure of all research results – and that prior to protection – a risk only big companies or institutions with significantly over-proportional funds can afford. It might according to some subjects eventually be clever to buy the investor advantage of a patent at the price of patent-protecting a less important part of the invention and much rather not disclose the really relevant IP of the product. Going such ways might limit the follow up costs of the patent. Such claims as these, however, require future quantitative investigations.

Research recommendations

As a result of this study three major research recommendations arise. First and foremost, the real cost of patents including market observation and legal defence should be investigated. By doing so it will be possible to make clear statements about the monetary sense of patent-protection of IP also and specifically in SMEs. Further quantitative research is necessary in order to measure the quantifiable impact of the above-mentioned success factors. The overall agreement of the research subjects was, that patents have a significant impact on the interest of investors in specific inventions or much rather into investing in such. Further quantitative research is necessary to prove such claims on a largerscale.

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TESTING THE MERGER PREMIUMS IN PUBLICLY TRADED FIRMS: THE CASE OF U.S. COMMERCIAL BANKS

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Abstract

This study examines the short-term wealth effects of the mergers and acquisitions (M&As) transactions that were announced between 2000 and 2014 in U.S. Banking Industry. In particular, the merger premiums before and after the Global Financial Crisis (2008-2009) are examined. The results reveal that, on average, cumulative abnormal returns (CARs) to the target banks are 23.64% while CARs to the bidders are -1.24% around the announcement date over the sample period. We also find statistically significant positive CARs of 2.42% for the combined banks. The findings point out that M&As are value-creating events for the combined banks due to synergies created between bidders and targets; however, bidders may sometimes overpay to realize these gains. Our findings also reveal that M&As taking place before the Global Financial Crisis period (2000-20007) realize lower gains for targets, bidders and combined firms compared post-Crisis period (2010-2014) possibly due to stronger banks surviving the Crisis and existence of a more prudent and reliable market environment after the passage of Dodd-Frank Act.

Keywords: Banking; Mergers and Acquisitions; Event Study; Global Financial Crisis, Investment, Stocks.

JEL Classification: G34; G21; G14; G30

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1. Introduction

Due to the liberalization and deregulation of financial markets, the U.S. Banking Industry has experienced an unprecedented change over the past several decades. During this time, the number of U.S. commercial banks has declined from 14,417 (1985) to 4,852 (Q1:2018)[1]. This decline has also stemmed from technological innovation, advanced applications and the banks' motivation to control their costs along with economies of scale. Mergers and acquisitions have been used as a strategic tool by banks' management to grow market share, diversify geographically, or improve their competitive position in their respective markets. After witnessing such a big wave of U.S. bank mergers in past decades, it is relevant to ask whether these transactions create value, and if they do, what the drivers of such value creation are. Unfortunately, empirical evidence does not provide unambiguous answers with respect to these questions. Furthermore, examination of the recent merger transactions is of importance because the Global Financial Crises, which took place in 2008 and 2009, has led to substantial changes in the way financial institutions operate mainly due to increased legislative oversight. Since the investors became more cautious regarding financial markets and valuations in general, it is reasonable to believe that the short-term market reactions to bank M&As may have changed.

This study explores the short-term market reaction to M&A announcements that occurred during the 2000-2014 period in the U.S. banking industry and aims to test value creation capacity of M&A transactions around the Global Financial Crisis and financial regulation that followed such as the Dodd-Frank Wall Street Reform and Consumer Protection Act of, 2010 with the aim of providing empirical contribution to the ongoing debate. With this goal in mind, we analyze the target, bidder and combined firm cumulative abnormal returns[2] (CARs) computed using standard event study methodology and empirically examine the short-term stock price returns to U.S. bank M&A announcements in order to measure the value creation capacity of these deals. Finally, we explore whether the short-term market reaction to bank merger announcements has changed before and after the Global Financial Crisis to better understand the influence of regulation on drivers and patterns of the Abnormal Returns (AR).

The selection of the benchmark to measure normal returns is central to conduct the event study. In previous literature, S&P 500 Index was employed frequently as a benchmark in computation of ARs. To correctly measure the announcement impact of an M&A deal in banking industry, we need to control for confounding factors outside the banking industry. With this goal in mind, we employ the U.S. Banking Index alternative to S&P 500 Index as a benchmark. This approach may yield more accurate results relative to traditional approach since the returns of the banks subject to M&A deal are more correlated with Banking Index returns than S&P 500 Index returns, thus capturing the

[1] Federal Reserve Bank of St. Louis, https://research.stlouisfed.org/fred2/series/USNUM (As of 5th of December, 2018)
[2] Abnormal return is the return to shareholders due to nonrecurring events that differs from what would have been predicted by the market model.

actual effect of the deal. In this respect, one minor contribution of this study to the current literature is the introduction of new benchmark in computation of ARs.
Our research also contributes to the literature by examining the most recent merger deals including those occurred after the Global Financial Crisis as we get to examine whether merger premiums have changed around the Crisis and recent regulation in the financial markets such as Dodd-Frank Wall Street Reform and Consumer Protection Act. Although the impact of the Crisis on financial markets is extensively examined, to our best knowledge, there is no comprehensive study on the wealth effect of the U.S. bank mergers comparing pre- and post- Crisis. In this sense, our sample period is relatively large (from 2000 to 2014) and comprehensive compared to earlier studies in relevant literature.

This paper is organized as follows. The next section presents a short overview of the related literature. Section 3 elaborates on the hypotheses to be tested. Section 4 outlines data and sample selection methodology. Section 5 introduces the event study methodology and the model used in the current study. Section 6 presents the empirical results and section 7 offer concluding remarks.

2. Literature Review

The short term and long term impacts of M&A transactions from various aspects have been examined in depth in the literature by market researchers and academicians since the beginning of consolidation took place in U.S. banking industry.

Empirical evidence from earlier research typically reports significant positive abnormal returns to the shareholders of the target firms, significant negative returns to shareholders of bidder firms, and significant positive returns to the shareholders of the combined firms around the transaction date [See, among others, Dodd and Ruback (1977), Bradley (1980), Jensen and Ruback (1983), Desai and Stover (1985), James and Weir (1987), Neely (1987), Trifts and Scanlon (1987), Wall and Gup (1989), Hawavini and Swary (1990), Cornett and De (1991), Cornett and Tehranian (1992), Baradwaj, Dubofsky, and Fraser (1992), Aggrawal, Jajje, Gershon, and Mandelker (1992), Houston and Ryngaert (1994), Madura and Wiant (1994), Holdren, Bowers, and Mason (1994), Palia (1994), Zhang (1995), Hudgins and Seifert (1996), Pilloff (1996), Siems (1996), Loughran and Vijh (1997), Subrahmanyam, Rangan, and Rosenstein (1997), Rau and Vermaelen (1998), Esty, Narasimhan, and Tufano (1999), Becher (2000), Andrade et al. (2001), Delong (2001), Houston, James, and Ryngaert (2001), Hart and Apilado (2002), Fuller, Netter, and Mike (2002), Amilhud, Delong, and Saunders (2002), Anderson, Becher, and Campbell (2004), Delong and DeYoung (2004), Moeller, Schlingemann, and Stulz (2005), Kolaric and Schiereck (2013). and Asimakopoulos and Athanasoglou (2013)].

Jensen and Ruback (1983) concluded that corporate takeovers result positive yields, from which shareholders of target firm gain and shareholders of bidding firm do not lose as Neely (1987) studied 29 U.S. mergers for the 1979-1985 periods and found 36.22% positive ARs for target firms. Trifts and Scanlon (1987) investigated 21 U.S. M&As for the period of 1982-1985 and found average losses of 3.25% for bidders and average

gains of 21.4% for targets. Cornett and De (1991a) studied 189 U.S. Banks (152 Bidders and 37 Targets) during the period of 1982-1986 and found average loss of 0.44% for bidders and gains of 9.76% for targets.

Houston and Ryngaert (1994) analyzed 153 bank mergers over the period of 1985–1991. Of the announced mergers, 131 were completed and 22 were not. Over a 5-day event window period, 131 completed mergers result CARs of –2.25%, 14.77% and 0.46% for bidder banks, target banks and combined, respectively. Over a 5-day event window period, 22 uncompleted/cancelled mergers result CARs of –2.93%, 9.79% and 0.43% for bidder banks, target banks and combined, respectively. Over a 5-day event window period, 153 all mergers results CARs of –2.32%, 14.39% and 0.38% for bidder banks, target banks and combined, respectively. Later study by Houston and Ryngaert (1997), using 209 mergers over the period of 1985–1992, in a 6-day (-4, +1) event-window period, found 0.24% and 20.4% for bidder and target CARs, respectively.

Becher (2000) analyzed 558 U.S. bank mergers over the period 1980–1997 and found that target banks enjoyed positive returns. According to Becher (2000), bank mergers posit synergistic gains and mergers in this industry do not take place just to create empires for chief executive officers (CEOs). Over a 36-day (-30, +5) event window, CARs are 22.64%, -0.10% and 3.03% for target banks, bidder banks and combined, respectively. Over an 11-day (-5, +5) event window, CARs are 17.10%, -1.08% and 1.80% for target banks, bidder banks and combined, respectively.

Asimakopoulos and Athanasoglou (2013) examined the impact of announced M&As on banks' stock prices by utilizing a standard event study analysis for a sample of European banks for a period of 15 years (1990-2004). They found that overall, an M&A announcement does not create value for the shareholders of bidders as opposed to the positive and significant value creation for the shareholders of the targets as Neely (1987) studied 29 U.S. Bank merger transactions for the 1979-1985 periods and found 3.12% average gains but not statistically significant for bidder banks.

3. Testable Hypotheses

Literature offers several hypotheses to explain motivations behind mergers and acquisitions that can broadly be categorized under value-creating and non-value creating motivations. In this study we test three alternative hypotheses explaining the possible reasons of mergers and acquisitions as outlined in Becher (2000); the *synergy* hypothesis, the *hubris or empire building* hypothesis, and the *combined synergy and hubris* hypothesis.

According to the *synergy hypothesis*, M&As take place when the combined firm value is greater than the sum of the values of the individual firms. The additional value is the synergistic gain arising from increase in operational or financial efficiencies obtained by combining the resources of the bidder and target firms. Accordingly, *synergy hypothesis* predicts CARs to target firms should be positive, CARs to bidder firms should be non-negative, and CARs to the combined should be positive. As an example to the non-value creating motivations, *the hubris or empire building hypothesis* bidder firms overpay to

acquire the target firm due to either bidder management suppose that synergies between target and bidder exist when in fact they do not exist or the management of bidder firm is self-driven to realize a merger or acquisition in order to build an empire rather than create a synergy. The hubris or empire building hypothesis would predict that, on average, CARs to target firms are positive, CARs to bidder firms are negative, and the CARs to the combined firm are non-positive (Roll, 1986).

In sum, while the synergy hypothesis claims that mergers are wealth creating events, the hubris or empire building hypothesis states otherwise by claiming that M&As may be the result of managerial hubris and empire building rather than any synergistic reason. A third alternative hypothesis put forth by Becher (2000) is that mergers and acquisitions are a result of both the synergy and hubris hypotheses. Accordingly, CARs to the target and combined firm to be positive along with negative CARs for the bidder firms implying that positive synergies may be associated with an M&A transaction, however, bidder firms might overpay to obtain these synergies.

4. Data and Sample Selection

Initially, a global list of 15,847 bank M&A deals data from the year of 2000 to 2014 is retrieved from SNL Financial database. In SNL Financial data, there are four different country classifications; 'Actual Acquirer Country', 'Buyer Country', 'Target Country' and 'Seller Country'. Having included only U.S.-based banks for all four classifications, our sample size reduced to 8,622. A proper ticker for each bank needs to be at hand in order to get the daily stock return data from the Center for Research in Security Prices (CRSP) database. In SNL Financial data, there are three different ticker classifications; Buyer Ticker, Target Ticker and Seller Ticker. After including the firms with tickers for all three classifications in our data, our sample size dramatically came down to 604. For the purpose of our analysis, only commercial banks and bank holding companies are included in the sample. This reduced our sample size to 450[3].

We utilize CRSP database to obtain the return data of each security for 500 trading days. Another inclusion criterion being conducted for our sample data is that the bidder and target banks having at least 100 observations in pre-event period available in the CRSP database to be able to estimate the market model parameters correctly. We also test our results by limiting our observations to maximum of 250 daily returns to estimate the market model and calculate ARs for bidders, targets and combined however; we do not get any significant differences compared to 500 daily returns. As a result of this last criterion, our final sample size reduced to 214 bidder and target banks in the period of 2000-2014.

According to Pilloff and Santomero (1998) selection bias stems from either including in the sample only major M&A deals during the period surrounding the deal of interest or excluding from the sample M&As that banks had multiple mergers in the same year, or over a given time period. Because of these criteria, transactions that are most relevant to analysis of M&A deals might be omitted in the sample. Since our sample selection

[3] U.S. Banking index return data is obtained from Bloomberg database.

method does not have such inclusion criteria, our analysis is not subject to such selection biases.

Total number of M&A transactions for 15 years covered in this study is 214, which translates roughly 14 transactions per year. The highest number of transactions took place in the years of 2004, 2006 and 2007 with the numbers of 30, 27 and 28, respectively. The lowest number of M&A transactions took place in the years of 2001 and 2002 with only 1 transactions in each. Average target-to-bidder ratio in the whole sample is 15.64%. This number means that from 2000 to 2014; on average, market value of bidder bank is 6.39 times larger than the value of target bank in our sample. Average target-to-bidder ratio out of 125 M&A transactions taking place in pre-Crisis period (2000-2007) is 16.3% while the same ratio out of 74 M&A transactions taking place in post-Crisis period (2010-2014) is 14.7% meaning that either bidder banks got bigger or target banks got smaller or both happened together following the Crisis.

5. Empirical Model and Methodology

Event study methodology has been used frequently by the academicians to assess the effect of a particular event on the returns of a firm's common stock price. In a typical study, first the market model is estimated using historical data, and then the estimated market model's parameters are used to determine the size and direction of the price changes. In this study, we get to examine the value creation around the announcement of a bank merger and acquisition by using the method as outlined in Brown and Warner (1985). According to the efficient market hypothesis, the market incorporates all available information immediately and fully in stock prices. Thus, prompt correction or balancing will be coming into the prices after the announcement of an M&A event.

Abnormal return represents the gain or loss for shareholders, which could be explained by many factors including an M&A transaction. It is called an abnormal return in a sense that it deviates from what an investor would normally expect to earn or lose for accepting a certain level of risk in normal market conditions. The null hypothesis of our study is that such an M&A event has no impact on the return generating process or the abnormal return is to be zero.

In order to estimate the expected return of each security, this study uses the market model which is a statistical model relating return of a corresponding security to the return of a market portfolio. The market model assumes that there is a stable linear relationship between the market return and the security return. The linear relationship in the pre-event estimation period may be given as:

$$\widetilde{R}_{it} = \alpha_i + \beta_i \widetilde{R}_{mt} + \varepsilon_{it} \quad (1)$$

where $\widetilde{R}_{it}$ is the expected return on the stock of bank *i* at time *t*, $\widetilde{R}_{mt}$ [4] is the return on the CRISP equally-weighted index at time *t* (market portfolio) and ε_{it} is the zero mean disturbance term at time *t*. This regression analysis is performed in the estimation

[4] U.S. Banking Index is utilized as the market return in our analysis.

window to determine the market parameters. Then, the following equation is utilized to compute the abnormal returns or risk-adjusted returns in the event period:

$$A_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \quad (2) \qquad \text{or} \qquad A_{it} = R_{it} - \widetilde{R}_{it} \quad (2)$$

where A_{it} is the abnormal return for bank *i* at time *t*, R_{it} is the actual return on the stock of bank *i* at time *t*, $\widetilde{R}_{it}$ is the expected return of bank *i* at time *t*, and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the market model parameters as estimated in regression model (1). Then, the CARs over the event period are calculated as the sum of the arithmetic means of the cross-sectional abnormal returns of each day over the event window period. For instance, if the event window is 3-day (-1, +1); the ARs are computed for each day (-1, 0 and +1) then the sum of ARs (AR_{-1} + AR_0 + AR_{+1}) for security A provides us CAR for Security A. The CARs under 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows are calculated.

The event study analysis is conducted for the whole sample period (2000–2014), and the sub-sample periods of 2000–2007 (pre-Crisis period), 2008–2009 (Crisis period) and 2010–2014 (post-Crisis period). To explore whether the abnormal returns have changed over time, four sub-sample periods were determined. These sub-sample periods are 2000 – 2007 representing the pre-Crisis period, 2008 – 2009 representing the Crisis period and 2010 – 2014 representing post-Crisis period. The last period was introduced to see if the Crisis led to a permanent change in the patterns by comparing with 2009-2010 period. In order to test whether a merger is value creating, we examine the combined CARs to bidder and target in line with the methodology drafted by Houston and Ryngaert (1994):

$$\text{Combined Cumulative Abnormal Return (CCAR)} = \frac{(V_{ib}\text{CAR}_{ib}) + (V_{it}\text{CAR}_{it})}{(V_{ib} + V_{it})} \quad (4)$$

where V_{ib} is the market value of bidder bank *i* on the first day of the event window and V_{it} is the market value of target bank *i* on the first day of the event window. Value of each bank is computed by multiplying the market value of the bank's stock price with the bank's number of shares outstanding. CAR_{ib} represents the CAR for bidder bank *i* over the event window and CAR_{it} represents the CAR for target bank *i* over the respective event window.

6. Empirical Results

The target shareholders usually demand a fairly large premium to sell their shares to the bidder firms because a typical merger is expected to create significant corporate value in the post-merger firm. In an efficient market, this premium should be immediately reflected in the target firm's share price. Average wealth effects for the overall sample and for various sub-samples classified by different event windows are presented in Table 1.

Overall, M&As announced between 2000 and 2014 create substantial positive CARs (statistically significant at the 1% level) for the target and combined. Over the entire sample period, the CARs to the target banks are on average 23.41% (3-day event window), 23.14% (5-day event window), and 26.04% (36-day event window), respectively with all three at 1% significance level. These results are in line with the previous studies that report shareholders of the target banks earn significant *positive* returns around the announcement dates.

The CARs to target banks within 3-day (-1, +1) event window for 2000 – 2014, 2000 – 2007, 2008 – 2009 and 2010 –2014 periods are 23.41%, 19.55%, 25.99% and 29.48% (all statistically significant at the 1%), respectively. For the same periods, the CARs to target banks within 5-day (-2, +2) and 36-day (-30, +5) event windows are also similar. Target banks results are consistent with the synergy hypothesis, hubris hypothesis and hubris & synergy hypothesis as all three hypotheses expect target banks to have positive CARs.

Table 1- Cumulative Abnormal Returns (CARs) with U.S. Banking Index

	3-day (-1, +1) event window		5-day (-2, +2) event window		36-day (-30, +5) event window	
Year	**CARs (%)**	**p-value**	**CARs (%)**	**p-value**	**CARs (%)**	**p-value**
Panel A						
Target Banks						
2000 – 2014	23.41	.0001	23.14	.0001	26.04	.0001
2000 – 2007	19.55	.0001	19.35	.0001	22.10	.0001
2008 – 2009	25.99	.0013	25.41	.0015	28.07	.0012
2010 – 2014	29.48	.0001	29.07	.0001	32.29	.0001
Panel B						
Bidder Banks						
2000 – 2014	-1.41	.0041	-1.07	.0354	-1.07	.1333
2000 – 2007	-2.06	.0001	-2.09	.0001	-2.11	.0003
2008 – 2009	-4.09	.2005	-4.19	.1823	-5.72	.0570
2010 – 2014	0.24	.8350	1.29	.2707	1.64	.3320
Panel C						

Combined						
2000 – 2014	2.24	.0001	2.52	.0001	3.29	.0001
2000 – 2007	1.05	.0025	0.97	.0087	1.55	.0048
2008 – 2009	2.68	.3310	2.69	.2728	3.39	.4095
2010 – 2014	4.20	.0004	5.12	.0001	6.22	.0001

This table represents the CARs results with respect to U.S. Banking Index utilized. P-values test the statistical significance of the CARs

Panel B of Table 1 displays the results for the bidder banks. For the full 2000–2014 period, the CARs to their shareholders are negative under each event window and statistically significant within 3-day (-1, +1) and 5-day (-2, +2) event windows. The CAR values are –1.41% (significant at 1 %), -1.07% (significant at 5 %), and –1.07% within the 3-day (-1, +1), 5-day (-2, +2), and 36-day (-30, +5) event windows, respectively. These results are in line with the findings of prior studies that the shareholders of the bidder firms experience a loss around the announcement of an M&A.

The CARs to bidder banks in 2000 – 2014, 2000 – 2007, 2008 – 2009 and 2010 –2014 periods are -1.41% (significant at 1%) , -2.06% (significant at 1%), -4.09% and 0.24%, respectively within 3-day (-1,+1) event window. For the same periods, the CARs to bidder banks within 5-day (-2, +2) event window are -1.07% (significant at 5%), -2.09% (significant at 1%), -4.19% and 1.29%, respectively. Within 36-day (-30, +5) event window, the CARs to the bidder banks in 2000 – 2014, 2000 – 2007, 2008 – 2009 and 2010 –2014 periods are -1.07%, -2.11% (significant at the 1%), -5.72% (significant at the 10%), and 1.64%, respectively. Bidder results are consistent with hubris hypothesis and hubris & synergy hypothesis as these hypotheses expect bidder banks to have negative CARs. However, our overall results for the banks are not consistent with the synergy hypothesis as this hypothesis expects the bidder banks to realize non-negative CARs.

Panel C of Table 1 summarizes CARs to the combined entity are positive and statistically significant at the 1 percent level in all event windows for the full period. CARs to combined came to be 2.24%, 2.52% and 3.29% and all statistically significant at 1% for 3-day (-1, +1), 5-day (-2, +2) and 36-day (-30, +5) event windows, respectively.

These results are consistent with the prior literature that combined firm shareholders or combined stock prices rose significantly around the announcement of a merger or acquisition. Overall, the results obtained by utilizing U.S. Banking Index return data point out that target banks realize a positive return, bidder banks realize a negative return, and the combined experiences a positive return around the merger announcement. These results also imply that the target banks increase their values at the expense of the bidder banks and the overall result is positive for the combined. These results exhibit that the combined firm experiences a positive but small return around the announcement

of a merger or acquisition and suggests a wealth transfer from the bidder banks to the target banks. This finding is also substantiated by Becher (2000) who observed 3% positive return for the combined, Anderson, Becher, and Campbell (2004), and Delong and DeYoung (2004).

Overall Results with Respect to the Hypotheses

Our research directly tests three hypotheses; synergy hypothesis, hubris hypothesis and hubris & synergy hypothesis outlined in section 3. As mentioned before, the most essential motive of companies engaging in mergers and acquisitions is the synergy. The synergy hypothesis proposes that the value of the combined firm is higher than the sum of the individual firm values (Bradley, Desai, and Kim, 1988; Seth, 1990; Maquiera, Megginson, and Nail, 1998; Hubbard and Palia, 1990).

The hubris hypothesis (Roll, 1986) implies that managers seek to acquire firms for their own personal motives and that the pure economic gains to the acquiring firm are not the only motivation or even the primary motivation in the acquisition. Roll (1986) also states that if the hubris hypothesis explains takeovers, the following should occur for those takeovers motivated by hubris: The stock price of the acquiring firm should fall after the market becomes aware of the takeover bid. This should occur because the takeover is not in the best interests of the acquiring firm's stockholders and does not represent an efficient allocation of their wealth. The stock price of the target should increase with the bid for control. This should occur because the acquiring firm is not only going to pay a premium but also may pay a premium for excess of the value of the target. The combined effect of the rising value of the target and the falling value of the acquiring firm should not be positive. This takes into account the costs of completing the takeover process. Table 2 compares our results produced using U.S. Banking Index Return with the expectation of each hypothesis.

Table 3- Pre- and Post-Crisis Cumulative Abnormal Returns (CARs) with U.S. Banking Index

	3-day (-1, +1) event window				5-day (-2, +2) event window				36-day (-30, +5) event window			
Year	**CAR (%)**	**F-v.**	**t-v.**	**p-v.**	**CAR (%)**	**F-v.**	**t-v.**	**p-v.**	**CAR (%)**	**F-v.**	**t-v.**	**p-v.**
Panel A												
Target Banks												
2000 – 2010	19.55 29.48	2.50	-2.95***	0.0039	19.35 29.07	2.79	-2.83***	0.0055	22.10 32.29	2.70	-2.72***	0.0077
Panel B												
Bidder Banks												
2000 – 2007	-2.0	8.95	-1.93	0.0576	-2.0	7.1	-2.79**	0.064	-2.1	5.09	-2.12	0.0362

		6		*		9	9	**		1		**	
2010	–	0.2				1.2				1.6			
2014		4				9				4			
Panel C Combined													
2000	–	1.0	6.4	-	0.0	0.9	5.	-	0.0	1.5	4.8	-	0.00
2007		5	7	2.65	096	7	6	3.52*	007	5	2	2.85	54
2010	–	4.2		***		5.1	0	**		6.2		***	
2014		0				2				2			

This table displays the CARs for targets, bidders, and combined around the announcement date of a bank merger or acquisition. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively. For F-test, H_0=Variances are equal. P-value represents the significant of difference.

Comparing the two periods for the target banks, we can reject the null hypothesis (H_0= $CARs_{pre\text{-}Crisis}$=$CARs_{post\text{-}Crisis}$) in all three event windows (3-day (-1, +1), 5-day (-2, +2) and 36-day (-30, +5) at 1% significance level, meaning that the CARs to the target banks before and after the Global Financial Crisis are statistically significantly different than each other.

CARs to bidder banks in pre-Crisis period are also lower than those in post-Crisis period (slightly higher than zero). The CARs to bidder banks in pre-Crisis period for 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows are -2.06% at 1% significance level, -2.09% at 1% significance level and -2.11% at 1% significance level, respectively, whereas the CARs to bidder banks in post-Crisis period for 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows are 0.24%, 1.29% and 1.64%, respectively.

Comparing the two periods for the bidder banks, we can reject the the null hypothesis (H_0= $CARs_{pre\text{-}Crisis}$=$CARs_{post\text{-}Crisis}$) in all three event windows with different significance levels. We can reject the the null hypothesis (H_0= $CARs_{pre\text{-}Crisis}$=$CARs_{post\text{-}Crisis}$) within 3-day (-1,+1) event window at 10% significance level, within 5-day (-2,+2) event window at 1% significance level and within 36-day (-30,+5) event window at 5% significance level, meaning that the CARs to the bidder banks before and after the Global Financial Crisis are statistically significantly different than each other within all event windows.

CARs to combined in pre-Crisis period are lower than those in post-Crisis period, similar to target banks. The CARs to combined in pre-Crisis period for 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows are 1.05% at 1% significance level, 0.97% at 1% significance level and 1.55% at 1% significance level, respectively, whereas the CARs to combined in post-Crisis period for 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows are 4.20% at 1% significance level, 5.12 at 1% significance level and 6.22% at 1% significance level, respectively. Comparing the pre-Crisis and post-Crisis periods for the combined, we can reject the the null hypothesis (H_0= $CARs_{pre\text{-}Crisis}$=$CARs_{post\text{-}Crisis}$) in 5-day (-2,+2) and 36-day (-30,+5) event windows all at 1% significance level meaning that the CARs to the combined before and after the Global Financial Crisis are statistically significantly different than each other within 3-day (-1,+1), 5-day (-2,+2) and 36-day (-30,+5) event windows, respectively.

In terms of overall comparison of S&P500 Index return and U.S. Banking Index return, U.S. Banking Index return provides us more robust results as pre-Crisis and post-Crisis CARs to targets, bidders and combined are statistically significantly different than each

other within all three event windows whereas when S&P500 utilized for the bidder bank within 3-day (-1, +1) event window, the results are not statistically significant.

7. Summary and Conclusion

The legislative measures taken after 2008-2009 Global Financial Crisis were designed to boost the financial stability by improving accountability and transparency in the financial system and to cease ‘‘too big to fail’’ perception to protect the U.S. financial system from abusive banking practices. These supervisory actions are more than likely to influence the characteristics of mergers and acquisitions both in terms of the managerial motives and the size of control premium which determines the value created or destroyed by these deals. In this study, we examine the wealth effects of a sample of 214 U.S. bank mergers spanning a period of 15 years (2000-2014), by utilizing a standard event-study analysis. To the best of our knowledge, this study is the first utilizing the U.S. Banking Index as the market return in estimation of market parameters. According to the overall results, M&A announcements on average create significant value for the shareholders of the target and the combined banks but do not create value for the shareholders of acquirer banks. Our results are in consonance with Houston and Ryngaert (1994) and Becher (2000).

We test three hypotheses in M&A literature: synergy hypothesis, hubris hypothesis and hubris & synergy hypothesis. Target banks results are consistent with synergy hypothesis, hubris hypothesis and hubris & synergy hypothesis as all three hypotheses expect target banks to have positive CARs. Bidder bank results are consistent with hubris hypothesis and hubris & synergy hypothesis as these hypotheses expect bidder banks to have negative CARs. However, our overall results for the bidder banks are not consistent with the synergy hypothesis as this hypothesis expects the bidder banks to realize non-negative CARs. Combined bank results are consistent with synergy hypothesis and hubris & synergy hypothesis as these hypotheses expect combined firm to have positive CARs. However, our overall results for the combined banks are not consistent with the hubris hypothesis as this hypothesis expects the combined to realize non-positive CARs.

Empirical results also suggest that pre-Crisis (2000-2007) and post-Crisis (2010-2014) CARs to targets, bidders and combined are different and statistically significant. In terms of comparison, pre-Crisis (2000-2007) and post-Crisis (2010-2014) periods' variances are tested. Equality of variances between two periods is rejected at 1% significance level for the targets and combined in all three event windows. Equality of variances between two periods is rejected at 1% significance level within 5-day (-2, +2) and 36-day (-30, +5) event windows and at 10% significance level within 3-day (-1, +1) event windows for bidder banks. The CARs to targets, bidders and combined banks increased significantly following the Global Financial Crisis, which brings forth the Dodd-Frank Act (2010). This fairly new regulation implemented after the Crisis could be one of the reasons of significantly higher CARs in the post-Crisis period as this regulation could reduce the risk levels by making the market more reliable and transparent with stricter rules. Another reason could be that stronger and healthier banks surviving the Crisis could increase the quality of target pool for the acquirers.

In future research, including U.S. Financial Index and compare the results with U.S. Banking Index and S&P500 Index can lead to a more comprehensive study. This study can be replicated by focusing purely on the effects of regulation, which have direct impact on U.S. Banking Industry.

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FISCAL STRUCTURE, HUMAN CAPITAL AND INNOVATION IN CHINA: PATTERN AND REGIONAL HETEROGENEITY

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Abstract

This paper investigates the primary factors that determine the regional innovation of China, a key engine related to the economy growth. We try to understand whether and to what extent fiscal structure and human capital stock helps to stimulate the innovation behavior. By employ provincial panel data from 2007 to 2016, we find that government expenditure structure is essentially important to boost local innovation behavior, more specifically, we find that government expenditure on technology and education is significantly associated with innovation, every unit increase in the government expenditure on technology and research is associated with 0.41 unit increase in innovation. We also find that human capital plays an important role in determining local innovation, these results are robust after considering other factors such as economy growth, industry structure etc. We then explore regional heterogeneity of this relationship, we divide our sample into western, middle and eastern region according to geographic location, the regression results show that that the relationship between fiscal structure (human capital) and innovation is different across regions, more specifically, government expenditure on technology is more promising and significant in eastern areas, less significant in other two areas, which means public finance is more efficient in eastern areas to support innovation behavior. Our research has provided solid empirical evidence that helps us to understand local government's role to promote regional innovation, in areas that are less developed, a proactive fiscal policy maybe very efficient to promote innovation, while in well developed areas, fiscal policies are less efficient than human-capital-boosting policies in promoting regional innovation.

Keywords: Regional Innovation, Fiscal Structure, Technology Expenditure, Educational Expenditure, Human Capital

JEL Classification: I22, I30, J40

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1. Introduction

This project tackles an extremely important issue confronting citizens of all the advanced societies: How local communities can, with fewer economic resources at their disposal, prosper in the ever changing and increasingly open global economy. How can these communities better their economic prospects for the foreseeable future? For over a decade, a roiling debate about the effects of globalization have cut across the industrialized world. This debate has focused on the role of national governments as champions for promoting the advantages of globalization or, more frequently, ameliorating its negative impacts. National governments have found themselves on the receiving end as anxious constituents seek protection against what is seen as the plundering of global corporations, global capital flows, and the integration into the global economy of massive pools of low-wage labor in the developing world.

In retrospect, the predictions of some early punditry of globalization that national governments would become essentially irrelevant, powerless to set or enforce the rules and at the mercy of rootless corporations moving productive assets across territorial borders at will, have turned out to be exaggerated. It is actually too soon to write off the national governments as players in the global economy. Despite some encroachments on governmental authority, national borders still do matter in economic affairs. But from the perspective of local communities the sense of vulnerability to the forces of globalization is acute, and most likely guaranteed. From the local perspective, the guidelines of approach are mostly set elsewhere. Local communities have fewer resources available to cope with the impacts of globalization. Indeed, local leadership has itself often been eroded as the fundamental pillars of the local economy – banks, manufacturing sector, law firms, accountancy, retailing, and others – have been merged or displaced by large national or multinational organizations with no particular interest in or commitment to the society.

For many local communities, the notion of a 'borderless world' is uncomfortably inches closer to the truth; certainly these communities have little or no ability to cushion themselves from the adverse effects of global economic forces, but local communities are neither without recourse. Much of the hard work needed to keep pace with the obstacles of globalization – setting up infrastructure, elevating educational performance, strengthening co-operation between public and private institutions – is often better undertaken at the local level than through centralized directive.
In this project we focus on one such response: strengthening local capabilities for innovation. By 'capabilities for innovation', we mean the ability to conceive, develop, and/or deliver new products and services, employ new production processes, and improve on those already in existence. The ability firms making the local economy adapt to new market and technological advancements through innovation is the key to sustainable growth and prosperity at the local level. The involvements of innovation are essential for productivity growth, sustenance and improvement of wage rates, and are themselves associated with appealing, better remunerating jobs. The network between innovation, sustainable growth and prosperity are increasingly well recognized across the world. To date, most policy initiatives geared towards improving innovation

performance have been assumed by the national governments. But there is increasing attention towards this issue at the regional and local levels too.

Local community leaders throughout the industrialized world would surely nod with the view recently expressed by one official about the U.S.A economy in general: "America must never compete in the battle to pay their workers least, and it will take sustained innovation to ensure that we don't have to. Local innovative capabilities are themselves subject to the pressures of globalization, however. Even regions with high concentrations of innovative activities these days cannot assume that they will be able to sustain them indefinitely. The whole scope of possibilities is bracketed by two limiting possibilities.

At one end of the tunnel, local companies, having recognized the importance of their own innovative processes of tapping into the global network of knowledge and ideas, reach progressively farther afield to do so, and eventually relocate these activities and perhaps ultimately all of their operations out of the region regardless. At the other end of the tunnel, local companies seek to establish their innovation performance by bonding their ties with other local firms, local public research and education institutions. In this scenario the local economy emerges as an epitome of new knowledge creation and application, attracting firms from around and beyond, and stimulating the establishment of new local businesses. The primary goal of the Local Innovation Systems project is to study the range of possible outcomes delimited by these two scenarios. We strive to study the consequences of the different outcomes for local economic development, and to gain insight into the actions.

2. Data

Mostly, under such circumstances it's vitally important to find any key factors that could ensure the improvement of local innovative capabilities. We found that local innovative capabilities were in accordance to the region's annual patent statistics. Hence, we used patent-relevant statistics as parameters for innovative capabilities. To guarantee numerical stability, we chose four categories of patent data as dependent variables to cater for innovative capabilities, namely the application and authorization numbers of all types of patents, and those of invention patents. The reason as to why we took into consideration both the numbers of patent applications and authorizations was to find out whether all contributory factors could lead to increase in the number of patent authorizations, or just in the number of patent applications.

Our information came from the National Bureau of Statistics' records of 31 provinces in China from 1997 to 2016 where in terms of explanatory variables, we considered the state's financial expenditures in education, science and technology, the recruitment and enrollment of lecturers of higher learning institutions. Funds allocated for education, science and technology are mostly directed to talent development and the R&D, which directly affect patent statistics. Moreover, enrollment and recruitment of institutions of higher education are in relation to the number of people entering the R&D field, which also have an impact on patent statistics. Therefore, we settled on these four sets of data as main explanatory variables. For control variables, we chose the GDP per capita, the section of population above 6 years old and with a college degree, and the shares of the

first and third industries in the GDP to investigate the effects of indirect variables on dependent variables. Statistics of all independent variables were also drawn from the National Bureau of Statistics' record of 31 provinces from 1997 to 2016 (the time span of some statistics is from 2007 to 2016, but this won't have effect on the reliability of the result.)

We log transformed (ln) all the statistics (dependent variables, explanatory variables and control variables) to rule out the interferences emanating from extreme numbers and different orders of magnitude. In addition, to guarantee numerical stability, we calculated the proportion of the population above 6 years old and with a college degree in total population, and the proportions of education and technology expenditures in total local financial expenditures.

3. Econometric Model

The article applies the Ordinary Least Squares (OLS) to produce the following Linear Regression Model (LRM):

$$\log(Y_{it}) = \beta_0 + \beta_1 * \log(hr_{it}) + \beta_2 \log(scicost_{it}) + \beta_3 \log(educost_{it}) + \beta_4 \log(gdpper_{it}) + \beta_5 \log(college_{it}) + \beta_6 \log(firstratio_{it}) + \varepsilon_{it} \quad (1)$$

"i" stands for the region, "t", year, "hr", enrollment of institutions of higher education, key explanatory variables "$educost_{it}$" and "$scicost_{it}$" stand for education expenditure, and science and technology expenditure respectively.

4. Empirical analysis

To analyze the local innovative capabilities in a comprehensive and objective manner, the article uses four types of statistics, namely; 1. The number of invention patent authorizations. 2. All the results of the regression analysis. 3. Comparative statistics. 4. The factors with the greatest influence to innovative capabilities.

Table 1

	(1) lpatent	(2) lpatent	(3) lpatent	(4) lpatent	(5) lpatent	(6) lpatent	(7) lpatent	(8) lauthorpat	(9) linventpat	(10) lauthinvent
lhr	0.0759	0.7742***	1.0406***	0.6827***	0.7144***	0.5474***	0.5069**	0.0074	0.9227***	0.2547
	(0.0932)	(0.1866)	(0.1876)	(0.1910)	(0.1958)	(0.2044)	(0.2080)	(0.2022)	(0.2359)	(0.2041)
lscicost		0.4696***		0.4553***	0.4577***	0.4126***	0.4143***	0.4300***	0.4429***	0.2831***
		(0.0773)		(0.0793)	(0.0802)	(0.0824)	(0.0827)	(0.0804)	(0.0937)	(0.0811)
leducost		0.1715		0.2631	0.2560	0.1432	0.1818	0.3009	-0.4069*	-0.2985
		(0.1695)		(0.1759)	(0.1782)	(0.1873)	(0.1902)	(0.1849)	(0.2157)	(0.1867)

eduratio			-0.6518 (1.3728)							
sciratio			18.0130*** (3.8874)							
lcollege				0.2185** (0.0932)		0.2105** (0.0929)	0.2217** (0.0933)	0.0587 (0.0907)	0.2571** (0.1058)	0.0167 (0.0916)
collegeratio					-12.9138 (46.3004)					
lgdpper						0.4276*	0.5412*	0.5101*	0.8950***	0.2101
						(0.2371)	(0.2859)	(0.2779)	(0.3241)	(0.2805)
firstratio							2.0804	2.4307	-0.5258	-5.8411***
							(1.5384)	(1.4955)	(1.7444)	(1.5096)
thirdratio							-0.0547	0.6434	0.0263	0.3792
							(0.7639)	(0.7426)	(0.8662)	(0.7496)
Constant	7.2390***	4.5975***	5.8937***	2.7733**	4.3495***	-0.2957	-1.8332	-0.6256	-4.7459	4.4203
	(0.0977)	(0.8450)	(0.5509)	(1.0888)	(0.8918)	(2.0173)	(2.8564)	(2.7767)	(3.2388)	(2.8029)
Observations	620	310	310	279	279	279	279	279	279	279

R^2	0.922	0.906	0.897	0.913	0.911	0.914	0.915	0.917	0.921	0.941

Ulttotpat Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ ulttotpat

We started first by finding out the relation between the number of invention patent authorizations and enrollment of institutions of higher education.The following table shows that from the simplest form of the model (1), we add in the control variables step by step for each time of the regression analysis. The first line simply demonstrates the relation between education levels and the number of invention patent authorizations. Line 2 and 3 add in the government's investments in relevant fields. Based on line 3, Line 4 adds in another variable, the education level. Line 5 further adds in the GDP statistics. Line 6 and 7 add in variables of industrial structures. Based on the former analysis, the last line adopts Random Effect Model at the same time to test the sensibility of the results.

The results show that, the coefficient of government's financial expenditure is positive at around 0.334 and is significant at the 1% level. When control variables are added, the coefficient reduces to around 0.286, and is significant at the 5% at least. In general, the coefficient of government's financial expenditure varies when new control variables are added, which is significant at the 5% level at least. Therefore, the results prove our hypothesis that the increase in the government's financial expenditure will facilitate the improvement of local innovative capabilities.

In terms of control variables, the coefficient of the GDP per capita is positive, which indicates that the higher the level of production, the closer the relations between regions, the fewer the barriers in innovative exchanges, and the higher the level of innovation. It's worth noting that the coefficient of the share of the first industry in the GDP is negative and it is significant at the 10% level, which follows from the decline of the first industry. That is the adjustment of the first industry which leads to an optimal distribution of resources and further contributes to the improvement of innovative capabilities.

We arranged all the statistics according to year and region, and then made a regression analysis.

The regression analysis was made up of three parts (3 tables).

4.1.Part one

We made regression analysis on dependent variables, that is, the number of patent applications, and all the 9 independent variables for 9 times with every independent variable added one at a time from one independent variables at first time to the 9 independent variables calculated at the same time as the last round of the regression analysis. Through this process, we could clearly see the variation trend of each explanatory variables. Besides this, we added the results of regression analysis of the other 3 dependent variables and all the 9 dependent variables.

4.2.Part two

We subdivided the statistics into 3 sets according to region, namely; region 2 Eastern China, region 3 Central China, and region 4 Western China. Through the regression analysis of the 4 dependent variables and all the independent variables of the 3 regions, we produced 3 tables with each having 4 sets of data. Eastern China includes Beijing, Tianjin, Hefei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan, Liaoning, Jilin and Heilongjiang. Central China includes Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan. Western China includes Inner Mongolia, Guangxi, Chongqing, Sichuan, Huizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

4.3.Part three (Numerical stability improvement).

We calculated the proportions of the 4 dependent variables in the country's GDP and population, and made regression analysis of the 4 ratios and all the variables to produce 2 tables of stability data.
We established that local innovative capabilities of the 3 regions of China are influenced by different factors. China is a nation with a vast territory and heavy population, therefore the results may vary with different regions. The article will thereby analyze such differences.

4.4.Findings.

We started by finding out the relation between the number of invention patent authorizations and enrollment of institutions of higher education.

The table below shows that starting from the simplest form of the model (1), we add in the control variables bit by bit for each time of the regression analysis. The first line simply shows the relation between education level and number of invention patent authorizations. Line 2 and 3 add in the government's investments in relevant fields. Based on line 3, line 4 adds in another variable, the GDP statistics. Line 5 and 6 further add in another variable, industrial structure. Based on the former analysis, the last line adopts random effect model at the same time to prove the credibility of the results.

The result indicates that the main factors affecting local innovative capabilities in Eastern China are education expenditure, the share of the first industry in the GDP, and population above 6 years old with a college degree, with coefficients of each one being 0.6, 5 and 0.3 respectively. The main factors that affect local innovative capabilities in Central China are science and technology expenditure, and the enrollment of institutions of higher education, with coefficients of each one being 0.5 and 0.4 respectively. The main factors affecting local innovative capabilities in Western China are the share of the first industry in the GDP, education expenditure and the enrollment of institution of higher education, with coefficients of each one being 3, 0.8 and 0.6 respectively. In general, the factors that affect local innovative capabilities across the country are mainly the government's science and technology, and education expenditures.

Table 2: Eastern China region1

	(1) lpatent	(2) lauthorpat	(3) linventpat	(4) lauthinvent
lhr	-0.3729	-0.4993	-0.5456	0.2462
	(0.3295)	(0.3739)	(0.3368)	(0.1748)
lscicost	0.1763	0.2246	0.2447*	0.4299***
	(0.1259)	(0.1429)	(0.1287)	(0.0969)
leducost	0.7249***	0.7615***	0.4620*	0.6246***
	(0.2530)	(0.2871)	(0.2586)	(0.1616)
lgdpper	0.4252	0.2275	0.8835***	0.3107
	(0.2827)	(0.3208)	(0.2889)	(0.1922)
firstratio	5.9158***	3.1160	5.3481***	-1.8704
	(1.9805)	(2.2475)	(2.0242)	(1.1361)
thirdratio	-1.3707	-0.5812	0.7328	2.5856***
	(0.8531)	(0.9681)	(0.8720)	(0.4325)
lcollege	0.3297**	0.2752	0.4010**	0.0634**
	(0.1503)	(0.1706)	(0.1536)	(0.0286)
Constant	0.2595	1.4966	-5.9098*	-3.2747*
	(3.3163)	(3.7634)	(3.3895)	(1.8847)
Observations	117	117	117	117
R^2	0.992	0.990	0.991	0.964

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
region1

Table 3: Central China region2

	(1)	(2)	(3)	(4)
	lpatent	lauthorpat	linventpat	lauthinvent
lhr	2.3520***	2.1220***	0.6129	0.6800**
	(0.6586)	(0.6003)	(0.7397)	(0.3230)
lscicost	0.5366***	0.4393***	0.4968***	0.7532***
	(0.1583)	(0.1443)	(0.1778)	(0.1295)
leducost	0.7273	0.3861	-0.9876	-0.0054
	(0.6363)	(0.5800)	(0.7147)	(0.2602)
lgdpper	-3.0058*	-1.2660	0.1294	0.6571*
	(1.5979)	(1.4563)	(1.7946)	(0.3872)
firstratio	-17.4043***	-13.2496***	-6.2412	1.6392
	(6.1471)	(5.6027)	(6.9039)	(2.8381)
thirdratio	-6.3912*	-2.5939	-4.1843	3.9073***
	(3.2670)	(2.9776)	(3.6692)	(1.1698)
lcollege	0.4592*	0.4435*	1.1165***	0.0443
	(0.2482)	(0.2262)	(0.2787)	(0.0523)
Constant	26.1477	9.5010	1.6204	-6.4702**
	(17.4241)	(15.8809)	(19.5691)	(2.8258)
Observations	54	54	54	54
R^2	0.976	0.980	0.975	0.910

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
region2

Table 4: Western China region3

	(1) lpatent	(2) lauthorpat	(3) linventpat	(4) lauthinvent
lhr	0.6378	-0.1706	1.9381***	0.4046***
	(0.3998)	(0.3573)	(0.4513)	(0.1081)
lscicost	0.1887	0.0396	0.5034*	0.8879***
	(0.2250)	(0.2011)	(0.2540)	(0.1975)
leducost	0.1560	0.0754	-0.3134	0.6299***
	(0.3332)	(0.2978)	(0.3761)	(0.1669)
lgdpper	0.5135	1.5504**	-0.2821	-0.6527***
	(0.6776)	(0.6056)	(0.7649)	(0.1885)
firstratio	2.9373	6.1584**	-8.4818**	-14.6734***
	(3.0335)	(2.7111)	(3.4243)	(1.8940)
thirdratio	2.3173	3.0971**	-0.2024	0.2665
	(1.4405)	(1.2873)	(1.6260)	(0.8229)
lcollege	0.2384	0.1130	-0.1171	0.0434
	(0.1535)	(0.1372)	(0.1733)	(0.0399)
Constant	-3.4308	-11.6878*	6.8540	7.1681***
	(6.7255)	(6.0105)	(7.5918)	(1.9604)
Observations	108	108	108	108
R^2	0.982	0.984	0.979	0.948

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
region3

5. Conclusion and recommendations

As a result of China including the improvement of local innovative capabilities into the state's development strategy, local governments all rush to formulate strategies on how to improve their innovative capabilities. This article is designed to highlight some practical recommendations based on the conclusions drawn from the regression analysis of China's provinces in the last 20 years. For Eastern China, the government should

expand education expenditure to attract top notch talent, and adjust industrial structures to emphasize more relevance on developing innovation-driven industries. For Central China, the government should allocate more funds on science and technology to draw more innovative enterprises and advanced technologies, and set a strong foundation as well as create a friendly environment for regional innovation. For Western China, the government should make the adjustment of industrial structures its priority, and in the meantime put more money in education.

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THE EFFECTS OF OIL PRICES ON TURKEY'S FOREIGN TRADE RELATIONS TO AZERBAIJAN*

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Abstract

Turkey is one of the most important trade partners of Azerbaijan. Also, Azerbaijan's national income is highly depended on oil revenues. Hence, this study aims to investigate the effects of oil prices on Azerbaijan's imports from Turkey. For this purpose, a vector autoregression (VAR) model is estimated using quarterly data on imports, GDP, exchange rate and oil prices covering 2001-2016. Among other results, we find that a shock to oil prices positively affects Azerbaijan's imports from Turkey. Furthermore, changes in Azerbaijan's imports from Turkey are explained by oil prices about 11%.

***Keywords*:** Oil prices, foreign trade, Azerbaijan, VAR model

***JEL Classification*:** C22, F10, Q43

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1. Introduction

Because of having heavy investments in its oil fields, Azerbaijan has emerged as an energy-rich country since the mid 1990's. After independence, the country needed urgent financial funds and entrepreneurs to reestablish its ex-socialistic economy. Due to its market economy experiences and stronger relations with the global economy, Turkey became important country for Azerbaijan. Furthermore, Turkey's trade relations with Azerbaijan have been relatively more important than other Turkish Republics emerged post-Soviet space, because Azerbaijan is the closest country to Turkey and very similar features at social and cultural level.

Foreign trade between Turkey and Azerbaijan is considerably based on energy (especially oil and natural gas) production and exports. These countries are connected to each other with two oil and gas pipelines, named Baku-Tbilisi-Ceyhan and Baku-Tbilisi-Erzurum. When the Baku-Tbilisi-Erzurum pipeline became operational in 2007, it not only allowed Turkey to have access to cheaper gas, but also equipped Ankara with a hedge against Moscow and Tehran.

While oil prices declined from the mid-2014 to today, trade relations between these countries also tended to decrease. Falling in trade figures demonstrate that Turkey's trade connections towards Azerbaijan is depended on the fluctuations in oil prices. Therefore, this paper aims to investigate the relationship between oil prices and Turkey's trade relations to Azerbaijan.

To the best of our knowledge, no work examines the effects of oil prices specifically on Azerbaijan's imports from Turkey. Therefore, our aim is to show the impact of oil prices on Azerbaijan's imports from Turkey. Quarterly dataset covering 2001-2016, which includes imports, GDP, exchange rate and oil prices, is employed to estimate a VAR model. According to impulse-response results, Azerbaijan's imports from Turkey positively affected by a shock on oil prices. Also, oil prices can explain about 11% of total changes in Azerbaijan's imports from Turkey.

Remainder of the paper is organized as follows: Section 2 summarizes the related literature. Section 3 explains data, model and methodology. Section 4 presents empirical results. Section 5 concludes.

2. Literature Review

Even the most of the papers in the literature investigate the effects of oil prices on economic growth, there are some works on the relationship between exports and oil prices. Among them, Altıntaş (2013) uses autoregressive distributed lag (ARDL) and 1987-2010 data for Turkey. Results show that 1% increases in oil prices and foreign income increase exports of Turkey by 0.22% and 5.61% when 1% increase in exchange rate decreases exports of Turkey by 0.61%. Çulha, Özmen and Yılmaz (2015) use fixed-effects and generalized method of moments (GMM) on 2003-2013 data for Turkey. They also consider 67 countries which are main export destinations for Turkey. They find when a 1% increase in oil prices expands Turkish exports to oil exporting countries by 0.08%-0.11%, it also decreases Turkey's exports to oil importing developed countries

by 0.06%-0.11%. Wei and Guo (2016) use VAR model and 1996-2014 quarterly data for China. According to the results, a shock to oil prices increase exports. Alagöz, Alacahan and Akarsu (2017) estimate current account function of Turkey, China, Kazakhstan, Mexico, Indonesia, Costa Rica, Colombia and South Africa using generalized method of moments (GMM), random-effects, fixed-effects and pooled ordinary least squares. Their data covers 1980-2016 and results show that a one unit increase in oil prices decreases current account by 30 million USD. Göçer and Bulut (2015) use Maki cointegration and Hacker and Hatemi-J causality tests on 1992-2014 quarterly data for Russia. They find that variables have long-run relationship. In addition, 1% increase in oil prices increase exports by 1.01%. Chen and Hsu (2012) use generalized autoregressive conditional heteroskedasticity (GARCH) on 1984-2008 data for 84 countries. Their main result is that oil price fluctuations decrease international trade. Özlale and Pekkurnaz (2010) examine the relationship between current account ratio and oil prices for Turkey. Their monthly data spans 1999-2008. They find that a shock to change in oil prices declines the change in current account ratio.

Among works on the relationship between oil prices and output, Sarwar, Chen and Waheed (2017) use 1960-2014 data for 210 countries. Taking into consideration electricity consumption, they find their variables are cointegrated. According to the results of fully modified OLS, a 1% increase in oil prices increase GDP by 0.112% for the whole panel. Gökmenoğlu, Azin and Taşpınar (2015) use 1961-2012 data for Turkey and show oil prices Granger cause industrial production. Using Toda-Yamamoto causality test, Dikkaya and Doyar (2017) find unidirectional causalities from oil prices to GDP, from exchange rate to oil prices and from GDP to exchange rate for Azerbaijan. They also show that there are unidirectional causalities from oil prices to GDP, from exchange rate to GDP and from GDP to exchange rate for Kazakhstan. Alpdoğan and Tok (2018) use various cointegration tests, and fully modified OLS and dynamic OLS on 1995-2016 data for OECD countries. They find that a 1% increase in oil prices increase gross national product (GNP) about 0.3%.

3. Data, Model and Methodology

We use quarterly data on imports of Azerbaijan from Turkey (current US$), nominal GDP of Azerbaijan in domestic currency, and domestic currency of Azerbaijan per dollar, and Brent oil prices per barrel (current US$). The data cover 2001Q01-2016Q04. Import series is obtained from TUIK (2018) (Turkish Statistical Institute) when oil price series is obtained from EIA (2018) (U.S. Energy Information Administration). GDP and exchange rate series are sourced from International Financial Statistics of IMF (2018).
For oil prices, we choose values in the last month of each quarter. We also transform GDP from domestic currency to US$ using exchange rate data mentioned above. Quarterly data are seasonally adjusted using moving averages. Seasonally adjusted variables are used in their natural logs and abbreviated as $\log IMP$ for natural log of imports, $\log GDP$ for natural log of GDP, $\log EXC$ for natural log of exchange rate and $\log OIL$ for natural log of oil prices. Our model in vector autoregression (VAR) form can be demonstrated as follows:

$$A_t = c + \alpha_1 A_{t-1} + \cdots + \alpha_p A_{t-p} + \varepsilon_t$$

Here, t stands for times. A_t is 4×1 $\log IMP$, $\log GDP$, $\log EXC$ and $\log OIL$ vector, c is 4×1 constant term vector, α_r is 4×4 coefficient matrix for lag $r = 1,2, \dots, p$, and ε_t is 4×1 vector of errors.

Our econometric analysis begins with unit root tests. We implement Augmented Dickey and Fuller (1981) (ADF) and Phillips and Perron (1988) (PP) unit root tests. Then VAR(p) model is estimated. Each variable in the model is employed in their stationary levels. Optimum lag order p is chosen as the lag order recommended by the majority of the information criteria. Then, impulse-response is conducted to show how a shock to oil prices affects the imports. Finally, variance decomposition is utilized to see the source of changes in imports.

4. Empirical Results

ADF and PP unit root tests are implemented to see the stationarity orders of the variables. According to Table 1, each variable is stationary in their first differences both with equations with constant and equations with constant and trend.

Table 1. Unit root tests

	ADF				PP			
	Constant		Constant + Trend		Constant		Constant + Trend	
	Level	1st Dif.	Level	1st Dif.	Level	1st Dif.	Level	1st Dif.
$\log IMP$	-1.6119	-7.7845***	0.1962	-8.5354***	-1.5888	-7.7993***	0.1962	-8.5354***
$\log GDP$	-2.0899	-7.1314***	0.5910	-7.9291***	-1.9237	-7.3174***	0.7213	-7.9308***
$\log EXC$	-1.1306	-4.0681***	0.7004	-4.4791***	0.5192	-8.1253***	1.3156	-8.5545***
$\log OIL$	-1.8959	-6.8144***	-1.4923	-6.8549***	-1.9125	-6.7366***	-1.5442	-6.7866***

*** shows significance at 1% level. Lag length for ADF test is chosen by Schwarz Information Criterion. Barlett Kernel is used as the spectral estimation method and the bandwidth is determined using the Newey–West method for PP test.

Since the variables are stationary in their first differences, VAR model is estimated using first differenced variables. According to majority of information criteria, optimum lag order is 4 (see Table A1). Estimated VAR(4) model (see Table A2) is found to be stable (see Figure A1). Also, residuals of VAR(4) are serially uncorrelated (see Table A3) and homoscedastic (see Table A4).

Since the impulse-response functions are highly sensitive to ordering of the variables, generalized impulses are chosen. Responses of oil prices is not indicated purposely,

since it does not make sense in the context of economics. Responses of the variables to generalized one standard error shock to a variable for 10 periods are shown on Figures 1-12.

Imports give high and positive response to a shock in itself (see Figure 1). The response is mostly positive. It is negative only in fourth, eighth and tenth periods. Imports give largely positive response to a shock in GDP (see Figure 2). In tenth period, the effect turns to be negative. It is negative only in fourth, eighth and tenth periods. Response of imports to a shock in exchange rate is found mostly negative (see Figure 3). It is positive in sixth and tenth periods.

A shock to imports creates mostly positive effect on GDP (see Figure 4). The response is found to be negative in third, fourth, seventh and tenth periods. GDP gives high and positive response to a shock to itself (see Figure 5). The response is mostly positive. It is negative in sixth and tenth periods. Response of GDP to a shock in exchange rate is found mostly negative (see Figure 6). The response is positive in around second, sixth and ninth periods.

Response of exchange rate to a shock in imports is also found mostly negative (see Figure 7) The response is positive only in third, seventh and tenth periods. Exchange rate also gives negative response to a shock in GDP (see Figure 8). The response is slightly positive in around seventh and ninth periods. Response of exchange rate to a shock in itself is mostly positive (see Figure 9). The response is negative in second, fifth, sixth and ninth periods.

Figure 1. $\Delta \log IMP$ to $\Delta \log IMP$

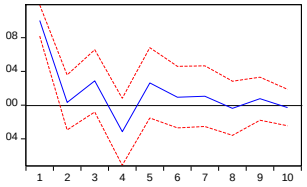


Figure 2. Response of $\Delta \log IMP$ to $\Delta \log GDP$

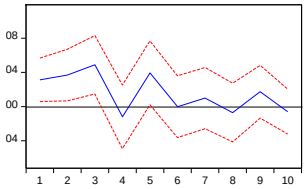


Figure 3. Response of $\Delta \log IMP$ to $\Delta \log EXC$

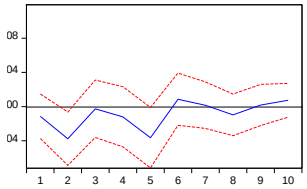


Figure 4. Response of $\Delta \log GDP$ to $\Delta \log IMP$

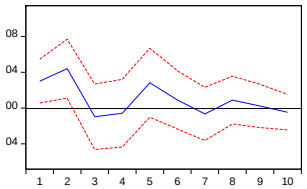


Figure 5. Response of $\Delta \log GDP$ to $\Delta \log GDP$

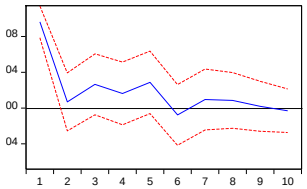


Figure 6. Response of $\Delta \log GDP$ to $\Delta \log EXC$

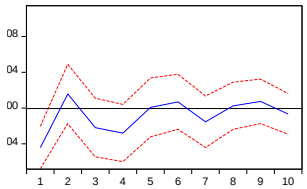


Figure 7. Response of $\Delta \log EXC$ to $\Delta \log IMP$

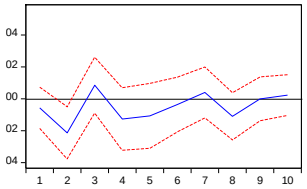


Figure 8. Response of $\Delta \log EXC$ to $\Delta \log GDP$

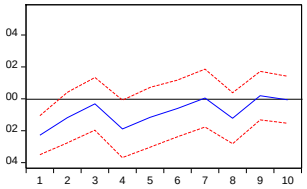


Figure 9. Response of $\Delta \log EXC$ to $\Delta \log EXC$

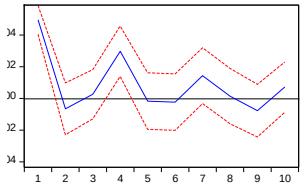


Figure 10. Response of $\Delta \log IMP$ to $\Delta \log OIL$

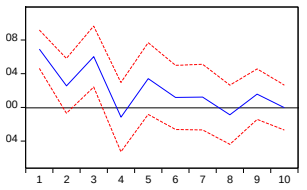


Figure 11. Response of $\Delta \log GDP$ to $\Delta \log OIL$

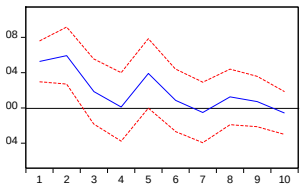
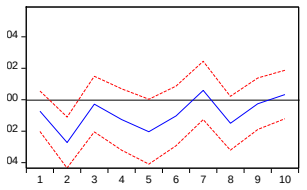


Figure 12. Response of $\Delta \log EXC$ to $\Delta \log OIL$



Imports give generally positive response to a shock in oil prices (see Figure 10). Also this response is high in the first periods. The response turns to be negative only in fourth and eighth periods. GDP also gives mostly positive response to a shock in oil prices (see Figure 11). The response is negative only in seventh and tenth periods. Unlike imports and GDP, exchange rate gives generally negative response to a shock in oil prices (see Figure 12). The response is positive in seventh and tenth periods.

Variance decompositions of imports, GDP and exchange rate are shown in Tables 2-4. However, variance decomposition of oil prices is not given for the same reason as in the impulse-response functions stated above.

Table 2. Variance decomposition of $\Delta \log IMP$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.1003	100.0000	0.0000	0.0000	0.0000
2	0.1115	81.0883	11.4770	4.2734	3.1613
3	0.1300	64.4790	18.8764	5.9476	10.6970
4	0.1367	63.7185	17.1222	7.2549	11.9045
5	0.1449	59.9538	20.3497	8.5871	11.1094
6	0.1458	59.6280	20.1494	8.8788	11.3438
7	0.1466	59.5585	20.1783	8.9929	11.2704
8	0.1475	58.8484	20.0922	9.8568	11.2026
9	0.1491	57.8761	20.7966	10.1902	11.1371
10	0.1494	57.6834	20.8438	10.2710	11.2019

Table 2 shows variance decomposition of imports. In the first period, changes in imports are totally self-explained. The share of imports decreases gradually to 58% when others increase. Oil prices can explain changes in imports about 3% in the first period. Then it increases up to 12% in fourth period. In the last period shares of GDP, exchange rate and oil prices are 21%, 10% and 11%, respectively.

Table 3. Variance decomposition of $\Delta \log GDP$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.0964	9.7217	90.2783	0.0000	0.0000
2	0.1179	20.4836	60.6982	2.8368	15.9815
3	0.1252	18.7793	60.0625	3.1784	17.9798
4	0.1288	17.9470	58.9619	6.0932	16.9978
5	0.1354	20.5811	55.7094	6.7276	16.9820
6	0.1365	20.6853	55.4581	6.6852	17.1713
7	0.1379	20.5065	55.1519	7.3212	17.0204
8	0.1386	20.7092	54.7752	7.5012	17.0144
9	0.1391	20.5886	54.3875	7.9031	17.1209
10	0.1395	20.5880	54.1021	8.2660	17.0440

Table 3 indicates variance decomposition of GDP. Imports and GDP explain total changes in GDP in the first period by 10% and 90%, respectively. In the following periods, the shares of imports and GDP decrease when the shares of exchange rate and oil prices increase up to 8% and 17%, respectively. In the explanation of the changes in GDP, it can be said that growth speed of exchange rate is higher than that of oil prices.

Table 4 shows variance decomposition of exchange rate. In the first period, GDP is an important variable that explains the changes in exchange rate. Accordingly, exchange rate itself and GDP explain total changes in exchange rate by 79% and 20%, respectively. In the following periods, the share of imports increases up to 17% when it was only 1% in the first period. In the end of the period, the share of exchange rate decreases to 54% when the shares of GDP and oil prices are 17% and 12%, respectively.

Table 4. Variance decomposition of $\Delta \log EXC$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.0496	1.2845	19.8320	78.8836	0.0000
2	0.0577	14.5930	15.5274	63.2231	6.6566
3	0.0597	15.7329	15.6038	59.2627	9.4006
4	0.0674	15.8428	17.6529	59.1141	7.3901
5	0.0708	16.6660	17.5379	54.8233	10.9727
6	0.0718	16.4319	17.5511	53.8818	12.1352
7	0.0738	15.8460	16.6248	55.8747	11.6546
8	0.0755	17.2364	17.3556	53.6710	11.7370
9	0.0760	17.0003	17.1941	53.9421	11.8636
10	0.0765	16.8836	17.0171	54.2884	11.8109

When we take into consider overall results, we can say that oil price shocks have positive effects on Azerbaijan's imports from Turkey. Also, 11% of changes in Azerbaijan's imports from Turkey due to oil prices.

5. Conclusions

Azerbaijan is an important country for Turkey referring foreign trade, foreign direct investments and socio-economic interactions. Turkey's energy needs and Azerbaijan's current necessities established dependency among these countries to some extent. Infrastructural investments (via construction companies) and industrial expansion of Turkish businesspeople towards ex-Soviet sphere more influenced Azerbaijan.

Current paper use quarterly data on Azerbaijan's imports from Turkey, GDP, exchange rate and oil prices and estimate a VAR model. Within the framework of estimated VAR model, we show impulse-response functions and variance decompositions. It is seen that, among other results, Azerbaijan's imports from Turkey give generally positive response to a positive shock to oil prices. Also, according to variance decompositions, oil price (after imports and GDP) is an important variable which explains the changes in imports about 11%.

Our results confirm the sensitivity of Azerbaijan's imports from Turkey to oil prices. When we consider Azerbaijan's high dependency to oil revenues, increases in oil prices provide higher GDP, and increasing GDP leads to higher imports from Turkey. Since we limit the imports only with Turkey, effects of oil prices on total imports may be higher than that of from Turkey.

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Appendices

Table A1. Lag order selection

	Lag 0	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
Log Likelihood	202.1672	232.0027	251.1741	266.3523	286.3103	300.9652
LR	NA	54.5269	32.3930	23.5523	28.2166*	18.6976
Final Prediction Error	1.27e-08	7.87e-09	7.11e-09	7.47e-09	6.78e-09*	7.60e-09
Akaike Information Criterion	-6.8334	-7.3104	-7.4198	-7.3915	-7.5279*	-7.4816
Schwarz Information Criterion	-6.6913*	-6.5999	-6.1409	-5.5442	-5.1123	-4.4975
Hannan-Quinn Inf. Criterion	-6.7780	-7.0337*	-6.9216	-6.6719	-6.5870	-6.3192

* indicates the lag order selected by related criterion.

Table A2. VAR(4) estimation

	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
$\Delta \log IMP\ (-1)$	-0.2629	0.0286	-0.0553	-0.7116**
	(0.1904)	(0.1830)	(0.0942)	(0.3595)
$\Delta \log IMP\ (-2)$	-0.1866	-0.1016	0.0850	-0.3086
	(0.1823)	(0.1751)	(0.0902)	(0.3441)
$\Delta \log IMP\ (-3)$	-0.2326	-0.0297	-0.1122	0.2660
	(0.1727)	(0.1660)	(0.0855)	(0.3261)
$\Delta \log IMP\ (-4)$	-0.0629	-0.0568	0.0613	-0.0430
	(0.1480)	(0.1423)	(0.0733)	(0.2795)
$\Delta \log GDP\ (-1)$	0.1484	-0.2968	-0.0253	0.2501
	(0.1915)	(0.1840)	(0.0948)	(0.3616)
$\Delta \log GDP\ (-2)$	0.3430*	-0.0696	0.0385	-0.2647
	(0.2048)	(0.1968)	(0.1013)	(0.3866)
$\Delta \log GDP\ (-3)$	-0.0469	0.1783	-0.0411	0.0910
	(0.2150)	(0.2066)	(0.1064)	(0.4059)
$\Delta \log GDP\ (-4)$	0.1882	0.4645***	-0.1082	0.0359
	(0.1823)	(0.1751)	(0.0902)	(0.3441)
$\Delta \log EXC\ (-1)$	-0.5930*	0.2832	-0.2376	-0.4724
	(0.3431)	(0.3297)	(0.1698)	(0.6477)
$\Delta \log EXC\ (-2)$	0.1008	0.0385	-0.0801	-0.9067
	(0.3314)	(0.3184)	(0.1640)	(0.6256)

$\Delta \log EXC\ (-3)$	-0.3438 (0.3359)	-0.3829 (0.3228)	0.5111*** (0.1662)	-0.3385 (0.6342)
$\Delta \log EXC\ (-4)$	-0.1163 (0.3516)	0.1499 (0.3379)	-0.0762 (0.1740)	0.8420 (0.6634)
$\Delta \log OIL\ (-1)$	0.1668 (0.1107)	0.3968*** (0.1064)	-0.1254** (0.0548)	0.3208 (0.2091)
$\Delta \log OIL\ (-2)$	0.1739 (0.1168)	0.2265** (0.1122)	-0.0596 (0.0578)	-0.0649 (0.2205)
$\Delta \log OIL\ (-3)$	0.0100 (0.1072)	0.0305 (0.1030)	-0.0188 (0.0530)	0.1120 (0.2024)
$\Delta \log OIL\ (-4)$	0.1317 (0.1045)	0.0768 (0.1004)	-0.0551 (0.0517)	-0.0980 (0.1973)
C	0.0341 (0.0227)	0.0174 (0.0218)	0.01710 (0.0112)	0.0389 (0.0428)
$\square^2$	0.5343	0.5158	0.5661	0.2048

*, ** and *** show respectively significance at 10%, 5% and 1% levels. Standard errors are in parentheses.

Figure A1. Inverse roots of AR characteristic polynomial

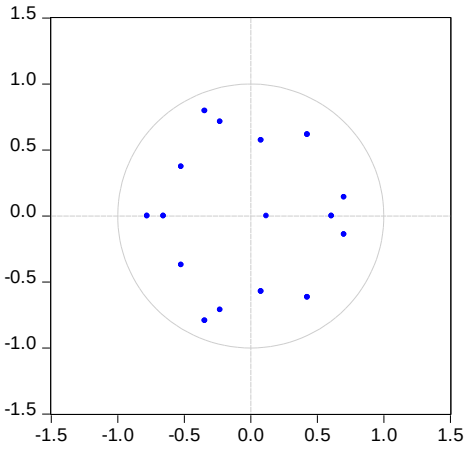

Table A3. VAR residual serial correlation LM test

Lag	LRE* stat	Prob.
1	11.30068	0.7906
2	18.66334	0.2865
3	17.91206	0.3291
4	13.72333	0.6193
5	24.60653	0.0771

*Edgeworth expansion corrected likelihood ratio statistic

Table A4. VAR residual heteroskedasticity test

Chi-sq	Prob.
317.2908	0.5323

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CURRENCY UNION AND COMMENTS ON MACROECONOMIC INDICATORS OF EUROPEAN ECONOMIES AFTER EURO CRISIS

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Abstract

With the introduction of the euro as the common currency, macroeconomic developments have led to the rapid expansion of the economic problems among the economies of the European country. The high level of integration and the increase in the level of influence resulted in a problem that would arise in a European country, and in a short time, also in other countries. Starting from the first half of 2010, especially the economic problems in Greece, extended to the other European countries in a short period. Countries such as Ireland, Portugal, Spain, Italy and Belgium faced serious economic problems after the debt crisis of Greece economy.

The crisis is largely taken as a problem connected to the common currency. Therefore, the fact that countries with different economic conditions use the same currency creates an important discussions in the literature.

In our study, we focus on monetary union and the process that bring the Eurozone area to the debt and economic crisis. In addition to discussions on the 2010 crisis in the European Union, the economies of the countries of EU will be grouped in the framework of Euro area-non Euro area criteria and will be subjected to a statistical analysis based on some macroeconomic indicators.

Keywords**:** Euro crisis, common currency, European currency union, Central Bank of Europe

JEL Classification: E50, E52, E60, H12

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1. Introduction

Monetary union is one of the most important steps taken in the history of European Union integration. This economic step is an important turning point that will produce results in financial, sociological and cultural terms. This stage, which is an important item on the agenda, both in first stage and also after the transition to the monetary union, has become a topic that has been discussed both in the literature and within the European Union after the Euro crisis.

The Monetary Union was established in 1999 under the European Union and was fully implemented in 2002 with the following process. Today, 19 member states are involved in the monetary union[1] and use the euro as legal currency (European Central Bank, 2009).

The euro area refers to a bit different region than the European Union. The Euro area comprising the European Union (EU) Member States which adopted the euro as their common currency, started in January 1999 with 11 countries and during the 1990's and beginning of the 2000's has expanded through a series of enlargements to 19 countries, so far (European Union, 2016).

Table 1. Euro area enlargements

EA-11 (*1 January 1999 - 31 December 2000*):
Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (DE), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Spain (ES)

EA-12 (*1 January 2001 - 31 December 2006*): EA-11 + Greece (EL)

EA-13 (*1 January 2007 - 31 December 2007*): EA-12 + Slovenia (SI)

EA-15 (*1 January 2008 - 31 December 2008*): EA-13 + Cyprus (CY) and Malta (MT)

EA-16 (*1 January 2009 - 31 December 2010*): EA-15 + Slovakia (SK)

EA-17 (*1 January 2011 - 31 December 2013*): EA-16 + Estonia (EE)

EA-18 (*from 1 January 2014*): EA-17 + Latvia (LV)

EA-19 (*from 1 January 2015*): EA-18 + Lithuania (LT)

[1] ""Legal basis of European Monetary Union can be stated as follows:
"— Decisions of the European Summits of The Hague (1969), Paris (1972), Brussels (1978), Hanover (1988), Madrid and Strasbourg (both 1989), and Maastricht (1991-1992);
— Articles 119-144, 219 and 282-284 of the Treaty on the Functioning of the European Union (TFEU);
— Protocols annexed to the TFEU on: the transition to the third stage of economic and monetary union; the excessive deficit and macroeconomic imbalances procedures; the convergence criteria; the opt-out clauses for the United Kingdom and Denmark; and the European System of Central Banks and the European Central Bank, as well as the Eurogroup".
European Parliament, History Of Economic And Monetary Union, Fact Sheets on the European Union – 2018, p. 1, http://www.europarl.europa.eu/ftu/pdf/en/FTU_2.6.1.pdf

Source: European Union, Glossary: Euro area enlargements, 2016, https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Euro_area_enlargements

Economic and Monetary Union (EMU) represents a crucial step in the integration of EU economies. In addition to the coordination of economic and fiscal policies, the establishment of the common monetary policy and the use of the euro as the common currency are the main objectives.

Economic and Monetary Union (EMU) targets a policy design to build economic and monetary policies that will ensure high employment along with sustainable economic growth (Council of the European Union, 2017).

In the legislation of the European Institutions, practical and political goals of European Monetary Union (EMU) are mentioned as (European Commission, 2018):

* Implementing an effective monetary policy for the euro area with the objective of price stability
* Coordinating economic and fiscal policies in Member States
* Ensuring the smooth operation of the single market
* Supervising and monitoring financial Institutions

In addition to these goals, expectations from EMU can be stated more wider range. With the practical terms, EMU means (European Commission, 2018):

* Coordination of economic policy-making between Member States
* Coordination of fiscal policies, notably through limits on government debt and deficit
* An independent monetary policy run by the European Central Bank (ECB)
* Single rules and supervision of financial Institutions within the euro area
* The single currency and the euro area

In this framework, with the monetary union, it is seen that the European Union is not only aimed at monetary integration. Moreover, it is envisaged that many macroeconomic targets will be implemented through monetary union and it is assumed that a higher level of prosperity will be achieved for all countries in the European Union.

2. Dynamics of the Euro crisis

When the first steps are taken to the monetary union, it is foreseen that the transition to the euro will take risks. From the start, the euro has rested on a gamble (Moravcsik, 2012). When European leaders opted for the transition to monetary union in 1992, the expectation that European economies would come close together was the result of this step, which was essentially a gambling. In time, it was envisaged that countries in Southern Europe would gradually approach German economic standards, and achieve lower inflation and lower inflation targets with lower wages and higher savings and less expenditure

The economic developments in the first half of the 2000s resulted in difficulties faced by European economies in the following period. In its essence, the crisis in the Eurozone is

a classic debt and BOP crisis (Frieden and Walter, 2017: 3) and in fact, the Eurozone crisis shows the similar results such as classic debt and balance of payments crisis. High borrowing due to over-consumption has naturally resulted in a crisis of the process.

The developments in the financial markets after monetary union, the euro was used a common currency led to borrowing as an attractive financing method. Borrowing costs decreased due to falling interest rates. This situation facilitated and encouraged the financing of public and private sector expenditures by borrowing (Ulusoy and Ela, 2014: 86).

Despite all the difficulties, the Euro, which has been successful for ten years, has become a symbol of Europe. However, the crisis experienced by the euro was similar to that of the United States[2]. After a decade, Europe suffered from the similar kind of profligate lending and borrowing, fueled by new types of financial derivatives, light-touch regulation and similar motivation of high profit intentions of financial markets which accelerated a financial crisis in the United States and global recession in 2008 (Hall , 2016: 51).

In the period before the financial crisis, both public and private sector debts increased with the easy access to capital and credit facilities. The tax cuts and the increase in public expenditures, which came along with the credit expansion, brought new risks for the countries with high internal and external debt stock. As a result of the economic revival, despite the increase in tax revenues, the high level of public expenditures brought along budget deficits. The violations of Maastricht Criteria for many countries and the economic indicators that go beyond this have increased macroeconomic risks over European economies (Eser and Ela, 2015: 209-210).

Following the transition to the Euro, countries such as Italy and Spain, which have previously had high inflation and interest rates, brought about a sudden decline in interest rates. Low interest rates were caused by public spending financed by the mortgage-funded housing sector and by debt. Financial markets came to believe that all Eurozone government bonds were essentially equivalent and that the margins of interest among these bonds are too small. Everything was fine until The Greek government had previously underestimated the size of its national debt. The market followed a sharp jump in interest rates on the Greek debt and followed next year with interest rates in other Eurozone countries with a large amount of government debt. With the 2011, the state debt of Ireland, Portugal and Italy exceeded 100 percent of their GDP and ten-year bond interest rates were over 12 percent in Ireland and Portugal, and over 7 percent in Italy. With these interest rates, government budgets were exposed and the rates increased to GDP (Feldstein, 2015: 1-2). At the end of first decade of 2000's, there could be seen substantial divergences in current account positions among Euro member states. Some states such as: Spain, Greece, Portugal and Italy became a position with persistent

[2] Countries with high interest rates in the pre-Euro period, due to high inflation rates experienced a decline in the post-euro interest rates. Lenders have fallen into the belief that bond conditions are the same for all countries and assumed that a bond issued by any government in the European Monetary Union was equally safe. Governments responded to the low interest rates by increasing their borrowing. For more info, please see: (Victor A. Beker, 2014: 1)

current account deficits while Germany had large surpluses (Stockhammer, Constantine and Reissl, 2016: 9).

With the beginning of 2010, the Euro-crisis has got worse. First, Greece and then Ireland and Portugal had to seek shelter under the so-called bailout umbrella. It soon turned out that financial support for these countries would be tied to a particular form of economic policy therapy – tough austerity programmes (Busch, 2012: 3).

EU and IMF credits to highly debted countries for financial assistance in 2010 first for Greece and the following period IMF and EU programs were subsequently provided to Ireland and Portugal (Nelson, Paul Belkin and Derek E. Mix, 2011: 11):

- 110 billion Euro, Greece, May 2010
- 85 billion Euro, Ireland, December 2010
- 78 billion Euro, Portugal, May 2011

It can be seen that the crisis is caused by different factors in each country in member states. While the crisis in Greece emerged from the public sector, the weaknesses in the banking and real estate sector in Ireland have been the determining factor in the crisis. The current account deficit and the banking sector-driven crisis in Portugal. In Spain, the weakening of economic activity due to insufficient domestic and foreign demand and the rise in the unemployment rate above 20% have been effective. In Italy and Belgium, the main source of the crisis was the problems experienced in public finance (T.C. Başbakanlık, 2011: 8).

Particularly, Greece tried to solve the problem of public debt burden by resorting to borrowing with low interest financing facilities provided by the Euro zone instead of providing financial discipline (Dağdelen, 2011: 4). However, although different economic problems stem from different dynamics, the common feature of the countries about the crisis is especially the high debt stock. In order to mitigate the effects of the financial crisis, interest rate cuts were made and stimulating policies were implemented in order to prevent stagnation and to stabilize the economy.

On the other hand, the problems in the banking sector of European countries, together with the financial crisis, forced the countries to help or nationalize these banks, at which point the crisis in the banking sector has spread to the public in terms of financing the crisis. Particularly in the PIIGS countries (Portugal, Ireland, Italy, Greece, Spain), the debt burden of the state increased due to the policies implemented after the financial crisis and the aid to the banks. This situation increased the concerns about the repayment of the debts of the countries. Due to increased concerns and the note-breaking policy of credit rating agencies, borrowing for countries has become costly and thus the European Debt Crisis has become more severe. Conditional support packages to the countries that have difficulty in translating their debts, as well as the International Monetary Fund (IMF) and the European Central Bank (ECB), have failed to solve the problem. In this case, additional funds and measures have been introduced to support countries in crisis (Eser and Ela, 2015: 210).

From the perspective of the European Union, one of the most important thing learned from the crisis is the need for a more efficient economic governance, financial oversight and institutionalization of coordination within the Union. This issue was reflected in Article 136 of the Lisbon Treaty[3] as follows: "Eurozone countries should adopt common economic policy rules and strengthen coordination for budgetary disciplines." (Eralp, 2010: 2). In addition, another point that underlined is the shortcomings in the economic governance of the Eurozone have been an urgent issue for the politicians' agenda (T.C. Başbakanlık, 2011: 9).

The discussions on the Euro Zone or the broader definition of the Economic and Monetary Union was not only due to the lack of sound control of the compliance of the EU countries with the Maastricht criteria in the Union. Another, and perhaps even more important problem was the inability of the legal and institutional infrastructure to provide the necessary coordination in economic and fiscal policies in a structure where the monetary policy and exchange rate policy was completely transferred to the European Central Bank, in accordance with the Economic and Monetary Union requirements (Eralp, 2010: 3).

3. Comments on Euro and the crisis: Statistical view to different country groups

The expansion and deepening of the euro crisis threatened the sustainability of the European common currency and also opened up a debate on the monetary union (Gibson, Palivos and George, 2013: 3) Becoming of Euro as common currency and the monetary policy as well, which in turn brings some macroeconomic results and problems. The fact that the conditions of independent monetary policy are limited and the conditions of the country cannot be taken into consideration in the policies to be implemented have become a factor that will affect the economies in the negative sense. The functioning of the European Central Bank as a monetary authority and the authority of national authorities in terms of fiscal policy have made it difficult to coordinate the coordination of these two policies.

The increase in the link between the economies of countries in monetary terms is also a factor triggering the crisis. The fact that the monetary union countries are using the euro and regional monetary policy is being carried out by the European Central Bank has strengthened the links between the economies of the countries in question. This situation facilitates the dissemination of negativities in a Euro country to other Euro countries in a short time (Yavuz, Şataf and Kır, 2013: 137).

The euro-area crisis, along with problems in the banking sector, has brought a debate between banks and governments. Additionally have led to negative feedback loops between weak banking systems and confidence in the sovereigns. Banking crises in

[3] The Lisbon Treaty was signed by the heads of state and government of the 27 EU Member States on 13 December 2007. For more info: http://www.lisbon-treaty.org/wcm/.
And for Article 136, please visit: http://www.lisbon-treaty.org/wcm/the-lisbon-treaty/treaty-on-the-functioning-of-the-european-union-and-comments/part-3-union-policies-and-internal-actions/title-viii-economic-and-monetary-policy/chapter-4-provisions-specific-to-member-states-whose-currency-is-the-euro/404-article-136.html.

Euro-area countries have placed large fiscal burdens on governments. By that way, bringing questions about solvency of governments and also fiscal policy infeasibilty under these conditions (Gibson, Palivos and George, 2013: 11).

In addition to the monetary policy variable, the high level of integration of the EU member countries, finance and real sectors increased the interaction between the economies and brought the crisis in Greece to spread to other countries in a short time (T.C. Başbakanlık, 2011: 8-9).

Prior to the use of the euro as a common currency, there were many criticisms that the Euro was far from being an optimal currency. And it was argued that the transition to the common currency would result in disaster. These warnings and critics appeared to be coming to fruition during the Eurozone crisis and, as one observer put it, placed the Eurozone in a "full-fledged existential crisis." (Beckworth, 2016: 4-5).

In the years following the crisis and in the crisis period, many measures were taken in order to achieve economic stability in the EU. Some steps were taken with close cooperation and negotiations as well as discussions.

Europe's comprehensive response to the crisis can be counted as follows (Regling, 2016: 6):

a) Budget consolidation and structural reform in euro area countries
b) An active monetary policy
c) Closer economic policy coordination in the currency union
d) Strengthening the banking system
e) Firewalls against the crisis: EFSF and ESM[4]

The euro area crisis has been one of the most important milestones in EU history. The Eurozone crisis and its consequences have been the one of the most significant political development in Europe over recent decades by the shooks on institutional foundations of EU. And also shows the incomplete nature of its overall economic policy framework in general (Georgiou, 2017: 7). With the crisis, weaknesses in the institutional framework of the EU have emerged. As a result of the steps taken in the aftermath of the crisis, significant innovations have been realized in the institutional sense, the institutional

[4] *"The European Financial Stability Facility (EFSF) was created as a temporary crisis resolution mechanism by the euro area Member States in June 2010. The EFSF has provided financial assistance to Ireland, Portugal and Greece. The assistance was financed by the EFSF through the issuance of EFSF bonds and other debt instruments on capital markets. The EFSF does not provide any further financial assistance, as this task is now performed solely by the ESM. Nevertheless, the EFSF continues to operate in order to:*
- receive loan repayments from beneficiary countries;
- make interest and principal payments to holders of EFSF bonds;
- roll over outstanding EFSF bonds, as the maturity of loans provided to Ireland, Portugal and Greece is longer than the maturity of bonds issued by the EFSF
The mission of both the EFSF and ESM is to safeguard financial stability in Europe by providing financial assistance to countries of the euro area. "
For more info: European Stability Mechanism, (2018), https://www.esm.europa.eu/efsf-overview.
And https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-financial-assistance/loan-programmes/european-financial-stability-facility-efsf_en

infrastructure of the EU has been strengthened and an important examination has been given with positive steps.

3.1. Comments on general government gross debt statistics of different country groups in European Union

The financial and economic crisis that started in 2007/08, followed by the debt crisis of some states in Eurozone are in 2010. Many researchers and policy makers concentrated on pointed on debt stock and they already had a strong opinion on the utility or risks of government debt (Holtfrerich and et all., 2016: 2). General government gross debt[5] is an important indicator for understanding the sustainability of the govenrment. And also helps to reflect the fiscal position of the public sector when it will be considered togetherly with the tax revenues of the governments. Government debt indicator was the most important and prior indicator that feel the pressure on it during the years of the Eurozone crisis.

Table 2. EU 16 - Euro Countries - General government gross debt - % of GDP

EU 16 - Euro Countries - General government gross debt - % of GDP													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	94,7	91,1	87	92,5	99,5	99,7	102,6	104,3	105,5	107,6	106,5	106,1	103,4
Germany	67	66,5	63,7	65,2	72,6	81	78,6	79,9	77,4	74,5	70,8	67,9	63,9
Ireland	26,1	23,6	23,9	42,4	61,5	86	110,9	119,9	119,7	104,1	76,8	73,4	68,4
Greece	107,4	103,6	103,1	109,4	126,7	146,2	172,1	159,6	177,4	178,9	175,9	178,5	176,1
Spain	42,3	38,9	35,6	39,5	52,8	60,1	69,5	85,7	95,5	100,4	99,3	99	98,1
France	67,4	64,6	64,5	68,8	83	85,3	87,8	90,6	93,4	94,9	95,6	98,2	98,5
Italy	101,9	102,6	99,8	102,4	112,5	115,4	116,5	123,4	129	131,8	131,6	131,4	131,2
Cyprus	63,4	59,3	54	45,6	54,3	56,8	66,2	80,1	103,1	108	108	105,5	96,1
Luxembourg	7,4	7,8	7,7	14,9	15,7	19,8	18,7	22	23,7	22,7	22,2	20,7	23
Malta	70	64,5	62,3	62,6	67,6	67,5	70,1	67,7	68,4	63,7	58,6	56,3	50,9
Netherlands	49,8	45,2	43	54,7	56,8	59,3	61,7	66,2	67,7	67,9	64,6	61,9	57
Austria	68,6	67,3	65	68,7	79,9	82,7	82,4	81,9	81,3	84	84,8	83	78,3
Portugal	67,4	69,2	68,4	71,7	83,6	96,2	111,4	126,2	129	130,6	128,8	129,2	124,8
Slovenia	26,3	26	22,8	21,8	34,6	38,4	46,6	53,8	70,4	80,4	82,6	78,7	74,1
Slovakia	34,1	31	30,1	28,5	36,3	41,2	43,7	52,2	54,7	53,5	52,2	51,8	50,9
Finland	40	38,2	34	32,7	41,7	47,1	48,5	53,9	56,5	60,2	63,6	63	61,3
EU 16 av.	58,36	56,21	54,06	57,59	67,44	73,92	80,46	85,46	90,79	91,45	88,87	87,79	84,75

Source: Prepared by the author with the data from: Eurostat, Government finance statistics, General government gross debt - annual data, (Last update of data in Eurostat: 24/10/2018).

The ratios of public debt stock to GDP in 16 monetary union countries are shown in Table 2. In the EU16 region, the year in which the debt stock / GDP ratio is highest with 91.45% is 2014. Italy, Ireland, Belgium, Greece, Portugal stand out as countries with high indebtedness. Although Spain experienced a serious crisis, it seems to be relatively

[5] "General government gross debt, also known as public debt, is the nominal (face) value of total gross debt outstanding at the end of the year and consolidated between and within the government subsectors". Eurostat, Glossary: Government debt, 27 June 2017, https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Government_debt.

more favorable compared to other problematic countries. More important problem for Spain is high unemployment rates.

Table 3. Non-euro countries - General government gross debt - % of GDP

Non-euro countries - General government gross debt - % of GDP													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bulgaria	26,8	21	16,3	13	13,7	15,3	15,2	16,7	17,1	27,1	26,2	29,6	25,6
Czechia	27,9	27,7	27,5	28,3	33,6	37,4	39,8	44,5	44,9	42,2	40	36,8	34,7
Denmark	37,4	31,5	27,3	33,3	40,2	42,6	46,1	44,9	44	44,3	39,9	37,9	36,1
Croatia	41,2	38,6	37,2	39	48,3	57,3	63,8	69,4	80,4	84	83,7	80,2	77,5
Hungary	60,5	64,5	65,5	71,6	77,8	80,2	80,5	78,4	77,1	76,6	76,6	75,9	73,3
Poland	46,4	46,9	44,2	46,3	49,4	53,1	54,1	53,7	55,7	50,4	51,3	54,2	50,6
Romania	15,7	12,3	11,9	12,4	22,1	29,7	34	36,9	37,6	39,2	37,8	37,3	35,1
Sweden	49,1	43,9	39,2	37,7	41,3	38,6	37,8	38,1	40,7	45,5	44,2	42,4	40,8
United Kingdom	39,8	40,7	41,7	49,7	63,7	75,2	80,8	84,1	85,2	87	87,9	87,9	87,4
Estonia	4,5	4,4	3,7	4,5	7	6,6	6,1	9,7	10,2	10,5	9,9	9,2	8,7
Latvia	11,4	9,6	8	18,2	35,8	46,8	42,7	41,2	39	40,9	36,8	40,3	40
Lithuania	17,6	17,2	15,9	14,6	28	36,2	37,2	39,8	38,8	40,5	42,6	39,9	39,4
Non-euro 9	38,3	36,3	34,5	36,8	43,3	47,7	50,2	51,9	53,6	55,1	54,2	53,6	51,2
Estonia+Latvia+ Lithuania	11,2	10,4	9,2	12,4	23,6	29,9	28,7	30,2	29,3	30,6	29,8	29,8	29,4

Source: Prepared by the author with the data from: Eurostat, Government finance statistics, General government gross debt - annual data, (Last update of data in Eurostat: 24/10/2018).

Table 3 shows the ratios of 9 non-euro countires' and 3 euro countries' (Estonia, Latvia, Lithuania - ELL) public debt stocks to GDP. When Euro member Estonia, Latvia and Lithuania are compared, they have lower public debt stock than other Euro countries. Among the non-euro countries, this ratio is below 50% for Bulgaria, Romania, Denmark and the Czech Republic. However, for all countries, it is observed that this ratio has entered a serious upward trend after 2010 and it has increased twice as much for many countries.

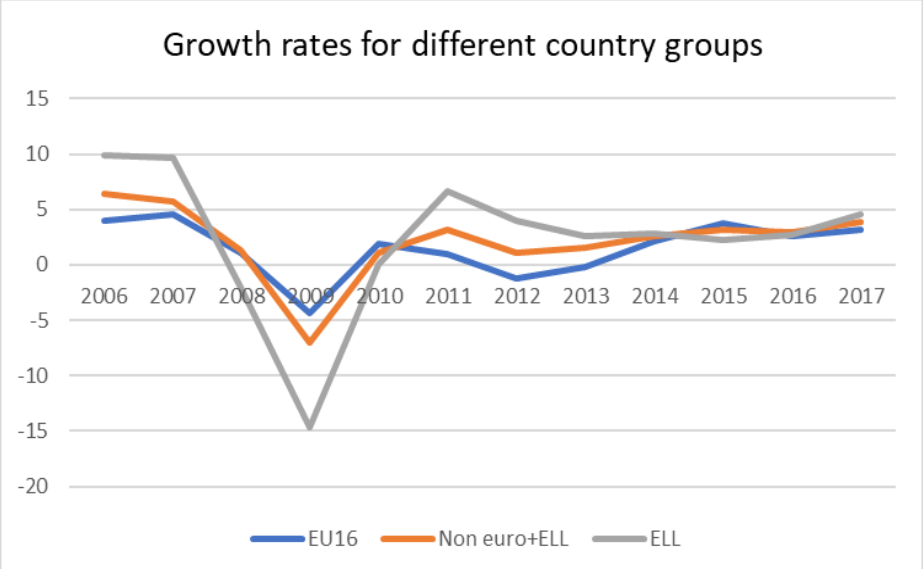
Table 4. Euro Countries- Comparisons - General government gross debt - % of GDP

Euro Countries- Comparisons - General government gross debt - % of GDP													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Estonia	4,5	4,4	3,7	4,5	7	6,6	6,1	9,7	10,2	10,5	9,9	9,2	8,7
Latvia	11,4	9,6	8	18,2	35,8	46,8	42,7	41,2	39	40,9	36,8	40,3	40
Lithuania	17,6	17,2	15,9	14,6	28	36,2	37,2	39,8	38,8	40,5	42,6	39,9	39,4
Non-euro 9	38,3	36,3	34,5	36,8	43,3	47,7	50,2	51,9	53,6	55,1	54,2	53,6	51,2
Estonia+Latvia+ Lithuania	11,2	10,4	9,2	12,4	23,6	29,9	28,7	30,2	29,3	30,6	29,8	29,8	29,4
EU 16 av.	58,36	56,21	54,06	57,59	67,44	73,92	80,46	85,46	90,79	91,45	88,87	87,79	84,75

Source: Prepared by the author with the data from: Eurostat, Government finance statistics, General government gross debt - annual data, (Last update of data in Eurostat: 24/10/2018).

Table 4 shows the comparisons between Non-euro countries, EU16 and Euro users special 3 countries. In non-euro 9 countries, lowest rate of debt to stock ratio is %34 in the year 2007. That rate is also lowest for special 3 countries ELL, in 2007 with the rate of %9,2. Fort he avarage EU16, the ratios of debt stock to GDP are always higher than the other 2 groups for all years. It is highest in 2014 with the rate of %91 for EU16.

Graph 1. Growth rates for different country groups in EU



Source: Prepared by the author with the data from: Eurostat, Real GDP growth rate statistics, annual data, (Last update of data in Eurostat: 17/08/2018).

Graph 1 shows the economic growth rates of different country groups; non-euro countries, EU16 and non-euro countries+special 3 countries. The increase in the debt to GDP ratio generally in all other member states is also due to the sharp decline in their GDP during the crisis. In some countries, GDP continued to decrease in the following years, especially strictly in 2008, 2009, 201 and partially 2011 0with additional negative effects on the debt ratio (Budimir, 2017: 53). The growth rates became more reasonable after 2013 and became more stable in generally.

3.2. Comments on Net Lending/Borrowing statistics of different country groups in European Union

Net lending / barrowing data[6] is an important indicator that gives an idea about economic performance of the countries and also indirectly about the possible future trend of debt stock. Recalling that a nation's current account is its net borrowing from rest of the world, large increases in foreign indebtedness shows up as a negative current account. That represents the net barrowing position in current account. A positive current account indicates that the nation is, on net, lending to foreigner nations. And at this situation, net lending represents positive data in this indicator. (Baldwin and Giavazzi, 2015). In this section, net lending / barrowing[7] statistics in different European Union groups will be discussed into the period of before and after the crisis.

[6] *"In the European Union, Member States which are part of the euro area are required to keep their budget deficits below 3 % of gross domestic product to promote economic stability and sustainable public finances. Under the terms of the European Union's Stability and Growth Pact (SGP), Member States pledged to keep their deficits and debt below certain limits: a Member State's government deficit may not exceed -3 % of its gross domestic product (GDP) in order to promote economic stability and sustainable public finances".* Eurostat, Glossary: Net lending net borrowing, 2016, https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Net_lending_net_borrowing.

[7] Eurostat, Glossary: Net lending net borrowing

"Net lending (+)/ net borrowing (-) is a national accounts balancing item. It is the last balancing item of the non-financial accounts - namely the balancing item of the capital account.

It can be used in the context of the domestic economy as a whole, but is most frequently used in the context of the Excessive deficit procedure (EDP) and government finance statistics; i.e. in the context of the net lending (+)/ net borrowing (-) of the general government sector. When the balancing item is positive, a surplus is said to exist, when it is negative, there is a deficit.

It can be derived as follows:

Net lending (+)/ net borrowing (-)

=Government surplus / deficit (net lending/ borrowing under EDP)

= gross saving (defined as gross disposable income less final consumption expenditure) less net capital transfers less gross acquisitions less disposals of non-financial assets

= total revenue less total expenditure

= (conceptually) net acquisition of financial assets less net incurrence of liabilities."

For more info: Eurostat, Glossary: Net lending net borrowing, 2016, https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Net_lending_net_borrowing.

Table 5. EU 16 - Euro Countries – Net Lending/Barrowing - % of GDP

EU 16 - Euro Countries - Net Lending/Borrowing - % of GDP)													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	1,9	1,9	1,6	-1,5	-1,3	1,5	-1,2	0,5	-0,4	-1,1	-1	-0,5	0,8
Germany	4,5	5,6	6,7	5,6	5,7	5,7	6,1	7	6,7	7,6	8,9	8,6	7,9
Ireland	-3,3	-5,2	-6,4	-6,2	-4,6	-1,1	-1,5	-2,6	1	-2,4	3,9	-5,7	-1,1
Greece	-7,8	-10,1	-13,3	-13,4	-11,5	-10,5	-8,7	-2,6	-0,4	-0,2	0,9	-0,7	-0,5
Spain	-6,7	-8,4	-9,3	-8,8	-4	-3,5	-2,8	0,3	2,2	1,6	1,8	2,5	2,1
France	0,1	0,3	0	-0,7	-0,5	-0,6	-0,9	-1,1	-0,5	-1	-0,4	-0,7	-0,5
Italy	-0,8	-1,4	-1,3	-2,8	-1,9	-3,4	-2,9	-0,1	0,9	2,1	1,7	2,3	2,7
Cyprus	:	:	:	-15,3	-7,3	-11	-3,7	-5,8	-3,5	-3,5	-1,2	-4,9	-7,9
Luxembourg	14,2	9,2	9,3	6,9	6,1	6,2	5,6	4,7	4,2	3,8	4,5	4,7	4,5
Malta	-3,4	-3	-0,7	-0,7	-5,4	-2,7	1	3,6	4,4	10,5	6,2	7,4	14,3
Netherlands	7,1	8,9	5,2	4,9	5,5	6,5	8,7	8,9	9,9	8,4	5,8	7,9	10,4
Austria	2,3	3	3,8	4,4	2,6	2,9	1,5	1,3	1,8	2,4	1,2	2,4	1,9
Portugal	-8,5	-9,5	-8,6	-10,9	-9,3	-8,8	-4,5	0,3	3,2	1,4	1,3	1,6	1,4
Slovenia	-2,2	-2,3	-4,3	-5,4	-0,5	0	0	2,3	4,8	6	5,6	4,8	6,4
Slovakia	-10,6	-9,5	-5,1	-5,3	-2,7	-3,2	-3,7	2,9	3,3	2,1	1,8	-0,2	-1,1
Finland	3,2	3,8	3,8	2,2	1,7	1,2	-1,6	-2,2	-2,1	-1,7	-0,7	-0,7	-0,6
EU 16 av.	-0,63	-1,04	-1,16	-2,94	-1,71	-1,30	-0,54	1,09	2,22	2,25	2,52	1,80	2,54

Source: Prepared by the author with the data from: Eurostat, Net Lending/Borrowing (current and capital account) - annual dat, (Last update of data in Eurostat: 17/08/2018).

Table 5 shows net lending / barrowing data in EU16 as a ratio to GDP. Negative data is particularly noteworthy in countries experiencing crisis. Negative rates are seen to be at the peak in the pre-crisis period, and after 2010 and 2011, partial improvement is observed in these data with strict policies. It is noteworthy that net lending / barrowing rate does not pose any risk to the whole period for Belgium which was strongly feel the Euro crisis on its economy. When the EU16 average is considered, a positive situation in general is noteworthy.

Table 6. Non-euro countries – Net Lending/Barrowing - % of GDP

Non-Euro Contries- Net Lending/Borrowing - % of GDP)													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bulgaria	:	:	-25,7	-21,2	-7	-0,9	1,5	0,4	2,4	3,5	3,1	4,8	7,7
Czechia	-1,4	-2,1	-4	-1,2	-1	-2,6	-1,8	-0,3	1,5	0,9	2,5	2,7	2
Denmark	4,3	3,3	1,5	2,9	3,4	6,6	6,9	6,3	7,7	8,7	7,9	8,1	8,1
Croatia	-5,2	-7	-7,2	-9	-5,1	-1,1	-0,7	-0,1	1	2,3	5,1	3,9	4,5
Hungary	-6,3	-6,4	-6,4	-5,8	0,9	2,1	3,1	4,3	7,3	5,2	7,3	6,1	4,2
Poland	-2,3	-3,4	-5,3	-5,6	-2,3	-3,6	-3,2	-1,5	1	0,4	1,8	0,5	1,4
Romania	-7,9	-10,4	-12,9	-11,1	-4,2	-4,9	-4,4	-3,4	1	2	1,2	0,4	-2
Sweden	6,1	7,6	8,1	7,7	5,9	5,8	5,3	5,4	5	4,4	4,3	4,2	3,2
United Kingdom	-2,1	-3,2	-3,8	-4,6	-3,9	-3,8	-2,4	-4,3	-5,2	-5	-5	-5,3	-3,8
Estonia	-8	-12,8	-13,8	-7,5	6	5,3	5,4	1,4	3,1	1,9	3,9	3	4,2
Latvia	-10,5	-19,6	-18,9	-11	10,2	4	-1,1	-0,6	-0,2	1,5	2,3	2,6	1,5
Lithuania	-6,3	-9,4	-13,4	-11,7	5,7	2,5	-1,3	1,5	4	5,8	0,7	0,7	2,1
Non-euro 9	-1,64	-2,40	-6,19	-5,32	-1,48	-0,27	0,48	0,76	2,41	2,49	3,13	2,82	2,81
Estonia+ Latvia+ Lithuania	-8,27	-13,93	-15,37	-10,07	7,30	3,93	1,00	0,77	2,30	3,07	2,30	2,10	2,60

Source: Prepared by the author with the data from: Eurostat, Net Lending/Borrowing (current and capital account) - annual dat, (Last update of data in Eurostat: 17/08/2018).

Table 6 shows net lending / barrowing data in Non-euro countries as a ratio to GDP and 3 euro countries' (Estonia, Latvia, Lithuania - ELL). For Romania, Croatia, Latvia and Lithuania, the ratios are especially higher than the other countries. Also avarage of ELL, fort he year 2007, the rate is the highest point with the rate of % - 15,37. With the 2010, after the crisis, it becomes positive and in 2010 it is at the highest level with the positive rate of % 3,93. Also fort he all years after the crisis, it keeps positive rates. That shows the accounts for these country groups became sustainable and reasonable after the 2010's.

Table 7. Euro Countries- Comparisons - Net Lending/Barrowing - % of GDP

Euro Countries- Comparisons - Net Lending/Borrowing - % of GDP)													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Non-euro 9	-1,64	-2,40	-6,19	-5,32	-1,48	-0,27	0,48	0,76	2,41	2,49	3,13	2,82	2,81
Estonia+ Latvia+ Lithuania	-8,27	-13,93	-15,37	-10,07	7,30	3,93	1,00	0,77	2,30	3,07	2,30	2,10	2,60
EU 16 av.	-0,63	-1,04	-1,16	-2,94	-1,71	-1,30	-0,54	1,09	2,22	2,25	2,52	1,80	2,54

Source: Prepared by the author with the data from: Eurostat, Net Lending/Borrowing (current and capital account) - annual dat, (Last update of data in Eurostat: 17/08/2018).

Table 7 shows the comparisons of net lending / barrowing data between Non-euro countries, EU16 and Euro users special 3 countries. It seems clear that fort he net lending/barrowing, performance of EU16 countries are relatively more successful than the non-euro 9 countries and also better than ELL. Following years after 2010's, fort he all groups of countries, ratios are relatively better than the previous years of the crisis. That can show, fiscal discipline[8] after the crisis years help the fiscal performance of the countries. For all groups, after 2012, rates become positively over % 2.

4. Conclusion

Starting from the first half of 2010, especially the economic problems in Greece, extended to the other European countries in a short period and Eurozone area faced various economic problems. Becoming of Euro as common currency created the strong links between the economies of countries in monetary terms. At the same time, crisis offered an opportunity for the EU to regulate itself in terms of institutional base. As a result of the steps taken such as: structural reforms, active monetary policy, corrdination in the currency area etc., EU improves its infrastructe in institutional level. In our stitistical overview, it can be seen that, countries that are not the member of currency union feel the effects of crisis relatively low level. Having an opportunity of independent monetary policy and also low level of interaction with the currency area protect them from the negative effects of the crisis. But further analysis and investigations should be made for certain opinions and judgments for these arguments. And also statistics that used in our study are data based on the ratio to GDP. For that reason fluctuations on GDP levels could be create some misunderstandings for the data used in our study.

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