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Bankruptcy prediction logit model developed on Romanian paired sample

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Abstract. *The current research targeted to develop a methodology for bankruptcy prediction applicable for Romanian companies. Under the effect of the economic crisis, as well as of the entrance in the European Union, Romania has registered a significant increase of the yearly bankruptcy frequency, which makes the availability of bankruptcy assessment tools more important than ever before. Using the logistic regression, the study proposes a multivariate model based only on financial data easily accessible to all the stakeholders of the company.*

The target population consisted of all the companies from the Timis County with annual sales of over 10,000 lei (aprox. 2,200 Euro). The model was developed over a paired sample that included all the companies from the 2010 target population that went bankrupt by the end of 2012. The testing was performed over the entire target population from the period 2007-2010. The study has thus included 53,252 yearly financial statements from the period 2007-2010.

The proposed model will not allow the analyst to conclude with absolute certainty whether the analyzed company will go bankrupt or not within a two year horizon. Instead, it will offer the possibility of placing the companies on risk classes, thus creating the basis for a differentiated behavior of the stakeholder toward a specific company.

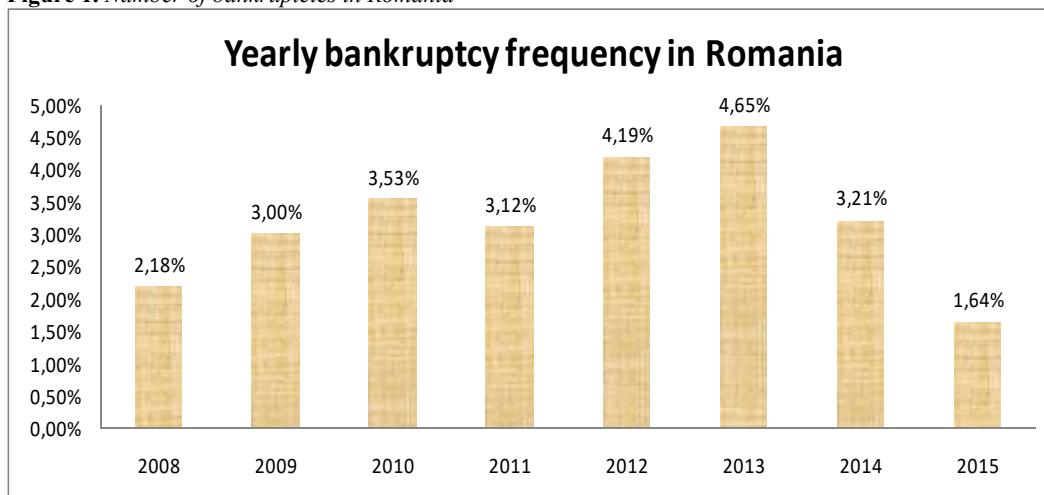
Keywords: ratio analysis, financial statements, risk, accuracy, benchmark.

JEL Classification: G33, M10.

Introduction

During the period 2008-2013, the corporate bankruptcy frequency in Romania has doubled, reaching in 2013 a peak of 4.65% (29,587 bankruptcies to a total number of companies of 636,042).

Figure 1. *Number of bankruptcies in Romania*



Source of data: calculations based on data published by the National Registry of Commerce (number of bankruptcies) and the Ministry of Public Finances (number of existing companies).

The context in which this phenomenon has manifested itself was marked by the economic crisis, the entrance of Romania in the European Union, as well as by an increase in the loan default ratio, Romania topping in this regard at the end of 2012 the 4th place within the European Union and 6th place worldwide in a ranking which included 131 countries (Brîndescu-Olariu, 2014a).

The state of bankruptcy negatively affects all the stakeholders of the company, which makes the existence of instruments for bankruptcy prediction important.

Assessment of the default risk in general and of the bankruptcy risk in particular have always been in the centre of the financial ratios analysis (Brîndescu-Olariu, 2016). Introduced in the USA in the 1860s, the financial ratios analysis only became popular in the continental Europe in the 1960s. The initial approaches of the financial ratios analysis in the prediction of bankruptcy were univariate. Some of the most important contributions in this field include (Yadav, 1986):

- the study conducted by J.R. Ramster and L.O. Foster in 1931 over a sample of 173 companies;
- the study conducted by FitzPatrick in 1932 over a sample of 38 de companies, of which 19 were bankrupt and 19 were healthy;
- the study conducted by Raymond Smith and Winakor Arthur in 1935 over a sample of 183 companies that failed over the period 1923-1931;
- the study conducted by Charles Merwin in 1942, over a sample of 900 companies.

Inspired by the models developed by Altman (1968) through discriminant analysis and later on by Ohlson (1980), through logistic regression, multivariate studies in the field of bankruptcy prediction have been performed all over the world during the last 50 years (Brîndescu-Olariu, 2016). The initial multivariate studies were performed on paired samples, an approach that still persists to great extent today.

The current study sets to create a multivariate model applicable in the Romanian practice. As differences between the profiles of the companies of different regions of Romania are expected, the focus was set on developing a model specific to only one geographical region: Timis County (largest and most western County in Romania).

The hypothesis on which the focus on a single county was based was that the differences in the characteristics of the companies make specific models for each county necessary. This hypothesis would be tested in a future research, by verifying the accuracy of the model developed in the current research on different populations (from other regions).

Population

The data employed is the same as in Brîndescu-Olariu (2016). More specifically, the target population included all companies from Timiș County that submitted yearly financial statements to the fiscal authorities during the period 2007-2010 and that registered yearly sales of at least 10000 lei (53,252 financial statements from the period 2007-2010).

The source of the data was represented by the online publications of the Ministry of Public Finances of Romania. Of the entire target population, 712 companies went bankrupt in the period 2009-2012, two years from the date of the financial statements of reference:

- of the 12,570 companies included with financial statements for 2007 in the research, 30 went bankrupt in 2009 (0.24%); the rest of the companies continued their activity under normal conditions at least until the end of 2012.
- of the 13,037 companies included with financial statements for 2008 in the research, 94 went bankrupt in 2010 (0.72%); the rest of the companies continued their activity under normal conditions at least until the end of 2012.
- of the 12,574 companies included with financial statements for 2009 in the research, 159 went bankrupt in 2011 (1.26%); the rest of the companies continued their activity under normal conditions at least until the end of 2012.
- of the 15,071 companies included with financial statements for 2010 in the research, 429 went bankrupt in 2012 (2.85%); the rest of the companies continued their activity under normal conditions at least until the end of 2012.

Methodology

In the purpose of combining the potential of individual financial ratios, the development of a multivariate model through logistic regression was targeted. The logistic regression

was chosen as it is indicated by the literature as one of the most popular and accurate methods (alongside discriminant analysis).

In accordance with many of the approaches from the international literature, the model was configured based on a paired sample.

In order to build a paired-sample, each of the 712 companies that went bankrupt in the period 2009-2012 was associated with a company from the same economic field that had the closest turnover in the year of reference for the financial statements included in the analysis.

In a first step, a model was developed over the paired sample of 2010, which included 429 companies that went bankrupt in 2012 and 429 companies that continued their activity under normal conditions at least until the end of 2012. Each of the 429 companies that were included in the target population of 2010 and went bankrupt in 2012 was paired with the company from 2010 with the same SIC code that had the closest turnover in 2010 but continued its activity under normal conditions at least until the end of 2012.

In a second step, the model was tested over the paired sample from the period 2007-2009. In a final step, the model was tested over the entire target population from the period 2007 – 2010.

The data was processed by using the SPSS software. The state of the company two years from the date of the financial statements of reference was defined as the dependent variable, a binary variable that can take the following values:

- 1, for the companies that went bankrupt 2 years after the date of the financial statements of reference;
- 0, for the companies that continued their activity under normal conditions at least until the end of 2012.

In order to simplify the explanations, the companies that went bankrupt 2 years after the date of the financial statements of reference will simply be referred to as „bankrupt”, while the companies that continued their activity under normal conditions at least until the end of 2012 will be referred to as „non-bankrupt”.

When defining the target population, the companies that close their activity for other reasons than bankruptcy during the period of analysis were excluded.

As an example, the value of the variable „State” was „1” for the companies that went bankrupt in 2011 and it was associated with the financial ratios of the respective companies from 2009. These companies were not included in the analysis for the following years (for 2010 with the financial statements and for 2012 with the state variable), even if they still existed.

Financial ratios from 2 years prior to the date of the variable „State” were used as independent variables. As the objective was to build a model and a methodology of analysis accessible to all the stakeholders of the company, only financial ratios that can easily be calculated based on the public data were taken into consideration. Under these circumstances, 26 financial ratios were tested as possible explanatory variables (Table 1).

Table 1. Financial ratios tested as explanatory variables

No.	Financial ratios	Symbol	Formula
1	Equity working capital	Ewc	Equity+Provisions-Fixed assets
2	Labor productivity in terms of profits	LPp	Gross profits/No. of employees
3	Profitability ratio	Pr	Net profits/Sales
4	Tax to profits ratio	TPr	Income tax/Gross profits
5	Autonomy ratio	Ar	(Equity+Provisions)/Total assets
6	Debt ratio	Dr	Total debt/Total assets
7	Solvency ratio	Sr	Total assets/Total debt
8	Equity working capital to sales ratio	EwcSr	Equity working capital / Sales
9	Arrears to sales ratio	ASr	Arrears/sales
10	Equity to fixed assets ratio	EFAr	Equity/Fixed assets
11	Arrears to cash ratio	ACr	Arrears/Cash
12	Cash to total debt ratio	CTDr	Cash/Total debt
13	Current assets to total debt ratio	CATDr	Current assets/Total debt
14	Cash ratio	Cr	Cash/Total assets
15	Equity working capital to current assets ratio	EwcCAr	Ewc/Current assets
16	Receivables collection period	RCP	(Receivables/Sales)x360
17	Total assets turnover ratio	TAr	Sales/Total assets
18	Arrears ratio	Ar	Arrears / Total debt
19	Cash to sales ratio	CSr	Cash/Sales
20	Fixed assets turnover ratio	FAr	Sales/Fixed assets
21	Inventory conversion ratio	ICr	(Inventory/Sales)x360
22	Tax to sales ratio	TSr	Income tax/Sales
23	Fixed assets ratio	FAr	Fixed assets/Total assets
24	Labor productivity in terms of sales	LPs	Sales/No. of employees
25	Current assets ratio	CAr	Current assets/Total assets
26	Return on equity	ROE	Net profits/(Equity+Provisions)

Only a part of the 26 financial ratios are suggested in the international literature as possible predictors of bankruptcy or were at least tested by other researchers as predictors. Thus, the ratios were not selected starting from the recommendations of the scientific literature, but from the availability to the general public of the data necessary for their calculation.

Initially, in the SPSS environment, logit univariate functions were estimated for each of the 26 ratios.

Each logit function has the following form:

$$P(\text{State}=1|Z_1) = \frac{e^{Z_1}}{1+e^{Z_1}} = \frac{1}{1+e^{-Z_1}}$$

where:

Z_1 = the score associated to a company. The Z_1 score represents a linear regression in which the explanatory variables are represented by the financial ratios:

$Z_1 = a + b_1X_1 + b_2X_2 + \dots + b_mX_m$. Initially, only one ratio was used for each function.

$P(\text{State}=1|Z_1)$ = the probability of bankruptcy 2 years after the date to which the Z_1 score is characteristic, estimated based on Z_1 .

e = Euler's constant.

The value of the Z_1 score does not have superior or inferior limits. The function $P(\text{State} = 1|Z_1)$ can only take values within the interval $[0; 1]$. In the estimation of the probability of bankruptcy in the year $N+2$, the variables $X_1, X_2, \dots, X_m$ represent financial ratios that characterise the financial state of the company in year N .

Thus, the financial ratios specific to the financial statements of the companies from the target population at the end of 2010 were tested as explanatory variables for the state of the company (bankrupt or non-bankrupt) at the end of 2012. In a similar manner, the financial ratios from 2009 were correlated to the state of the company at the end of 2011, the financial ratios from 2008 were correlated to the state of the company at the end of 2010 and the financial ratios from 2007 were correlated to the state of the company at the end of 2009.

The higher the Z_1 score, the closer to 1 the value of the function $P(\text{State} = 1|Z_1)$ will be, thus suggesting a high probability of bankruptcy. The probability of bankruptcy 2 years after the date of the financial statements of reference would be estimated at 0.5 in the case of a Z_1 score equal to 0.

For values of the Z_1 score that are below 0, the probability of bankruptcy 2 years after the date of the financial statements of reference would be estimated at less than 0.5, with a tendency toward 0 of the probability of bankruptcy as the Z_1 score decreases.

The performance of each univariate model developed over the paired sample of 2010 was initially evaluated by its in-sample general accuracy. In the evaluation process, each univariate model was used to classify every company from the paired sample of 2010. The cut-off value was considered to be 0.5. For each model, a company for which the probability of bankruptcy was estimated as higher than 0.5 was classified as bankrupt. All the companies with estimated probabilities of bankruptcy of 0.5 or less were classified as non-bankrupt. The percentage of companies correctly classified from the total sample represents the general accuracy of the classification.

$$\text{general accuracy} = \frac{\text{number of companies correctly classified}}{\text{total number of companies}} \times 100\%$$

The general accuracy represents the weighted average of the sensitivity and the specificity.

$$\text{general accuracy} = w_b \times \text{sensitivity} + w_{nb} \times \text{specificity}$$

where:

$$w_b = \frac{\text{number of bankrupt companies}}{\text{total number of companies}} \times 100\%$$

and

$$w_{nb} = \frac{\text{number of non-bankrupt companies}}{\text{total number of companies}} \times 100\%.$$

The sensitivity represents the accuracy of the classification of bankrupt companies.

$$\text{sensitivity} = \frac{\text{number of bankrupt companies correctly classified}}{\text{total number of bankrupt companies}} \times 100\%$$

The specificity represents the accuracy of the classification of non-bankrupt companies.

$$\text{specificity} = \frac{\text{number of non – bankrupt companies correctly classified}}{\text{total number of non – bankrupt companies}} \times 100\%$$

As the sample from 2010 used for the development of the univariate models was a paired sample, the weight of the bankrupt companies was equal to the weight of the non-bankrupt companies (50%). For such a sample, the „by chance” accuracy is 50% (by classifying all 858 companies as bankrupt, the analyst would be correct in 50% of the cases). A model is considered a useful classifier if it allows for a general accuracy at least 25% higher than the „by chance” accuracy (Chung et al., 2008).

Based on this benchmark, the univariate models would be considered as potentially useful if they would offer an in-sample accuracy (the accuracy in the classification of the companies from the development sample) of at least 62.5% ($a = 50\% \times 125\%$).

The purpose of the development of univariate models was not to obtain practical univariate tools of analysis, but to observe the individual potential of the ratios, especially in terms of sensitivity and specificity. Together with information concerning the intercorrelations, the sensitivity and the specificity ensured by each ratio in the univariate approach were used as reference for grouping the ratios into multivariate models.

Thus, ratios were grouped into multivariate models, avoiding intercorrelations, searching for statistical significance at 0.01 significance level and targeting to ensure complementarity for sensitivity and specificity. Over 100 combinations were tested in the SPSS environment. In the end, the combination that ensured the best general in-sample accuracy was retained as a proposed multivariate model.

Additional in-sample tests were performed on the model using the area under the ROC Curve. Out of sample tests were performed on the paired sample from the period 2007-2009, using the general accuracy and the area under the ROC Curve as performance indicators.

In the final testing stages, the model was tested on the entire population of 2010 in terms of general accuracy and area under the ROC Curve.

The structure of the target population is significantly different from the structure of the sample, with the weight of the bankrupt firms being of only 2.85% within the target population of 2010 (2.85% of the target population of 2010 went bankrupt in 2012). Such structure differences brought in the past some criticism to the models developed based on paired samples. Nevertheless, the sampling method remains very popular in this field.

Based on the „25% rule” (Chung et al., 2008), the model should be considered a useful classifier if it could offer a general accuracy of at least 62.5% over a paired sample and of 100% over the entire target population:

- the „by chance” general accuracy over the 2010 target population would be of 94.46% ($w_{nb}^2 + w_b^2 = 97.15\%^2 + 2.85\%^2 = 94.46\%$);
- $94.46\% \times 125\% \approx 118\%$.

Most of the models available in the international literature cannot ensure even in-sample general accuracies at least equal to the „by chance” general accuracies. Of the 40 models presented, the highest reported in-sample (paired sample of 54 companies) accuracy was of 95.60% (Ugurlu and Aksoy, 2006).

Considering that the current research targets to develop a model that only employs data easily available to all stakeholders, an out of sample general accuracy close to 100% does not constitute a reasonable objective.

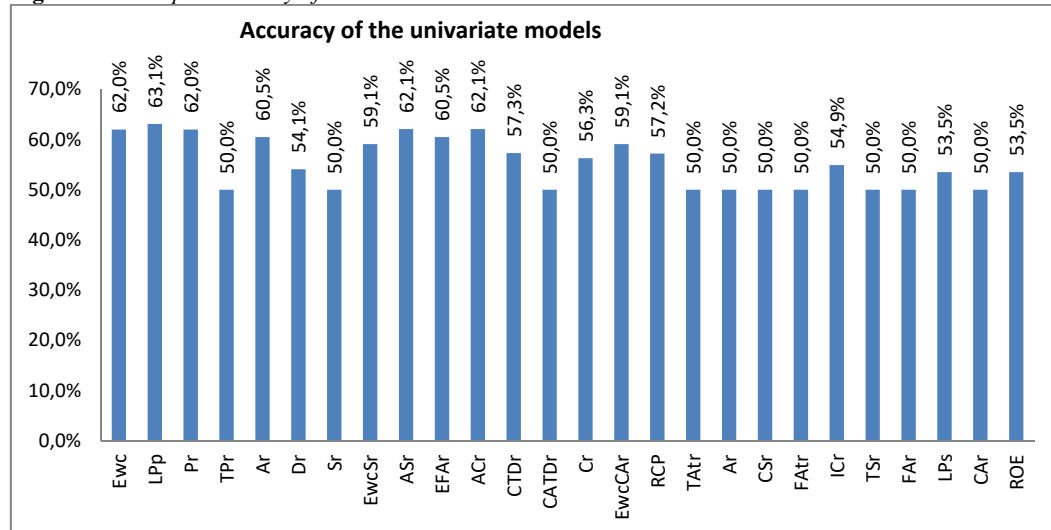
Instead, the purpose of the model would be to ensure the classification of the analysed companies on risk classes.

In practice, using the model, the analyst should expect every analysed company not to go bankrupt (the model would not indicate a probability of bankruptcy higher than 0.5), but it will be possible to evaluate the bankruptcy risk as higher or lower than the average.

Results

The in-sample general accuracies of the univariate models are showed in Figure 1. The highest in-sample general accuracy was offered by the model based on the labour productivity in terms of profits (63.1%).

Figure 2. *In sample accuracy of the univariate models*



In an attempt to increase the general accuracy of the classification, different ratio combinations were tested for the development of multivariate models. The combinations were prioritized based on the sensitivity and specificity ensured by each ratio. The increase of the general accuracy obtained by combining ratios into multivariate models was limited by the intercorrelations between the ratios. Combinations between ratios with low Pearson coefficients were granted priority from this point of view.

The ratios finally retained in the model were:

- Receivables collection period (RCP);
- Profitability ratio (Pr);
- Cash to total debt ratio (CTDr);
- Fixed assets ratio (FAr);
- Equity working capital (Ewc).

The ratios were retained within the final model based on their contribution to the in-sample general accuracy and on the significance of their correlation to the State variable.

Table 2. *Coefficients of the logit function and tests*

No.	Rate	B	Wald	Sig.
1	RCP	0,000635	14,557	0,000
2	Pr	-0,343	11,600	0,001
3	CTDr	-0,243	12,283	0,000
4	FAr	-1,185	27,958	0,000
5	Ewc	-0,000000544	21,322	0,000

All the independent variables are statistically significant at a significance level of 0.001. The receivables collection period and the equity working capital are expressed in absolute values, while the other independent variables are expressed in relative values. This leads to significantly lower coefficients for the receivables collection period and the equity working capital.

The receivables collection period is positively correlated to the Z_1 score. Higher values of the receivables collection period will influence the Z_1 score in a positive sense from the mathematical point of view, thus sustaining high levels of estimated probability of bankruptcy.

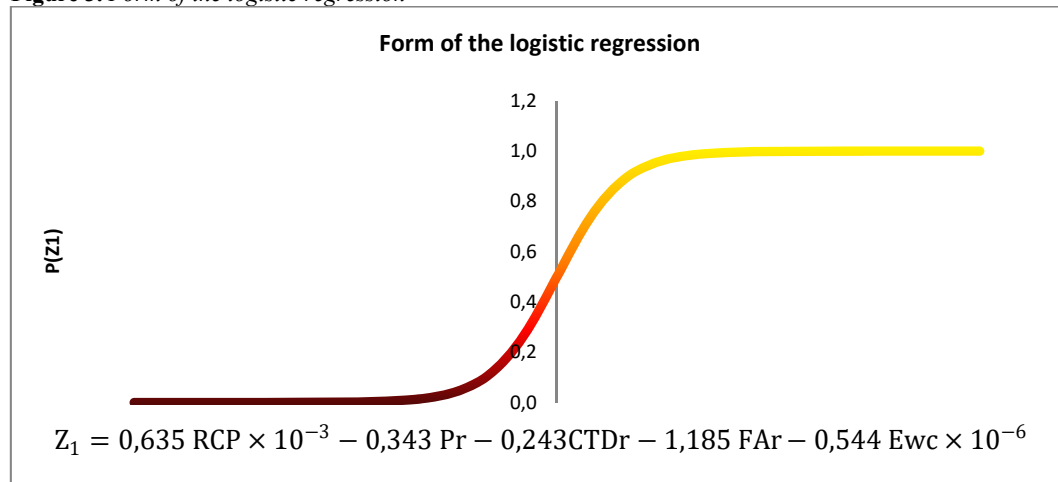
The profitability ratio, the cash to total debt ratio, the fixed assets ratio and the equity working capital are negatively correlated to the Z_1 score. Higher values of these ratios will influence the Z_1 score in a negative sense from the mathematical point of view, thus sustaining low levels of estimated probability of bankruptcy.

The Z_1 score has the following form:

$$Z_1 = 0,635 \text{ RCP} \times 10^{-3} - 0,343 \text{ Pr} - 0,243 \text{ CTDr} - 1,185 \text{ FAr} - 0,544 \text{ Ewc} \times 10^{-6}$$

The probability of bankruptcy can be estimated based on the following function:

$$P(\text{State} = 1 | Z_1) = \frac{1}{1 + e^{-(0,635 \text{ RCP} \times 10^{-3} - 0,343 \text{ Pr} - 0,243 \text{ CTDr} - 1,185 \text{ FAr} - 0,544 \text{ Ewc} \times 10^{-6})}}$$

Figure 3. *Form of the logistic regression*

Using 0.5 as cut-off value, the in-sample general accuracy (the general accuracy over the 2010 paired sample) is of 66.7%. Thus, by classifying as bankrupt all the companies for which the estimated probability of bankruptcy is higher than 0.5 (estimation generated through the use of the model), 267 of the 429 bankrupt companies are correctly evaluated. At the same time, by classifying as non-bankrupt all the companies for which the probability of bankruptcy was estimated at less than 0.5, the evaluation would be correct for 305 out of the 429 non-bankrupt companies from the 2010 paired sample.

An additional performance test was made through the area under the ROC Curve (AUC), which can take values between 0 and 1 (Skalska and Freylich, 2006). An AUC of 0.5 corresponds to a “by chance” classification accuracy, while an AUC of 1 corresponds to a perfect accuracy. The ROC Curve reflects graphically the relationship between the sensitivity and the specificity for all possible cut-off values (van Erkel and Pattynama, 1998). The area under the ROC Curve thus isolates the classification performance of the logit model with no connection to a specific cut-off value, which makes it one of the most viable solutions for measuring the classification performance of a model and for comparing models (Hanely and McNeil, 1982, Faragi and Reiser, 2002).

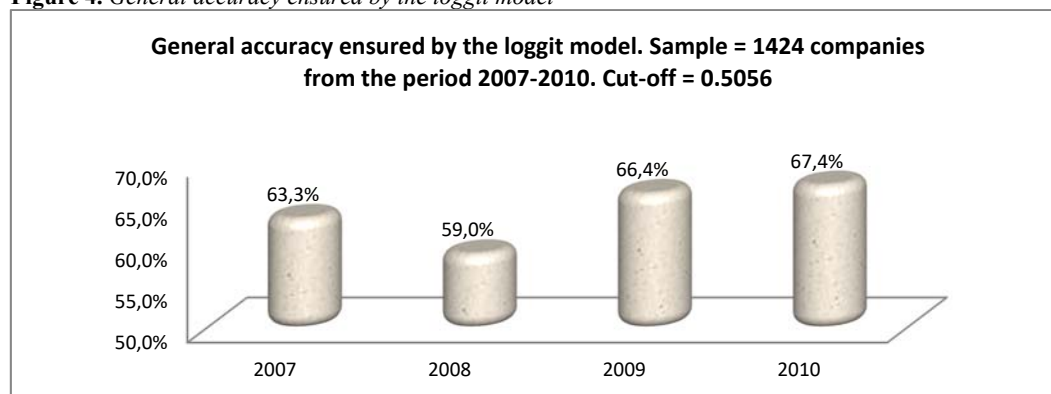
The area under the ROC Curve over the 2010 paired sample specific to the logit model was of 0.728, which can be evaluated as fair classification accuracy (Tazhibi and Bashardoost and Ahmadi, 2011).

The inspection of the ROC Curve coordinates revealed that the cut-off value that maximizes the in-sample general accuracy is of 0.5056 (which ensures a general accuracy over the 2010 paired sample of 67.4%).

The performance of the model in terms of general accuracy decreases over the period 2010-2007, as shown in Figure 4. The area under the ROC Curve also decreases over the period 2010-2007 (over the paired sample), from 0.728 in 2010 to 0.727 in 2009, 0.680 in 2008 and 0.616 in 2007. The area under the ROC Curve for the entire sample (the 1424 companies from the period 2007-2010) was of 0.714.

The general accuracy shown in Figure 4 was estimated based on the cut-off value of 0.5056 (which maximizes the general accuracy for the 2010 paired sample). The out-of-sample general accuracy (over the paired sample from the period 2007-2009) was of 63.6%.

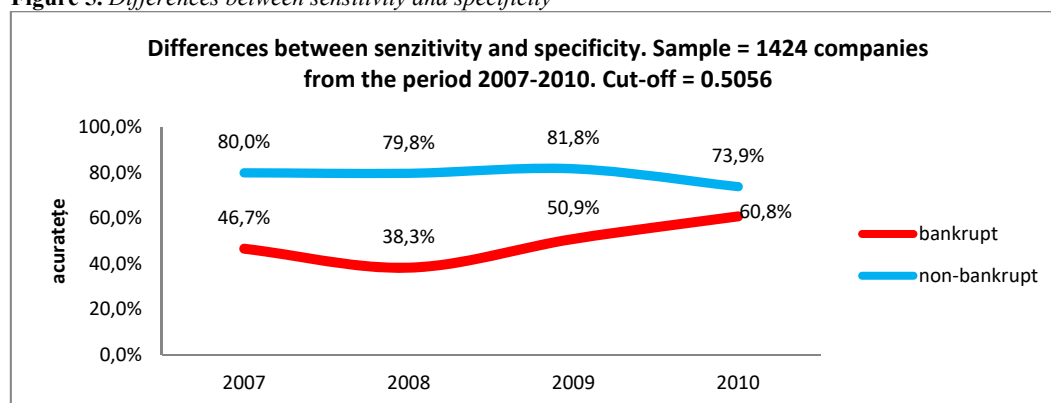
Figure 4. General accuracy ensured by the loggit model



The in-sample general accuracy of the multivariate logit model (as well as its out-of-sample general accuracy) overlaps the „by chance” general accuracy, as well as the in-sample accuracy of the best univariate model (63.1%).

Still, the multivariate model generates significant differences between sensitivity and specificity, as shown in Figure 5.

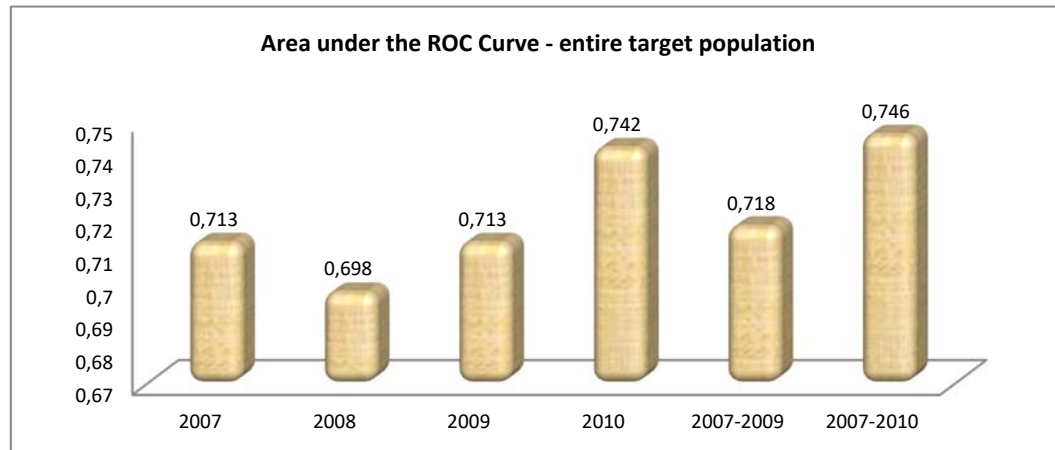
Figure 5. Differences between sensitivity and specificity



The area under the ROC Curve over the entire target population of 2010 (the population from which the development sample was extracted) was of 0.742, suggesting a fair classification performance.

The area under the ROC Curve over the entire target population of 2007-2009 was of 0.718.

As shown in Figure 6, the area under the ROC Curve over the entire target population of 2007-2010 was of 0.746.

Figure 6. *Area under the ROC Curve*

Although the general accuracy represents an easy to use criterion for evaluating the performance of a model, its relevance is diminished with the decrease of the frequency of the studied phenomenon (Metz, 1978). For any population with a low frequency of the studied phenomenon, the “by chance” general accuracy is high. For the target population of 2010, the bankruptcy frequency was of 2.85%. By simply classifying all the companies as non-bankrupt, the analyst would be accurate in 97.15% of the cases. Over such a population, the general accuracy of a model could be maximised by maximizing the specificity. Such an objective could be partially reached by simply increasing the cut-off value (which, for a logit model, would be limited between 0 and 1).

Using a high cut-off value, the analyst would reduce the sensitivity, but would increase the specificity. As the weight of the non-bankrupt companies is significantly higher, the general accuracy would increase (the specificity weights more than the sensitivity within the general accuracy). Most of the bankrupt companies would be wrongly classified (as non-bankrupt), but most of the non-bankrupt companies would be correctly classified. The analyst would thus reduce the false positive rate, but would accept an increase of the false negative rate.

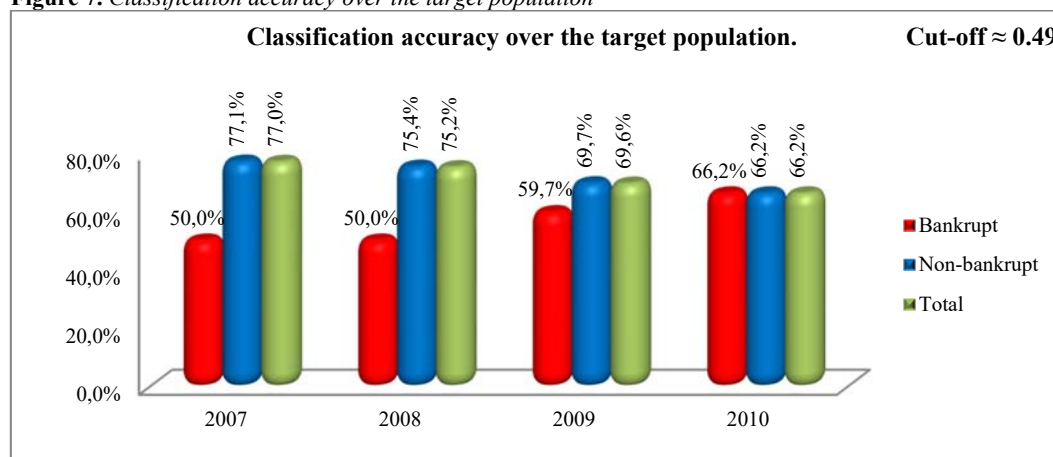
By simply using a cut-off value of 1, the analyst would classify as non-bankrupt all the companies with estimated probabilities of bankruptcy lower or equal to 1 (all the companies from the target population). Thus, no matter of the specific classification performance of the model (and no matter what model would be used), the general accuracy obtained over the 2010 target population would be of 97.15% (with 100% specificity and 0% sensitivity). The 97.15% general accuracy would present no relevance for the classification performance of the model. Instead, over populations with low frequencies of the bankruptcy cases, the classification performance of a model could be better measured through the general accuracy at the cut-off value that equalises the sensitivity and the specificity.

The cut-off value that equalises the sensitivity and the specificity for the entire 2010 target population is of approximately 0.49. By classifying all the companies from the

2010 target population that have an estimated probability of bankruptcy (based on the proposed model) of higher than 0.49 as bankrupt, the sensitivity would be equal to the specificity (66.2%).

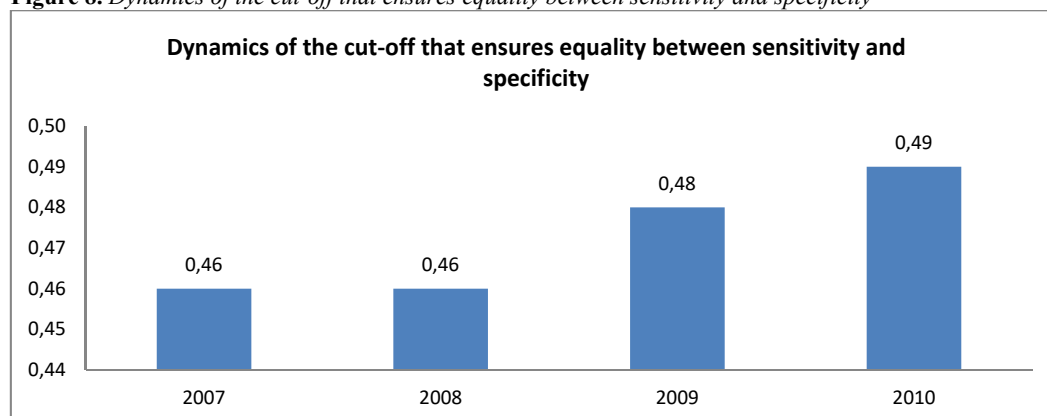
Figure 7 shows the classification performance of the model on the target population from the period 2007-2010 based on the cut-off value of 0.49 (the cut-off value that equalises the sensitivity and the specificity for the 2010 target population).

Figure 7. Classification accuracy over the target population



The cut-off that ensures equality between sensitivity and specificity varies between 0.46 and 0.49 for the 2007-2010 target population, as shown in Figure 8.

Figure 8. Dynamics of the cut-off that ensures equality between sensitivity and specificity



As the model cannot ensure a classification accuracy higher than the „by chance” accuracy (most models present in the international literature can't), the classification based on a singular cut-off is not considered a practical approach.

Instead, classifying the companies on risk classes based on the estimated probabilities of bankruptcy is considered more useful. In this sense, the companies from the target population of 2010 were grouped on ten intervals of the logit function, as shown in Table 3.

Table 3. Bankruptcy incidence over the target population of 2010 on intervals of the estimated probability of bankruptcy

No.	P (State = Bankrupt)	Risk index
1	$P(\text{State} = \text{Bankrupt}) < 0.1$	6%
2	$0.1 \leq P(\text{State} = \text{Bankrupt}) < 0.2$	0%
3	$0.2 \leq P(\text{State} = \text{Bankrupt}) < 0.3$	9%
4	$0.3 \leq P(\text{State} = \text{Bankrupt}) < 0.4$	54%
5	$0.4 \leq P(\text{State} = \text{Bankrupt}) < 0.5$	75%
6	$0.5 \leq P(\text{State} = \text{Bankrupt}) < 0.6$	140%
7	$0.6 \leq P(\text{State} = \text{Bankrupt}) < 0.7$	283%
8	$0.7 \leq P(\text{State} = \text{Bankrupt}) < 0.8$	546%
9	$0.8 \leq P(\text{State} = \text{Bankrupt}) < 0.9$	464%
10	$P(\text{State} = \text{Bankrupt}) \geq 0.9$	421%

For each interval of the estimated probability of bankruptcy (based on the proposed logit model), the risk index was calculated by dividing the actual bankruptcy frequency specific to the interval to the actual bankruptcy frequency specific to the entire target population of 2010.

Thus, a risk index higher than 100% shows an actual bankruptcy frequency higher than the average (2.85%), while a risk index lower than 100% shows an actual bankruptcy frequency lower than the average.

Based on the risk indexes shown in Table 3 for the 2010 target population, 3 risk classes are proposed, as shown in Table 4.

Table 4. Risk classes

No.	Estimated probability of bankruptcy	Risk index
1	High risk: $P(\text{State} = \text{Bankrupt}) \geq 0.5$	216.4%
2	Average risk: $0.3 \leq P(\text{State} = \text{Bankrupt}) < 0.5$	66.9%
3	Low risk: $P(\text{State} = \text{Bankrupt}) < 0.3$	7.1%

As shown in Table 4, the group of companies from the 2010 target population with estimated probabilities of bankruptcy higher or equal to 0.5 had an actual bankruptcy frequency 2.164 times higher than the average. At the same time, the group of companies from the 2010 target population with estimated probabilities of bankruptcy lower than 0.3 had an actual bankruptcy frequency of only 7.1% from the average.

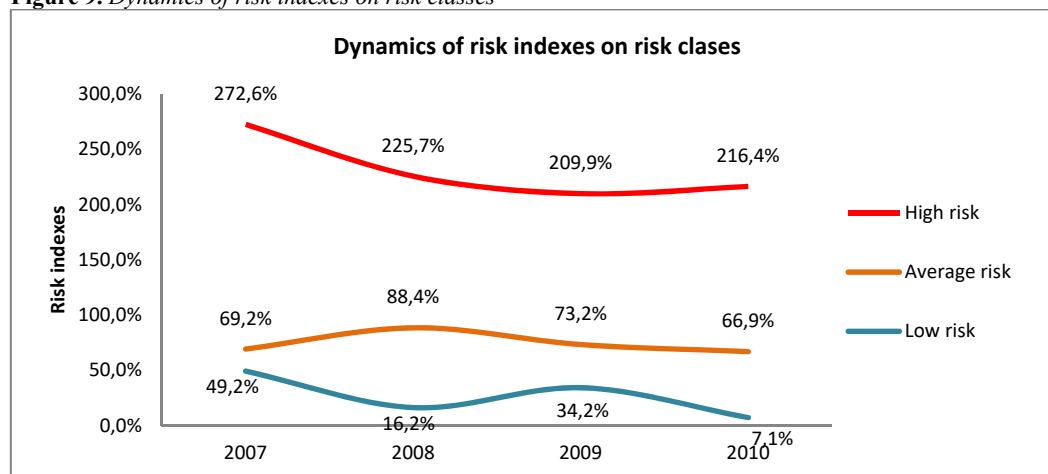
The risk indexes for the three proposed classes over the 2007-2009 target population are shown in Table 5 and Figure 9.

Table 5. Bankruptcy incidence over the target population of 2007-2009 on intervals of the estimated probability of bankruptcy

No.	P (State = Bankrupt)	2007	2008	2009	2010
1	$P(\text{State} = \text{Bankrupt}) < 0.1$	87%	0%	14%	6%
2	$0.1 \leq P(\text{State} = \text{Bankrupt}) < 0.2$	0%	0%	22%	0%
3	$0.2 \leq P(\text{State} = \text{Bankrupt}) < 0.3$	49%	25%	46%	9%
4	$0.3 \leq P(\text{State} = \text{Bankrupt}) < 0.4$	36%	79%	38%	54%
5	$0.4 \leq P(\text{State} = \text{Bankrupt}) < 0.5$	96%	96%	98%	75%
6	$0.5 \leq P(\text{State} = \text{Bankrupt}) < 0.6$	157%	195%	135%	140%
7	$0.6 \leq P(\text{State} = \text{Bankrupt}) < 0.7$	0%	190%	476%	283%
8	$0.7 \leq P(\text{State} = \text{Bankrupt}) < 0.8$	381%	226%	494%	546%
9	$0.8 \leq P(\text{State} = \text{Bankrupt}) < 0.9$	1132%	433%	356%	464%
10	$P(\text{State} = \text{Bankrupt}) \geq 0.9$	1529%	504%	213%	421%

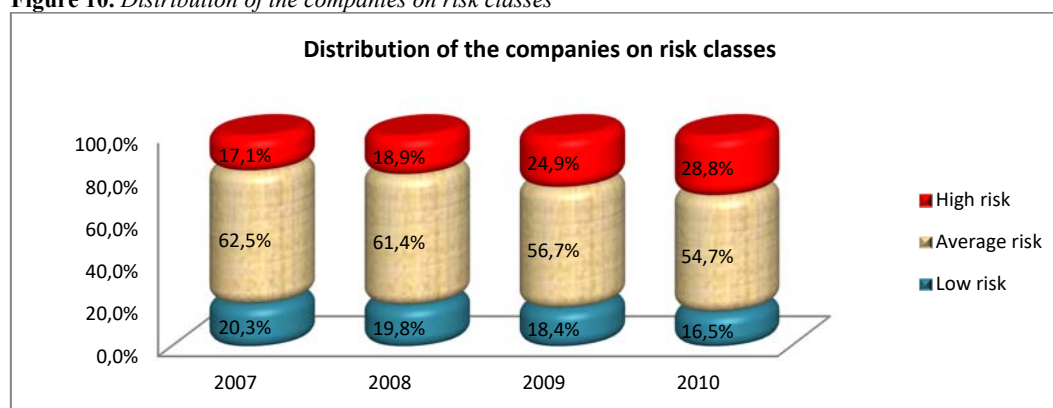
As shown in Figure 9, the risk indexes remain relatively stable over the period 2007-2010, with no intersections between the proposed risk classes.

Figure 9. Dynamics of risk indexes on risk classes



According to Figure 10, approximately 55-60% of the companies are positioned within the average risk class. Under these circumstances, a stakeholder could find it useful to treat with more caution the relationship with a company positioned in the high risk class, while developing on the other hand the relationships with the companies positioned in the low risk class.

Figure 10. Distribution of the companies on risk classes



Conclusions

Based on the results of the research, the analyst is recommended to classify the company under analysis in one of the following tree risk classes:

- high bankruptcy risk, for estimated bankruptcy probabilities of 0.5 or more;
- average bankruptcy risk, for estimated bankruptcy probabilities between 0.3 and 0.5;
- low bankruptcy risk, for estimated bankruptcy probabilities of less than 0.3.

The proposed methodology is easily accessible to all the stakeholders of the company, as it only employs publically available data that can be obtained freely online (from the website of the Romanian Ministry of Public Finance).

To evaluate the bankruptcy risk for a specific company, the analyst only has to retrieve the data, calculate the five ratios, calculate the Z1 score and estimate the probability of bankruptcy based on the logit function:

$$P(State = 1|Z_1) = \frac{1}{1 + e^{-(0,635 \text{ RCP} \times 10^{-3} - 0,343 \text{ Pr} - 0,243 \text{ CTD}r - 1,185 \text{ FAr} - 0,544 \text{ Ewc} \times 10^{-6})}}$$

The model will not allow the analyst to conclude with absolute certainty whether the analyzed company will go bankrupt or not within a 2 – year horizon. Instead, it will offer the possibility to differentiate the companies on risk classes, thus creating the basis for a differentiated behavior of the stakeholder toward those companies.

Based on the bankruptcy frequency of the last year included in the research, the information offered by the proposed methodology is the following:

- out of 1000 companies included in the low bankruptcy risk class, approximately 2 will go bankrupt within 2 years;
- out of 1000 companies included in the average bankruptcy risk class, approximately 19 will go bankrupt within 2 years;
- out of 1000 companies included in the high bankruptcy risk class, approximately 62 will go bankrupt within 2 years;
- with no consideration to output of the model, out of 1000 observed companies, approximately 29 will go bankrupt within 2 years.

The time horizon of 2 years between the date of the financial statements of reference and the date of the predicted state of the company was considered optimal, as 1 year would have been unpractical (the financial statements are only made public after the middle of the following year) and a longer period would have unjustifiably reduced the accuracy.

Although initial univariate studies conducted within the current research showed some predictive capacities for the ratios included in the final multivariate model as independent variables, attempts should not be made to relate directly the bankruptcy probability estimated through the multivariate model to each individual ratio. The purpose of such a multivariate model is specifically to respond to the lack of prediction capabilities of any single financial ratio.

While other studies (or common sense) could suggest positive correlations between the probability of bankruptcy and the Receivables collection period (through the negative impact on cash-flows), negative correlations between the probability of bankruptcy and the Equity working capital (through its contribution in financing the operating cycle), or between the probability of bankruptcy and the Profitability ratio (through its contribution to equity), the analyst should not attempt to explain a certain state of the company by decomposing the model on individual ratios calculated on past data. The model should therefore not be employed for explanatory purposes, but only for predictions.

The current research offers a solution specific for the Romanian companies, as the Romanian practice currently employs on a large scale methodologies developed over populations from overseas, from too distant past periods or simply over Romanian samples that lack representativeness.

The research should be continued with studies on the following directions:

- development of multivariate models based on the dynamics of the ratios;
- the correlation between the estimated probability of bankruptcy and the financial risk;
- the correlation between the estimated probability of bankruptcy and the return on equity;
- the applicability of the proposed methodology for companies from other regions.

The proposed methodology should be updated annually, to ensure a permanent adaptation to any modifications of the characteristics of the target population.

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The impact of financial risks on economic growth in EU-15

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Abstract. *This paper examines the impact of financial risks on economic growth in the first 15 Member States of the European Union, considering 1995-2014 period and aims to lay down a new explanatory model of economic growth, based mainly on the behavioral reactivity of the financial disruptions mentioned above. The model was estimated through the panel estimated generalized least squares method and included additional control variables in order to strengthen the research conducted. Our goal consists in the examination of the financial risks in the European Union and in the estimation of their impact on economic growth.*

Keywords: European Union, financial risks, economic growth, financial crisis, panel.

JEL Classification: C23, G01, G31, O47.

1. Introduction

The financial crisis was the biggest challenge for the global economy and European Union (EU), from the postwar period to the present. The economic slowdown was caused mainly by the disturbances manifested on the credit markets from the European Union and by the losses incurred by the systemically important credit institutions.

Thereby, the confidence in the financial system to meet payment obligations crashed and financial, economic and political risks stood on an upward trend and experienced a high volatility during this period. These kind of risks has distorted economic growth and drew the premises of building an economy of fear.

Financial risks arise from the likelihood of incurring financial costs as a result of the investments placed in companies which are in default on their financial obligations.

Subsequently, national governments have guaranteed for the banking sector debt through government bonds, in order to save the sector, because some credit institutions were too important to be left to fail. Thus, bank debt was converted into public debt and high levels of it has led to additional financial risks.

Our motivation in choosing this subject lies in the great importance of financial risks evolution, regarding the influence exerted by them on future economic cycles. The growth of financial risks reduce the investors confidence to place funds in certain economic activities and also, may impact the country rating in a negative sense.

The main goal of the paper is to analyse the impact of financial risks on economic growth in the first 15 member states of the European Union, taking into account the following specific objectives:

- performing the comparative analysis of financial risks at aggregate and granular level in the EU-15 (1995-2014 period);
- estimating the impact of financial risks on economic growth in the EU-15;
- identifying other relevant determinant factors for the endogenous variable and estimating their coefficients;
- testing the hypotheses of the model in order to confirm its validity.

In this paper, we chose to analyse the countries belonging to the EU-15 group, because in 1995 (starting point of the analysis), the EU included 15 Member States.

2. Literature review

The economic development and growth are the main goals that all countries should take into consideration in developing national strategies. The financial crisis started in 2007 in the United States and has affected EU countries in less than a year, 2008 and 2009 representing a difficult period when economies and finances of Member States were affected. After a slight improvement in 2010, the pessimistic scenarios of economists regarding the persistence of the recession have become true. Blyth (2013) noted that recent developments in the sovereign debt crisis is a result of the financial crisis, as

governments have intervened to save the banking sectors and, therefore the financial crisis has turned into a debt crisis. All of this led to an increase in financial risks that have affected economic growth. The growth of disturbances mentioned-above grew the financial system vulnerability and the whole system became prone to shocks.

Dinu (2011) asserted that the signalised trends do not coincide with those existing on the market, this condition being caused by the estimation of neglected, erroneous and falsified signals by the economists community as a result of too objective and mechanical thinking in testing economic hypotheses.

The PRS Group computes the financial risk, placing the indicator values on a scalar field, following the aggregation of its subcomponents, which are represented by the following risks: current account, external debt, external debt service, exchange rate stability and international liquidity. Next, we specified a number of authors who have analysed the impact of financial risk subcomponents on economic growth, respectively their evolution in the European Union.

Regarding the evolution of the current account, Jaumotte and Sodsriwiboon (2010) analysed the current account imbalances in the southern Eurozone sub-model and identified monetary integration (process which has greatly increased access to foreign savings) as the main cause of current account balances reduction. Holinski et al. (2012) demonstrated that a large share of the current account surplus registered in the northern sub-model of euro zone is due to fiscal consolidation, savings, relatively stable private investments, competitiveness and higher revenues recorded abroad. At the opposite, southern sub-model has experienced a reduction in private savings since 1992, which led to loan growth and trade balance deficits. The authors believe that excessive risk-taking by the banking sector and the procyclicality of the common monetary policy in the euro area are possible determinants of the current account imbalances, ex-ante crisis. Socol (2011) demonstrated that the current account deficit occurs due to lower domestic production and budget deficits, considering the fact that, if a country goes into recession, it will require additional budget expenditures. However, in that country, the price level will decrease due to the aggregate demand reduction. Nevertheless, the decrease level depends on the elasticity of the aggregate supply curve. On the other hand, a current account surplus implies an increase in production and exports, resulting in a budget surplus caused by the production growth. Smith and Lazarus (2015) identified a positive impact of higher current account balance on economic growth in advanced countries in the European Union.

Pattillo et al. (2011) analysed the relationship between external debt and economic growth in 93 emerging countries and identified a negative impact of debt on gross domestic product (GDP) growth in countries with an average level of the endogenous. According to their research, the debt doubling from the countries with an average foreign debt reduce economic growth by one third or a quarter of the previously increase. The authors identified a negative impact of external debt on growth, in the case of debt level exceeding the 160-170% threshold of total exports of goods and services or 35-40% of

GDP. The rising of external debt diminish the investors' expectations regarding their financial investments yields, anticipating a tax rates increment. This instability, finally, has the ability to blur technological progress and the efficient allocation of resources. Also, a high level of external debt diminishes the ability of states with low income to provide social services such as health and education. Randveer et al. (2011) analysed the effects of private debt on economic growth in 31 OECD countries and 20 emerging countries. The authors found a high correlation between the high levels of debt (before entering into a recessionary phase) and low growth rates, ex-post recession. Regarding public debt, Reinhart et al. (2010) found that a high proportion of public debt to GDP leads to a decline in economic growth. On the other hand, Dreger and Reimers (2013) showed that the negative impact of public debt increase (expressed as a percentage of GDP) on growth is specific to the euro area and to the periods when there are recorded unsustainable debt levels. Egert (2015) identified a negative nonlinear relationship between the government debt and economic growth, which is influenced by the analysed sample, data frequency, as well as, by the method applied.

Clements et al. (2003) analysed the impact of external debt service on growth in low-income countries and discovered that the exogenous variable decrease affects indirectly (through its impact on public investments) and negatively the economic growth. The negative effect of higher external debt service on growth was also confirmed by Kohlscheen (2008). Gohar et al. (2009) investigated the impact of external debt service on growth in low-income countries, using the panel method and obtained a negative and significant coefficient of the estimator. Also, Shabbir (2013) examined the influence of the increase of the external debt service on the growth rate of gross national income and concluded that the impact is negative. Mihuț and Călea (2015) proved that in the EU there is a negative relationship between external debt and economic growth. The growth of the interest expenses increase the budget deficit, this having the ability to have adverse consequences on growth. At the same time, a high level of payments of principal repayments, interest and commissions are a source of concern for investors and an increase in these indicators may reduce the economic sentiment.

Regarding the relationship between exchange rate stability and growth, finding a direct connection is a challenge. Grauwe and Schnabl (2004) demonstrated that the fixed exchange rate regime stimulates international trade and division of labour, which leads to interest rate decrease, thereby stimulating investment and economic growth. On the other hand, Huang and Malhotra (2005) found that the choice of exchange rate regime does not have a significant impact on economic growth in European countries, but the adoption of a flexible exchange rate regime has the ability to influence the level of economic growth. Other authors have argued the importance of exchange rate stability to maintain a steady pace of growth. Broda and Romalis (2011) highlighted that exchange rate volatility reduce the differentiated goods trade. Also, Rapetti (2013) demonstrated that a high fluctuation of the real exchange rate (measured generally by the standard deviation of the variation coefficient of the real exchange rate) affects economic growth, adversely.

Polterovich and Popov (2002), Cruz and Kriesler (2008) and Levy-Yeyati and Sturzenegger (2009) identified a positive impact of international reserves on growth.

International liquidity becomes an element of utmost importance during periods when economic growth adopted measures are not feasible by political or any other reasons. For example, a country politically unstable, with a precarious social welfare, can have an effective economic development through the accumulation of foreign reserves by the central bank. Bussière et al. (2014) analysed the usefulness of official international reserves, stating that the countries who have held a high share of reserves in the short-term debt had a great resilience to the financial crisis shock. Krushkova and Maric (2015) confirmed the positive effect on growth, as a consequence of international reserves accumulation, using a panel data model for countries such as Brazil, China and Russia during 1993-2012 period. Also, Cheng (2015) found a high correlation between international official reserve increase and economic growth in emerging countries.

3. Methodology

This section describes the methodology and techniques applied in order to perform the empirical analysis. Combining qualitative and quantitative approach, using the deductive method in both cases was essential to provide an additional level of robustness to our assessment.

Investigating the impact of financial risks on economic growth in the EU-15 requires, in a first phase, analysing the regressors evolution at granular level. In this regard, we extracted the indicators related to financial risks, as well as its sub-indicators from PRS Group platform for the first 15 EU Member States, the series of data covering the 1995-2014 period. Given that the frequency of the data is monthly and our study is based on annual data, we computed the annual average for each indicator. The PRS Group scales the financial risk indicators within the following ranges:

- financial risk (0-50, 50 being the lowest risk);
- risk for current account as a share of total exports of goods and services (0-15, 15 being the lowest risk);
- risk for debt service (0-10, 10 being the lowest risk);
- risk for exchange rate stability (0-10, 10 being the lowest risk);
- risk for external debt (0-10, 10 being the lowest risk);
- risk for international liquidity (0-5, 5 being the lowest risk).

Our research involved performing the risk analysis on two sub-periods through the use of comparative analysis as a research method, the sub-periods being separated, according to the moment when we found a change of trend, one of them including the financial crisis. We also calculated the standard deviation of the risks, this having the role to be a proxy for the financial risks volatility (a high level of it highlighting the instability of the economy) manifested during the 1995-2014 period, using the formula:

$$SD = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}} \quad (1)$$

Regarding quantitative approach, using Eviews 9.0, we estimated the impact of financial risks (accompanied by other control variables) on growth in the EU-15 by panel

estimated generalized least squares fixed effect model (weighted by Cross-section SUR option), data being extracted with annual frequency for the 1995-2014 period from platforms such as: AMECO, Eurostat, PRS Group and World Bank (Annex 1). We used Cross-section SUR option in order to correct the possible inconveniences of the model, related to the presence of the heteroscedasticity and that of the autocorrelation between cross-sections. The observations (300 for 15 cross-sections and 285 observations after adjustments) included in the analysis increased the ability of the used method to give a greater efficiency of the following model:

$$y_t = \alpha_0 + \beta_0 y_{t-1} + \beta_1 imp_t + \beta_2 npt_t + \beta_3 budget_{t-1} + \beta_4 intrate_{t-1} + \beta_4 inflation_{t-1} + \beta_5 finrisk_{t-1} + \beta_6 yrisk_{t-1} + \varepsilon_t \quad (2)$$

where:

y_t , y_{t-1} , imp_t , respectively npt_t surprise the evolution of the economic growth and its autoregressive term, as well as that of the imports and net taxes applied to products, while $budget_{t-1}$, $intrate_{t-1}$, $inflation_{t-1}$, $finrisk_{t-1}$ and $yrisk_{t-1}$ represents the budgetary balance, the real long-term interest rate, inflation rate and the financial risks related to economic growth, all of these being lagged by 1 year, according to the economic theory.

In order to confirm the methodology used, we tested the stationarity for each variable through the test „Summary” which aggregates the results of the following tests: Levin, Lin and Chu, Breitung, Im, Pesaran and Shin, the ADF Fisher, respectively PP-Fisher. In exceptional cases, we used the statistical correlogram for identifying the presence or absence of trend, a situation that helped us establishing the initial condition of the following hypotheses: the presence of trend and constant, the presence of constant and the absence of trend and constant.

In some cases, the panel technique eliminates the problems related to the non-stationary character of the variables, but it brings new challenges for the heterogeneity of the data set. For this purpose, we used both Hausman and Redundant fixed effects – likelihood ratio tests, in order to choose the optimal effects estimation method between the random effects and the fixed effects methods. After the selection of the most appropriate method for estimating the coefficients, we checked the model validation hypotheses using the following tests:

- verifying the validity of the model (F-statistic);
- testing the residuals distribution (Jarque-Berra);
- examination of the residuals autocorrelation and cross-section dependence (Durbin Watson, Breusch-Pagan and Pesaran CD);
- testing homoscedasticity (White test) – we compared the product of the coefficient of determination and the number of observations with Chi-square statistic; if Chi-square has a higher value than the product, it can be confirmed the homoscedasticity hypothesis of the model;
- checking for multicollinearity (Klein's criterion) – Klein's criterion involves comparing the statistical correlation Pearson between the exogenous variables with the coefficient of determination. If the statistical correlation between two exogenous variables is

greater than the coefficient of determination, then the presence of the multicollinearity can be accepted. Otherwise, multicollinearity absence is confirmed.

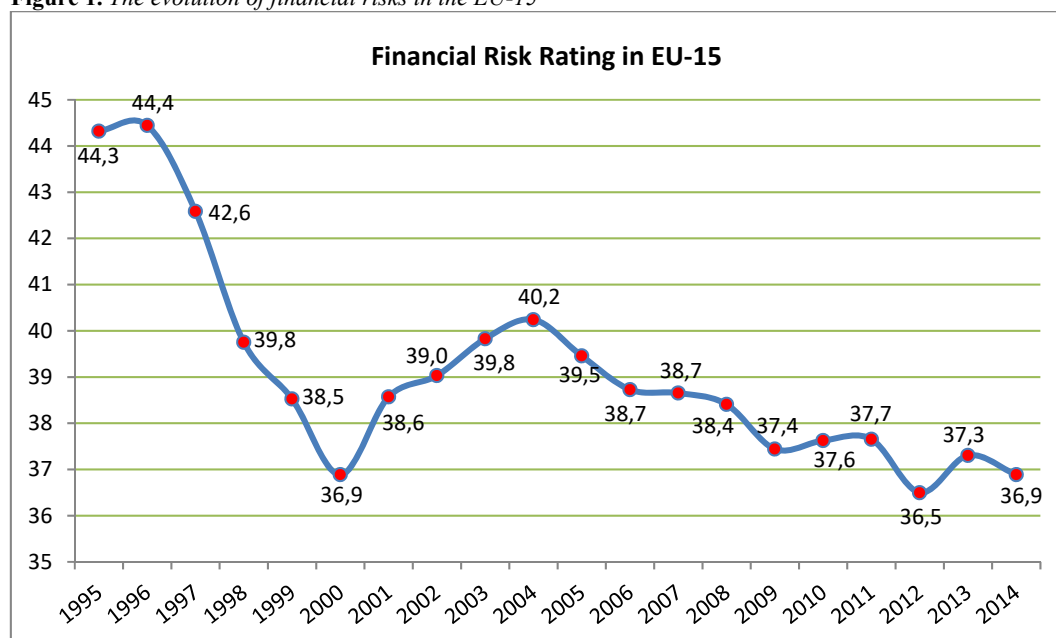
4. Results and interpretations

Depending on the methodology assumed, in the first phase, we analysed the evolution of the financial risks in EU-15 at aggregate and granular level.

According to the statistics published by the PRS Group, the lowest financial risks were manifested in 1996 (Figure 1), while in 2012 it was recorded the peak of the financial risks, a situation influenced mainly by the unfavorable evolution of the risks for external debt and international liquidity. The minimum point of the risk was based, primarily on the favorable evolution of the current account as a percentage of total exports of goods and services. Also, in 2005, after a slight improvement of the financial risk until 2004, there was a change of trend, which made us to separate the analysis in two equally sized sub-periods (1995-2004 and 2005-2014). This change of trend was caused by the evolution of the risk for foreign debt, a driver of the financial risk that felt an excessive increase from 2005 to the present.

First, our analysis consisted in the individual investigation of the EU-15 financial risks, as well as the analysis of its subcomponents, including the interpretation of the financial components evolution (Figure 2) and that of the risks recorded in the first and second period (Figure 3).

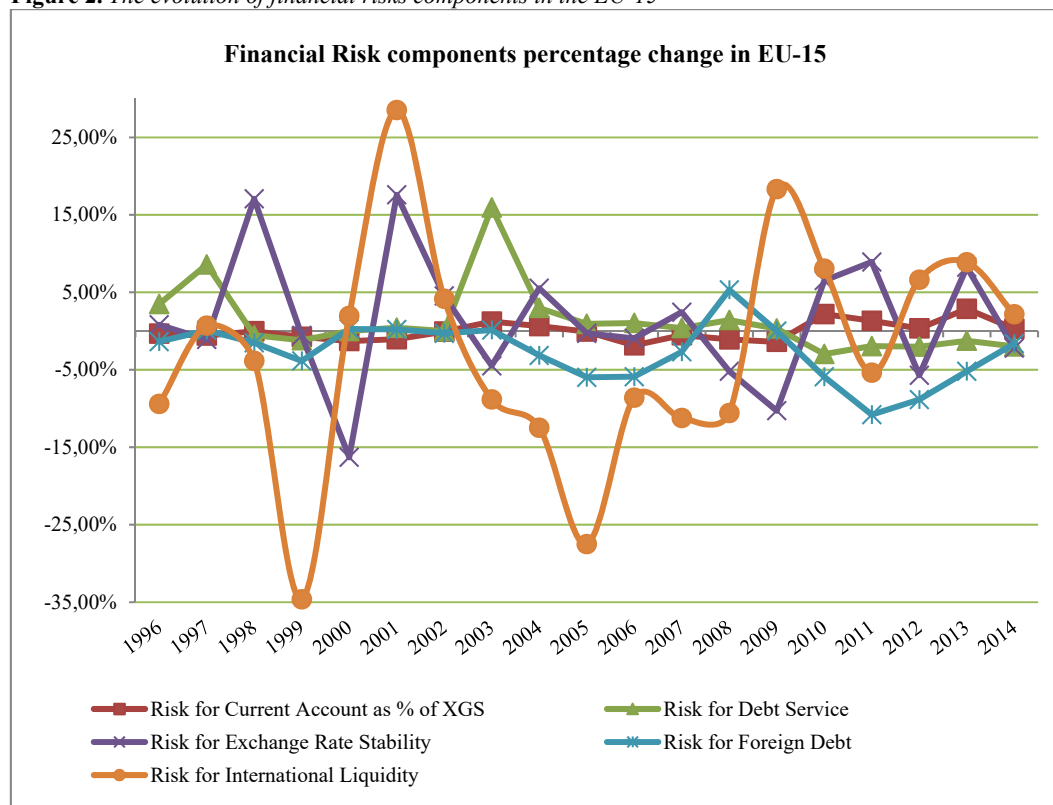
Figure 1. *The evolution of financial risks in the EU-15*



Source: Own calculations using PRS Group database.

The financial risk. We found that the highest growth of financial risks (compared to the value recorded in the previous year) occurred in 1998 (6.65%), while in 2013 it was recorded the largest decrease of the financial risks, post-crisis (2.21%), being preceded in 2012, as a consequence of high risks for external debt, by the highest percentage change of the 2005-2014 period (+ 3.07%).

Figure 2. *The evolution of financial risks components in the EU-15*



Source: Own calculations using PRS Group database.

Moreover, the decrease of financial risks in 2001 with 4.56% (the largest fall of 1995-2014) annulled the financial risk increase (4.25%) manifested in 2000, a situation caused mainly by the high fluctuation of the exchange rate in 2000. The reason why the USD/EUR exchange rate volatility reached high levels in 2000 compared to 2001 consists in the world perception towards the euro. In 1999, the euro was introduced as a virtual currency, following to be inserted on market since 2002. In 2000, the euro depreciated with 12.97% in December against the USD, while the depreciation of the euro in 2001 occurred in a lower rhythm, the USD/EUR exchange rate rising from 1.066 in January to 1.121 in December (5,16% depreciation of the euro). The explanation of this divergent evolution from the point of view of exchange rate stability consists in the low level of the confidence in the currency, manifested in 2000 (before euro introduction as a currency on market), which led to a strong depreciation of the euro and to a perception improvement towards the currency, due to the appropriation of the euro introduction on market.

Although, some studies have analysed the impact of the referendum organized in Denmark for abolishing the opt-out clause (28 September 2000), the impact of this event on the depreciation of the euro was only temporary (2 months), the USD/EUR exchange rate rising from 1.147 in September 2000 to 1.168 in November 2000, following to decrease at the end of December to 1.115.

EU-15 felt an increase of financial risks with 6.31% in the period 2005-2014, compared to 1995-2004. In the first examined period, Greece, Portugal and Sweden had the highest level of financial risks, while Luxembourg, Austria and Denmark were at the opposite pole. In the second analysed period, Sweden and Denmark were placed better from the perspective of the indicator evolution, these countries representing the only states from EU-15 that have managed a decrease of financial risks during this period, compared to the 1995-2004 period (a decrease by 1.55 deviation points for Sweden, respectively 0.79 deviation points for Denmark), Spain taking the position of Sweden in the category of countries with excessive financial risks, alongside Greece and Portugal. On the other hand, the most performing countries in the second period were Denmark, Germany and Luxembourg. We notice that, in countries like Ireland, Austria and Spain, in the second period, it have been manifested the most significant increases of financial risks, compared to the previous period, the indicator level decreasing with 6.36, 5.57 and 4.80 deviation points.

Denmark and Sweden have managed to diverge from the financial risks growth trend of EU-15 through a better position of the current account in the second period, as well as, due to significant reductions of the risks related to external debt service, exchange rate stability and international liquidity. At the opposite pole, was situated Ireland, Austria and Spain, the increasing of financial risks being caused, largely, by the growth of external debt risk and the international liquidity risk in all three cases, and by the increase of the risks for current account and external debt service in the case of Ireland, respectively by the increase of the risk for current account in the case of Spain.

On the other hand, Luxembourg and Germany are among the most advanced 3 member states from EU-15, from the point of view of the level of financial risks recorded during the 2005-2014 period. Germany reduced its financial risks related to current account, debt service and exchange rate stability, while Luxembourg has oriented towards the decrease of the risks for external debt service and exchange rate stability. Greece and Portugal remained among the last countries in the EU-15 in the second analysed period, recording an increase of risks for current account, external debt and international liquidity. In this context, Greece and Portugal had a similar trend of financial risks modification in 2005-2014, compared to 1995-2004, with the one manifested in Germany, excepting the evolution of the risk for current account, this one having an unfavorable position in the two peripheral countries, respectively favorable in Germany. Therefore, we found that one of the main reasons that made the difference regarding financial risks recorded in EU-15 consisted in the evolution of the current account. Specifically, Portugal and Greece have become market outlets for Germany and favored the growth prospects of its

economy. According to Eurostat, in the 2005-2014 period (compared to the previous one), the exports from Germany to Greece increased by 37.91%, while the exports from Germany to Portugal grew by 27.09%, which supports our assumption.

The risk for current account (as a percentage of total exports of goods and services).

For the time period analysed, the minimum level of risk for current account was registered in 1995, while in 2009, starting with financial crisis, we found the highest risk for current account, year that recorded the highest percentage increase of the risk post-crisis (1.39%).

In 2006 took place the highest increase of the risk for current account (1.84%), that being influenced by the exports growth below potential of Euro Area-12 (EA-12 - 10.84%), that situation being caused by the delayed effect of the euro's appreciation which reduced the competitiveness of EA-12 exporters and, respectively, that of the euro zone imports growth above exports growth rate of EA-12, for the second successive year (12.12%). The highest decrease rate of the risk was recorded in 2013 (2.87%) and was influenced by the positively percentage change of the exports of the EU-15 (+1.07%) and by the percentage change of imports EU-15 (-0.26%).

The risk for current account from EU-15 recorded a growth of 1.66% in the 2005-2014 period, compared to the first analysed period and was based, mainly on the increase of the risks from Spain, France, Italy, Greece or Portugal. The balance has been equilibrated by the decrease of financial risks from Germany, Sweden, Austria, Denmark and Netherlands. The position of the member states can be explained, mainly by the evolution of the trade balance and competitiveness of national exporters.

At the EU-15 level, the most performing countries from the perspective of the risk for current account in the first period were Netherlands, France and Belgium, while Greece, Portugal and UK have registered the weakest positions of the indicator. As can be seen in Figure 3, in the second period, the upper trio has changed, following to be composed of Sweden, Germany and Luxembourg, while Spain took the place of UK into the lower trio.

The risk for external debt service (as a percentage of total exports of goods and services). Following the examination of the statistical data published by the PRS Group, we found that the minimum point of risk was recorded in 2009 and the maximum in 1995. Given that, the exports decreased in 2009 in EU-15, we can say that debt service coverage ratio fall was caused by the lower debt service, this representing a result of several reductions in interbank interest rate from Economic and Monetary Union (Euribor – 3 months) from 6.82% in 1995 to 1.22% in 2009. The interest rate to which banks borrow in euro on the interbank market recorded this decrease following the reduction of the ECB's monetary policy interest rate and the massive injection of liquidity. The current low risk for external debt service can be explained by low costs with rates, interest rates and commissions (components that can be covered easily from exports revenues), the low level of the risk indicating a high capacity for external debt payment in EU-15.

In 2003, we have witnessed the strongest risk reduction for external debt service in EU-15 (15.95% – caused by the decrease of Euribor – 3 months in 2003 with 2.07 percentage points compared to their level in 2000), while the highest increase was manifested in 2010 (2.96%), the risk analysed recording increases until 2014, this being influenced by the growth of costs with public debt.

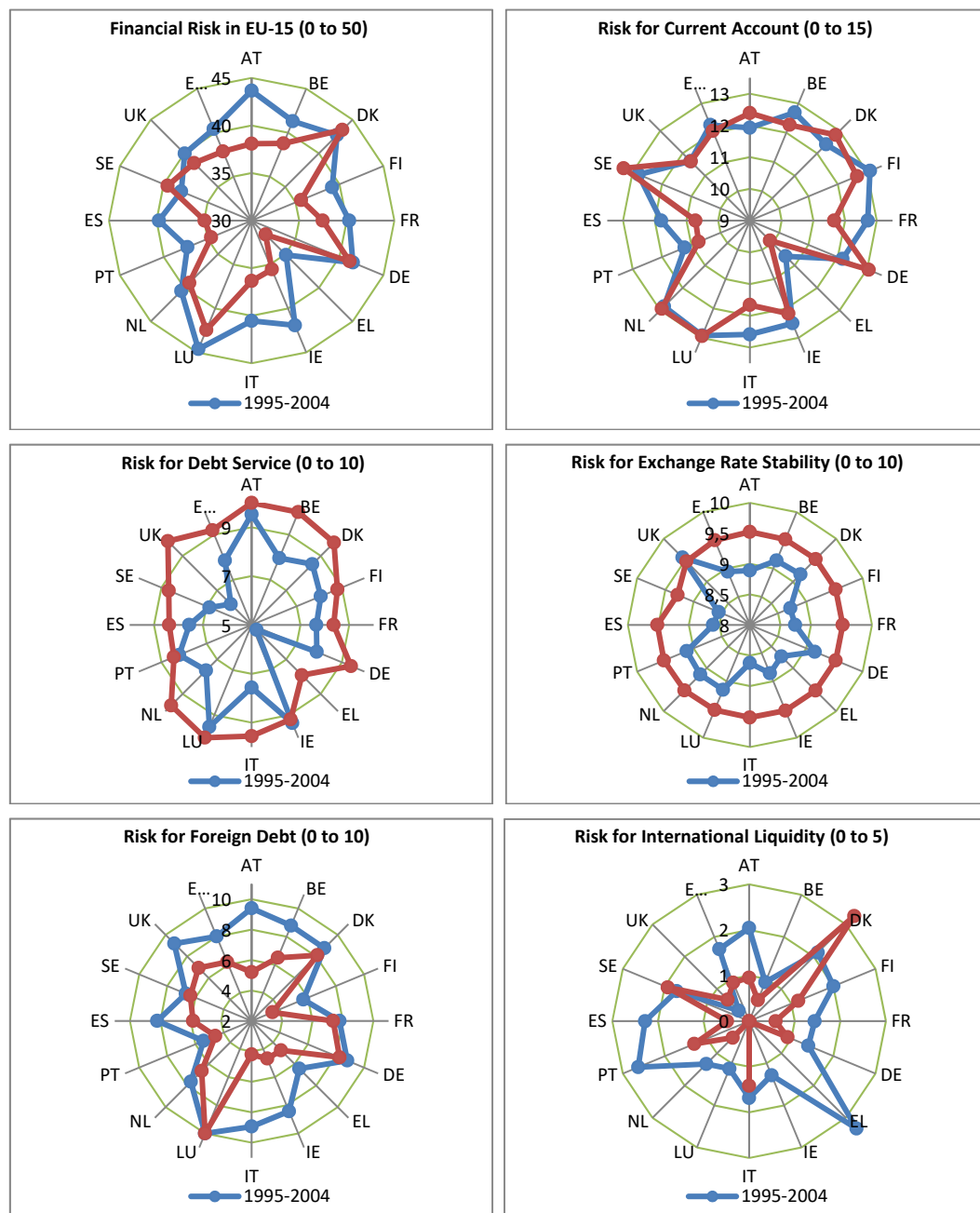
In the 2005-2014 period, the risk of external debt manifested in EU-15 decreased by 17.14%, compared to 1995-2004 and was influenced mainly, by the reduction of the interest rate on the interbank market and by liquidity injection.

The first period corresponds to a top 3, composed of Austria, Luxembourg and Ireland, from the point of view of efficient countries in the risk management for external debt service, while the lower ranking includes Greece, Sweden and UK. In the 2005-2014 period, Belgium took the place of Ireland in the upper ranking, while Sweden and UK have improved their position compared to other countries, their former positions in the ranking being taken by Spain and France.

The risk for exchange rate stability. In the examined period, the highest level of risk for stability exchange rate took place in 1997, while the minimum level of it was recorded in 2013.

The risk related to exchange rate stability in EU-15 felt a decrease of 6.21% (from 8.944 to 9.501) in the second period, compared to the previous one, this being influenced by the euro adoption in analysed countries, excepting Denmark, UK and Sweden. During the 1995-2004 years, the countries with the most powerful position were UK, Denmark, Germany, Luxembourg and Netherlands. Among the worst performing, we identified countries such as, Sweden, Spain and Italy. The high convergence level of the indicator in EU-15 during 2005-2014 period, excluding the states that have adopted the opt-out clause and Sweden, is explained by the fact that, in this period, the euro was used as a single European currency for the entire analysed period, while this argument only applies for three years from the previous period. At the same time, reducing the risk for exchange rate stability was caused by the application of the EMU principles, oriented to strengthen the euro stability.

The risk for external debt (as a percentage of GDP). We identified a maximum point of risk for foreign debt in 2014, while the lowest level of it has been recorded in 1995.

Figure 3. Financial risk components in EU-15 member states

Source: Own calculations using PRS Group database.

Thereby, external debt felt an ascending trend and represents one of the biggest problems in the European Union, its unfavorable evolution being mainly caused by the high levels of public debt. This indicator felt the highest growth in 2011 (10.79%), close to the

manifestation of the default risk in the euro area (2012), while the risk for external debt has been reduced the most in 2008 (5.33%).

The 2005-2014 period marks an increase of the risk for foreign debt with 22.70% in EU-15, this involution being caused, among other factors, by the high growth of the risk (expressed in deviation points) in Italy (4.74), Austria (4.20) and Ireland (3.75). In the first period, countries such as, Luxembourg, Austria and the UK performed, while the last three positions were held by Greece, Finland and Portugal. In the second period, Germany and Denmark took the place of Austria and UK in the upper ranking and, in terms of the lower ranking, Italy replaced Greece, the increase of the risk for external debt from Italy representing the highest growth from EU-15.

The risk for international liquidity (expressed as number of months of imports coverage). The evolution of the risks showed a minimum risk for international liquidity in 1995, covering the necessary imports for a period of about three months, while in 2008 has been recorded the maximum risk level, when official reserves had the capacity to sustain the imports for a period of about 20 days. In this year, the shock of the financial crisis and the inability of banks to grant new loans, in the absence of the recovery of those already made, led to the official reserves utilisation for improving the resilience of the financial system. In 1999, it has occurred the highest percentage increase in risk (34.62%) at the opposite pole being situated the decrease from 2001 (28.54%).

The risk for international liquidity has increased by 46.57% in 2005-2014 compared to 1995-2004, it relying on the increase of the risk (expressed in deviation points) from countries like Greece (3.31), Spain (1.80), respectively Portugal (1.33). Also, there were risk reductions, the most significant being found in Denmark (1.13), UK (0.34) and Sweden (0.21).

At EU-15 level, in the first period, the most performing countries in terms of risk management for international liquidity were UK, Belgium and Luxembourg, the poorly positioned countries being Greece, Portugal and Spain. In the second period, Denmark, Sweden and Italy have entered into the category of countries with low international liquidity risks, while at the opposite pole were countries such as Belgium, Ireland and Luxembourg.

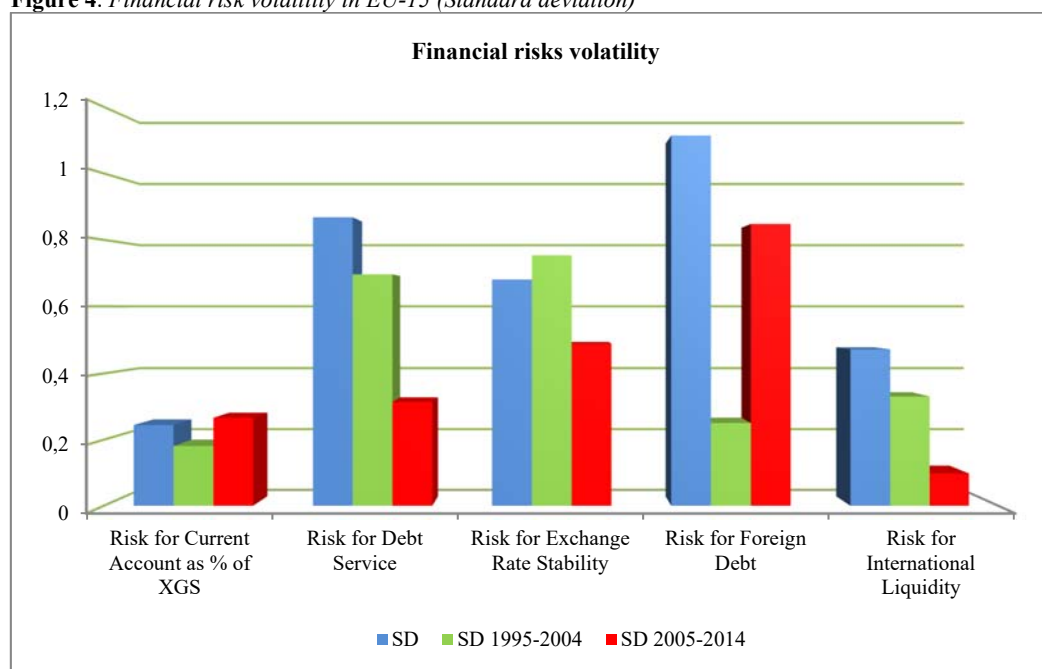
Financial risk volatility. In order to capture the volatility of the financial risks in the EU-15, we computed the standard deviation (Figure 4), identifying a level of financial volatility during 1995-2014 of 2.278 deviation points, with a maximum volatility of the risk for external debt for the entire analysed period of 1.114 deviation points, the larger contribution to it being held by the fluctuation of the risk for external debt manifested in 2005-2014 period (0.848 deviation points). Overall, the risk for current account (0.245) and for international liquidity (0.472) recorded the lowest fluctuations, while the risk for external debt service (0.868) and for exchange rate stability (0.681) ensured the balance between the maximum and the minimum deviation from the mean. Thereby, we found that the fluctuation of the risk for external debt had a high impact on the deviation from the mean of the financial risk indicator.

Model estimation. In the second phase of the research, we analysed the results of the estimated model, starting from the investigation of the data series characteristics.

Following the examination of the stationarity (Table 1), we found that all used tests confirm this hypothesis on the following variables: economic growth and net taxes on products, respectively economic growth, budget balance, real long-term interest rate, inflation rate, financial risk and risk for economic growth, the last ones being lagged by 1 year.

The only variable on which half of the tests argued the presence of a unit root and half confirmed its stationarity is the variable related to import (expressed as a percentage of GDP). In this regard, we processed correlogram to verify the autocorrelation function and we found the presence of the trend and constant, because for 12 lags considered, there is a trend of decline in function. Taking into account this feature, we confirmed the stationarity of the variable because, in that case, all tests confirmed the alternative hypothesis. Thereby, it can be stated that, the variables included in the model have been fluctuating around average, which confirms the previously assumed method (least squares).

Figure 4. Financial risk volatility in EU-15 (Standard deviation)



Source: Own calculations using PRS Group database.

Table 1. Stationarity of the variables at first order of integration - $I(0)$

Variable	Levin, Lin and Chu			Breitung	Im, Pesaran and Shin		ADF-Fisher			PP-Fisher		
	*	**	***		*	**	*	**	***	*	**	***
y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
y(-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
imp	0.00	0.01	1.00	0.00	0.00	0.68	0.00	0.61	1.00	0.01	0.80	1.00
npt	0.02	0.00	0.83	0.00	0.00	0.00	0.00	0.00	1.00	0.03	0.00	1.00
budget(-1)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
intrate(-1)	0.00	0.00	0.00	0.39	0.00	0.07	0.00	0.03	0.00	0.00	0.06	0.00
inflation(-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
finrisk(-1)	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.73	0.06	0.00
yrisk(-1)	0.00	0.00	0.02	0.28	0.00	0.04	0.00	0.03	0.81	0.00	0.02	0.94

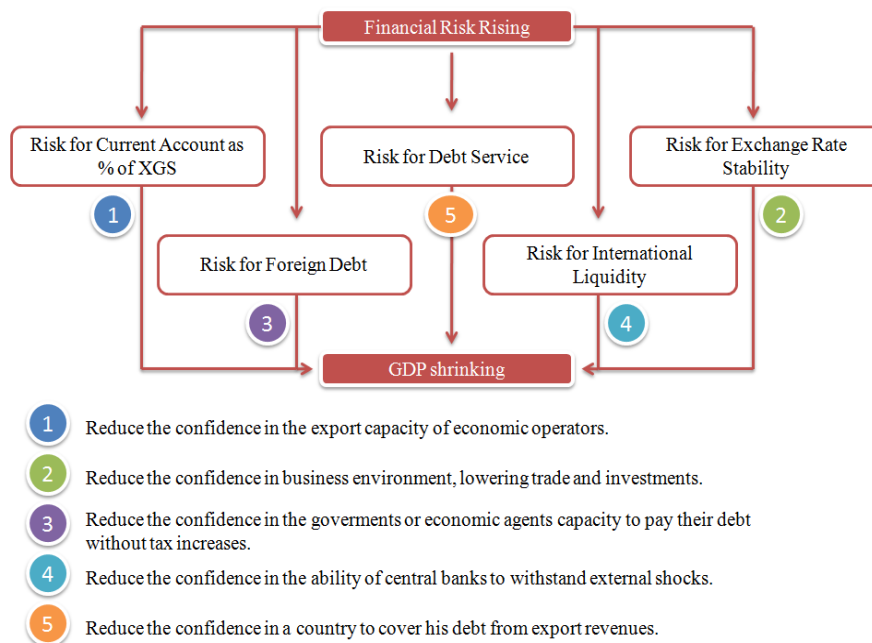
*trend and constant; ** constant; *** absence of trend and constant.

Source: Own calculations using Eviews 9.0.

Prior to estimate the model, we had to test its compatibility with random effects or fixed effects method by performing the Hausman test (Correlated Random Effects) and the Redundant Fixed Effects – Likelihood Ratio test. Given that the probability associated with the test Hausman (0%) is less than 5%, we rejected the null hypothesis which assumes that the model is compatible with the random effects method and accepted the alternative one, that indicates the use of the fixed effects method, as being more appropriate. For the avoidance of doubt on the correct selection of the estimation method, we ran the Redundant Fixed Effects – Likelihood Ratio test, its null hypothesis consisting in the rejection of the compatibility with the fixed effects method. Given that the probability of the test (0%) is less than 5%, we rejected the null hypothesis and accepted the alternative one, confirming that the model is compatible with the fixed effects method.

Further, we estimated the regression using the fixed effects method and analysed the obtained results (Annex 2). The coefficient of determination (R-squared) shows that the used exogenous variables explain 90.15% of the endogenous variable fluctuation, which indicates that we used a correct selection of the explanatory factors. The probabilities associated with the explanatory variables prove that, for each estimator, the probability of the coefficients to be insignificant is less than 1%. Regarding the coefficients examination, we analysed the estimated impacts respecting the „ceteris paribus” condition.

The results of the estimated regression prove the negative impact of financial risks on economic growth from the next year, an increase (decrease) by 1 deviation point of the indicator, which implies a decrease (increase) of financial risks – considering the inverse scaling of the indicator –, leading to an modification of GDP growth rate of +0.192 (-0.192) percentage points. The negative impact of the increase of the financial risks on economic growth in the EU-15 was caused by the manifestation of the risks of its components, as well as by the new feelings of fear and panic, recorded by the economic agents as a result of financial disturbances experienced during the crisis. For a better understanding of the impact of these 5 types of financial risks on economic growth, we explained their effects in Figure 5.

Figure 5. *Financial risks effects on economic growth*

Source: Own calculations using Microsoft Office PowerPoint 2007.

According to the results attached in the Annex 2, an increase of the economic growth rate in the previous year by one percentage point lead to a change in current economic growth with 0.536 percentage point, that being caused by the manifestation of the optimism and by the presence of an great expectations behaviour from the economic operators. The model estimated a negative impact of 0.027 percentage points of an increase in imports by 1 percentage point (expressed as a percentage of GDP), on the economic growth and a positive effect on the percentage change in real GDP of 0.166 percentage points, due to the increase of the net taxes on products by one percentage point of GDP. These two reactions has derived from the formulas related to GDP calculation methods (expenditures approach and production approach).

The increase (decrease) of budget balance (expressed as a percentage of GDP) by 1 percentage point from the previous year has a positive (negative) impact of 0.095 percentage points on the economic growth rate in EU-15, that being influenced mainly by the orientation of the Member States to counter-cyclical economic policies adoption and by the impact of rising budget deficit on the public debt growth, also affecting interest rate and investment. However, 1 percentage point change of the variable related to real long-term interest rate lagged by one year, resulted in a rate of economic growth, lower by 0.207 percentage points. On the other hand, the reaction of economic growth as a result of a 1 percentage point change in consumer price index from the previous year, was negative (-0.896 percentage points), as a consequence of its impact on reducing consumption. A last control variable analysed consists in the risk for economic growth from the previous year. We found that an increase (decrease) in its evolution by 1

deviation points, which implies a decrease (increase) of the risk, lead to a reduction (increase) of economic growth in the current year with 0.337 percentage points. This reaction is influenced by the tendency of governments to accumulate buffers in times with low risks and to release them in periods where there is manifested an intensification of them. If all variables remain constant, economic growth changes by 2,255 percentage points, indicating that there are still other variables not included in the model, which may impact the level of GDP.

Regarding the confirmation of the model validity, we used F-stat test, whose value confirms this hypothesis (109.094) since it is greater than F-critical (1.661) and its likelihood (0%) is lower than the significance threshold of 5%.

Next, we checked the assumptions required for the model validation, test results used for this purpose, being attached in Table 2. Jarque-Berra test confirmed the absence of arguments to reject the assumption that the residuals are normally distributed, taking into consideration the fact that the associated probability (7.8%) is greater than 5%, while the Durbin-Watson test (2.094) is not conclusive to confirm or to reject the autocorrelation of the residuals, since DW value is greater than 4-DU and less than 4-DL. Despite the fact that, the Durbin-Watson test recommended accepting the hypothesis that autocorrelation is negative, in order to provide an exhaustive analysis of the autocorrelation phenomenon, we further analysed the corresponding probabilities of Breusch-Pagan LM (100%) and Pesaran CD (83.6%) tests, which confirmed the absence of cross-section dependence, given that their likelihood is higher than the threshold of 5%. Regarding homoscedasticity, we attached the explanations box from Table 2.

An other hypothesis to be confirmed for validating the results of the model consists in the absence of the multicollinearity. In order to test the presence of multicollinearity, we used the Klein's criterion (1962), a method which supports the presence of the multicollinearity hypothesis only if the correlations between the regressors are greater than the coefficient of determination. Table 3 proves the absence of the multicollinearity, since no correlation between regressors does not exceed 90%.

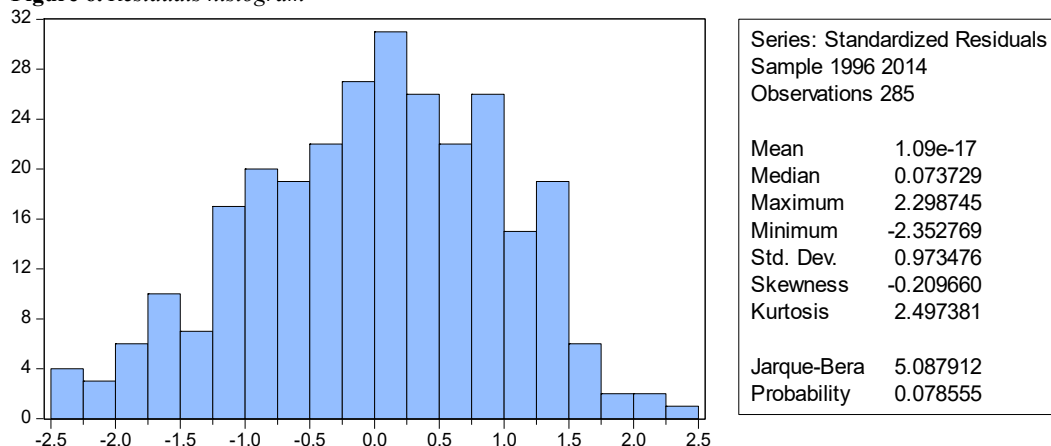
Taking into consideration the hypotheses tested, we can assume that our analysis is valid and meets all the required criteria for a correct specified econometric model.

Table 2. *Checking the hypotheses for model validation*

Hypothesis tested	Test	Probability / Result	Hypothesis accepted
Compatibility with random effect model	Correlated Random Effects - Hausman Test	0.000	NO
Compatibility with fixed effect model	Redundant Fixed Effects - Likelihood Ratio	0.000	YES
Normal distribution of the residuals	Jarque-Berra	0.078	YES
Absence of residuals dependence**	Breusch-Pagan LM	1.000	YES
Absence of residuals dependence**	Pesaran CD	0.836	YES
Homoscedasticity***	White	256.950**	YES

*We attached the histogram in Figure 6; ** at cross-sections level; *** White test result is less than Chi-squared statistic for 266 degrees of freedom (305.041) -> n-k-1 (285 observations, 9 regressors and 9 dummy variables, included in fixed effect model), which led to the acceptance of homoscedasticity.

Source: Own calculations using Eviews 9.0.

Figure 6. *Residuals histogram*

Source: Own calculations using Eviews 9.0.

Table 3. *Checking for multicollinearity-Klein's criterion*

Correlation matrix	Y*	IMP	NPT	Budget*	Intrate*	Inflation*	Finrisk*	Yrisk*
Y*	1.00	0.17	-0.01	0.44	-0.25	0.20	0.31	0.68
IMP	0.17	1.00	-0.09	0.26	-0.19	-0.04	0.26	0.13
NPT	-0.01	-0.09	1.00	0.27	-0.09	-0.09	0.02	0.01
Budget*	0.44	0.26	0.27	1.00	-0.38	-0.03	0.32	0.63
Intrate*	-0.25	-0.19	-0.09	-0.38	1.00	-0.14	-0.06	-0.44
Inflation*	0.20	-0.04	-0.09	0.03	-0.15	1.00	-0.09	0.23
Finrisk*	0.31	0.26	0.02	0.32	-0.06	-0.09	1.00	0.17
Yrisk*	0.68	0.13	0.01	0.63	-0.44	0.23	0.17	1.00

R-squared = 0.90; *Variables lagged by 1-year.

Source: Own calculations using Eviews 9.0.

5. Conclusions

Our analysis shows that in the EU-15 were accumulated excessive financial risks in the 2005-2014 period, relying mainly on the increase of the risks for external debt, current account or international liquidity. The financial risk has reached the highest level in countries like Greece, Portugal and Spain and had severe adverse consequences on economic growth in those states. Surprisingly, the risk for external debt service has experienced a downward trend, which was caused by the lowering of the interbank interest rates.

The data source used reinforces the EU-15 dichotomy in winners and losers of the European project and demonstrates the existence of financial imbalances at European Union level, one of these consisting in the effect of increasing the export share of Germany in Portugal and Greece on the growth of financial risks recorded as well as on economic growth.

The estimated model demonstrated a negative influence of an increase in EU-15 financial risks on economic growth, impact that can be transmitted through the effect of declining

the confidence in the country to face financial challenges and through the intrinsic effect. The coefficient is significant and the tests performed confirmed the validity of the model, which gives certainty to our model.

It is clear that the EU-15 is divergent, even in terms of accumulation of financial risks, the risk reduction in a country, offering the premises for an increase of risks in other countries, through commercial, financial and political channel.

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Annex 1. Structure of the model

Variable	Unit	Source
Endogenous		
Real Gross Domestic Product	Percentage change	Eurostat
Exogenous		
Imports	Percentage of GDP	Eurostat
Budget balance	Percentage of GDP	AMECO
Real long-term interest rate	Rate	AMECO
Inflation rate	Percentage change of consumer prices	World Bank
Net taxes on products	Percentage of GDP	Eurostat
Financial risk	Index (risk rating)	PRS Group
Risk for economic growth	Index (risk rating)	PRS Group

Source: Own calculations.

Annex 2. Model estimation

Dependent Variable: Y
Method: Panel EGLS (Cross-section SUR)
Sample (adjusted): 1996 2014
Periods included: 19
Cross-sections included: 15
Total panel (balanced) observations: 285
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	0.536103	0.024134	22.21362	0.0000
IMP	-0.026784	0.006572	-4.075655	0.0001
NPT	0.166397	0.053833	3.091008	0.0022
BUDGET(-1)	0.094992	0.011775	8.067331	0.0000
INTRATE(-1)	-0.207414	0.019183	-10.81225	0.0000
INFLATION(-1)	-0.895764	0.031996	-27.99620	0.0000
FINRISK(-1)	0.192455	0.011514	16.71498	0.0000
YRISK(-1)	-0.336776	0.026335	-12.78798	0.0000
C	-2.255361	0.790613	-2.852672	0.0047
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.901580	Mean dependent var	0.428365	
Adjusted R-squared	0.893316	S.D. dependent var	3.146942	
S.E. of regression	1.013523	Sum squared resid	269.1342	
F-statistic	109.0942	Durbin-Watson stat	2.094182	
Prob(F-statistic)	0.000000			

Source: Own calculations using Eviews 9.0.

Unemployment convergence analysis for Nordic countries: Evidence from linear and nonlinear unit root tests

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Abstract. *The purpose of this study is to analyze the unemployment convergence in the NORDIC countries. The linearity test developed by Harvey et al. (2008) was used, the Sollis (2009) nonlinear unit root test was used for the countries the nonlinearity of which have been identified and the Narayan and Popp (2010) test was used for the series the linearity of which have been identified. As a result of the analysis, it was found out that the unemployment rates in Finland, Norway and Sweden converged to the NORDIC mean whereas the unemployment rates in Denmark and Iceland did not converge to the NORDIC mean. Based on this result, it could be said for Denmark and Iceland that the shocks to unemployment rate differentials are persistent.*

Keywords: Convergence, Nonlinear Unit Root Test, Linear Unit Root Test, Linearity, Unemployment Rate.

JEL Classification: C22, J64.

1. Introduction

The concept of convergence has been one of the topics frequently discussed in the mainstream literature of economy since the end of 1980s. The discussion is around to what extent these existing differences of international societies, countries or regions with different distribution of natural resources and different income levels would continue. In other words, the topics on in which direction inequalities between economies would change constitute the basis of convergence discussions.

The validity of the contemporary economic growth models in the most general terms is tested against the concept of convergence; in other words, the differences between the characteristics of the Solow type of growth model and the endogenous growth models are made clear (Jones, 2002). The convergence hypothesis which assumes that the differences between per capita income levels in different countries or regions of similar type in terms of economic choices and technology will decrease in time is based on the neoclassic growth model of Solow (1956). According to this model, if the GDP levels of the countries or regions studied start to look similar in time, then it could be said that poor countries have the tendency to grow faster when compared with that of developed countries (Sala-i-Martin, 1996). So, it is observed that the per capita income and production levels of countries converge. According to Barro and Sala-i-Martin (1992), if economies are in a position lower than stationary levels, then their per capita parameters tend to grow faster and this indicates the existence of convergence (Barro and Sala-i-Martin, 1992).

The concept of convergence was first introduced by Baumol (1986) and was divided into two as beta (β) and sigma (σ) convergences. After Baumol's study, the studies of Barro and Sala-i-Martin (1991-1992) and Sala-i-Martin (1996) hold an important place in the literature of convergence and its types. In most general terms, the β convergence defines the negative relationship between the income level at the start and the income growth rate later (Paas et al., 2007). In other words, it is the type of convergence that designs the type of relationship in which poor countries show the tendency of growing faster than rich countries. The σ convergence introduced into literature based on the Galton's fallacy in the study by Quah (1993), on the other hand, is the type of convergence that shows the decrease of cross-sectional dispersion of per capita income or production level in time. In other words, if the speed of increase of per capita income in a given economy can be investigated and predicted that it would reach the mean of per capita income in general, then this means that it is about the β convergence. On the other hand, it is about the σ convergence if the study is about how the per capita national income distribution was in the past and how it will be in the future (Barro and Sala-i-Martin, 1991).

Although the literature has mainly focused on the β and σ types of convergence, the concept of convergence also involves other different types. These types could be classified as convergence within one economy and between economies, convergence in growth rate and income level, conditional and unconditional convergence, convergence of income and total factor efficiency, deterministic and stochastic convergence (Islam, 2003).

In convergence analysis, definitions based on horizontal section regression were replaced in time by linear and nonlinear time series methods and panel data analysis. This development in literature has brought with it the creation of a differentiation between deterministic and stochastic convergence. Quah (1993), Bernard and Durlauf (1991, 1995, 1996), Evans (1998), Binder and Pesaran (1999) were especially the ones who used the time series analyses in their studies shedding light on the concept of stochastic convergence. The nonlinear time series techniques were used in this study to investigate the presence of stochastic convergence in the unemployment levels in the NORDIC countries.

Stochastic convergence investigates, in essence, whether there is any relationship between the permanent movements in per capita production of a country with the permanent movements in production of another country (Bernard and Durlauf, 1991). The very first interpretation was developed by Carlino and Mills (1993) and was expressed as the logarithm of per capita income level in an economy in a stationary state with respect to the economy that it is compared with. Bernard and Durlauf (1995) developed an alternative interpretation in their study and came to the conclusion that two economies would converge if there is cointegration with the $[1 \ -1]$ vector (Fleissig and Strauss, 2001).

Stochastic convergence has been defined in two different ways by Bernard and Durlauf (1996). If it is expected to see a decrease as a value in per capita production levels in the given t period according to the first definition, then this means that the Countries i and j will converge between t and $t+T$ periods. When $y_{i,t}$ and $y_{j,t}$ symbolize the logarithm of per capita production levels of country i and country j and ξ_t symbolize that the existing information at time t . The stochastic convergence is expressed as follows,

$$E(y_{i,t+T} - y_{j,t+T} | \xi_t) < y_{i,t} - y_{j,t} \quad (1)$$

According to the second definition, the Economies i and j converge when the predictions with respect to the per capita production level logarithms for both countries are equal to each other in a given t time:

$$\lim_{k \rightarrow \infty} E(y_{i,t+k} - y_{j,t+k} | \xi_t) = 0 \quad (2)$$

Both definitions reflect the inferences of the neoclassic growth model from the perspective of empirical studies (Bernard and Durlauf, 1996).

Although the concept of convergence is addressed via income convergence due to its appearance, numerous studies have focused on the topic for different countries and regions taking into account different macroeconomic variables such as unemployment, labor efficiency and inflation.

There are studies in literature that investigated unemployment and especially labor efficiency convergences of different regions or country groups. The most important reason for doing so is the effort to try to understand existing economic inequalities between regions. As long as the inertia in regional unemployment differences could be understood, it could also be identified whether regional policies are effective or not.

Blanchard and Katz (1992) emphasized the importance of the convergence of regional unemployment rates in order to create a long term balance in labor market (Katrencik et al., 2008).

Although there are numerous empirical studies that analyze GDP convergence especially at the economic unions level, there are relatively less studies on unemployment convergence. The fact that there is no analysis testing unemployment convergence empirically in the NORDIC countries was the reason why this study was conducted. On the other hand, there is only a limited number of empirical analyses on unemployment convergence of different economic unions that the NORDIC countries are part of. Carrera and Rodríguez (2009) conducted a study on thirteen European countries covering the period between 1984 and 2005 and reached at the conclusion that their unemployment rates converged starting from 1993. In countries such as Belgium, Denmark, Germany, Luxembourg, the Netherlands, Portugal and Sweden where the unemployment rate was under the mean of Europe, an increase was seen in unemployment rates after this convergence in 1993 whereas the unemployment rates in Spain, Ireland and Finland where the unemployment rate was over the mean of Europe decreased after this convergence.

Rosiek and Włodarczyk (2012) investigated the β and σ convergences in the analysis that they carried out in order to test unemployment convergence between 1999-2009 in the EU-27 countries that also include Sweden, Denmark and Finland. As a result of the empirical analysis carried out, the existence of σ convergence was identified in unemployment rates between 1999-2007 and the results also show divergence in unemployment rates in the same regions between 2008 and 2009. On the other hand, from the perspective of the β convergence, they reached at the conclusion that there was a convergence from the regions where the unemployment rates were high towards the regions where the unemployment rates were low.

In their study on Finland, Koskela and Uusitalo (2003) reached at the conclusion that the unemployment rate which was 3% at the beginning of 1990s went up to 18% within four years and then converged to the European mean at 8,5% in 2002. Likewise, Holmlund (2003) investigated the unemployment rate for Sweden which went up quite rapidly at the beginning of 1990s and then followed a downward trend and converged to the European mean. These studies came to the conclusion that if structural problems are solved and if the labor market institutions start to enjoy a more flexible structure, then a faster decrease could be observed in unemployment rates.

The basic purpose of this study is to contribute to literature since there is no empirical analysis focusing specifically on the NORDIC region with respect to unemployment convergence and to identify the inequalities between unemployment rates in this region. It will be proposed to go for differentiation in the economic policies followed in the countries where convergence has not taken place.

The method frequently used to test empirically stochastic convergence is the use of unit root tests. The basic problem encountered in the studies based on unit root tests is choosing the right test. Different tests chosen produce different results and therefore the results obtained are different from each other.

First of all, a unit root test that is appropriate for the data structure will be chosen first in order to avoid any results with deviations. To achieve this, the nonlinearity test developed by Harvey et al. (2008) will be used to investigate whether the series are linear or not. The reason why this test is preferred is because its variables offer the basic advantage of not being influenced by the levels of stationarity.

The nonlinear unit root tests developed by Sollis (2009) will be used for the series identified to be nonlinear. The reason for preferring these tests is that the transition between regimes considered to be more appropriate for the economic structure is smooth and has a better power than previous tests. This test also allows for symmetric or asymmetric nonlinear adjustments. The unit root test with two structural breaks developed by Narayan and Popp (2010) will be used for the series the linearity of which have been identified. The main advantage of this test is that it allows for structural breaks within the scope of null hypothesis. Narayan and Popp (2013) compared the performances of unit root tests with structural breaks and proved that the Narayan and Popp (2010) test performs better than other tests with structural breaks. This is the reason why this test is preferred.

The second part of the study introduces the dataset methodology used in empirical application and the third part provides information about empirical results. Section 4 presents the summary and policy implications of the study.

2. Data and methodology

Monthly data of the January 2000 – March 2015 period are used in this study that investigates unemployment convergence in the NORDIC countries. The data used are taken from Eurostat.

Stochastic convergence was introduced by Carlino and Mills (1993) and Bernard and Durlauf (1995). According to Bernard and Durlauf (1995), if the logarithm of the analyzed variable y_{ijt} , follows a stationary process, then stochastic convergence occurs.

$$y_{ijt} = \log Y_{it} - \log Y_{jt} \quad (3)$$

where y_{ijt} is the analyzed variable, Y_{it} is the variable value for unit i at time t and Y_{jt} is the variable value for unit j at time t .

Carlino and Mills (1993) define deviation series as $Dy_{jt} = \bar{y}_t - y_{jt}$ where y_{jt} is the analyzed variable value for unit j at time t and $\bar{y}$ is the mean value of all units at time t . Rejection of the unit root hypothesis gives evidence of stochastic convergence.

In the light of this article, we used the data as follows:

$$y_{it} = \ln \left(\frac{x_{it}}{\bar{x}_t} \right) \quad (4)$$

where x_{it} is unemployment rate of country i , $\bar{x}_t$ is the mean unemployment rate of NORDIC countries.

Linear models have the advantage of being undoubtedly simple and intuitive. However, they also have several limitations, some of which can be overcome via nonlinear modeling. These limitations are as follows: linear models cannot allow for strong asymmetries in data, they are not suitable for data characterized by sudden and irregular jumps, they neglect nonlinear dependence, they are useful for prediction and they are not suitable for series which are not time reversible, respectively. In addition, a failure to recognize and deal with the presence of nonlinearity in the generating mechanism of a time series can often lead to poorly behaved parameter estimates and to models which miss important serial dependencies altogether (Bisaglia and Gerolimetto, 2014, p. 1). Therefore, linear and nonlinear structure should be investigated for the corresponding time series.

In theoretical and empirical econometric studies, investigating linearity is one of the crucial issues. McLeod-Li (1983), Keenan (1985), Tsay (1986) and Brock, Dechert and Scheinkman (1987) improved linearity tests in the past 30 years. The classic linearity tests are based upon the assumption that the variables are $I(0)$ or $I(1)$. In empirical study, this issue is especially problematic. Therefore, in a recent contribution, Harvey et al. (2008) propose a new linearity test which can be applied either to the $I(0)$ or $I(1)$ process. This study proposes a Wald test when the order of integration is unknown, which is a weighted mean of the Wald tests for the null of linearity when the variable is known to have a unit root and when it is known to be stationary (Cuestas, Gil-Alana and Taylor, 2012, p. 9).

The basic problem experienced in unit root tests is that the correct model specification cannot be determined. Enders and Granger (1998) demonstrate that the standard tests for unit root and cointegration all have lower power in the presence of misspecified model dynamics. Perron (1989) showed that when the existing structural break ignores the conventional unit root tests, it will be biased towards not rejecting a false null of a unit root. A similar phenomenon occurs in nonlinear models. If the data are nonlinear, then the linear unit root tests will face the problem of power. These test results will be the non-rejection of the null hypothesis and biased (Cuestas and Garratt, 2011).

The reason for preferring these tests is that the transition between regimes considered to be more appropriate for the proper economic structures is smooth and has a better power than previous tests.

Kapetanios et al. (2003) propose the implications of the presence of a particular kind of nonlinear dynamics for unit root testing procedures. In addition to this, they provide an alternative framework for a test of the null of a unit root process against an alternative of nonlinear exponential smooth transition autoregressive (ESTAR) process, which is globally stationary.

The KSS test is based on the assumption that the mean reversion is symmetrical at every point. This assumption means that negative and positive deviations have got the same effect. Sollis (2009) extended this assumption and developed a new test that allowed for symmetric or asymmetric nonlinear adjustments. In this test, the speed of mean reversion will be different depending on the sign of the shock, not only the size (Cuestas and

Ramlogan-Dobson 2013). The model to be used for the test based on the asymmetric ESTAR (AESTAR) model proposed by Sollis (2009) is as follows;

$$\Delta y_t = G(\gamma_1, y_{t-1})\{S_t(\gamma_2, y_{t-1})\rho_1 + (1 - S_t(\gamma_2, y_{t-1}))\rho_2\}y_{t-1} + \sum_{i=1}^k k_i \Delta y_{t-i} + \varepsilon_i \quad (5)$$

Here $G(\gamma_1, y_{t-1}) = 1 - \exp(-\gamma_1(y_{t-1}^2))$ with $\gamma_1 \geq 0$ and $S_t(\gamma_2, y_{t-1}) = \{1 + \exp(-\gamma_2 y_{t-1})\}^{-1}$ with $\gamma_2 \geq 0$. Just line in the KSS test, the Sollis (2009) model will look like as follows with the use of the Taylor approximations.

$$\Delta y_t = a(\rho_2^* - \rho_1^*)\gamma_1\gamma_2 y_{t-1}^4 + \rho_2^*\gamma_1 y_{t-1}^3 + \eta_i \quad (6)$$

Where ρ_1^* ve ρ_2^* are linear functions of ρ_1 and ρ_2 . Where $a = 1/4$, which can be written as:

$$\Delta y_t = \phi_1 y_{t-1}^3 + \phi_2 y_{t-1}^4 + \eta_i \quad (7)$$

Where $\phi_1 = \rho_2^*\gamma_1$ and $\phi_2 = a(\rho_2^* - \rho_1^*)\gamma_1\gamma_2$. An augmented version is

$$\Delta y_t = \phi_1 y_{t-1}^3 + \phi_2 y_{t-1}^4 + \sum_{i=1}^k k_i \Delta y_{t-i} + \eta_i \quad (8)$$

Where y_t , a similar KSS test, is raw, demeaned or detrended data. The null hypothesis of nonstationarity is $H_0: \phi_1 = \phi_2 = 0$. Sollis (2009) derives the asymptotic distribution of an F test of $H_0: \phi_1 = \phi_2 = 0$ showing it to be a nonstandard function of Brownian motions. The test statistics can be written as follows:

$$F = (R\hat{\beta} - r)'[\hat{\sigma}^2 R\{\sum_t x_t x_t'\}^{-1} R']^{-1}(R\hat{\beta} - r)/m \quad (9)$$

The critical values of F statistics are tabulated by Sollis (2009). When the null hypothesis is rejected, the null hypothesis of symmetric ESTAR, $H_0: \phi_2 = 0$, can be tested against the alternative of asymmetric ESTAR, $H_0: \phi_2 \neq 0$, by means of standard hypothesis test. For the standard F critical values to be applicable for this test, $\phi_1 < 0$, so that under the null being tested the series is stationary (Sollis, 2009).

In empirical econometrics studies, researchers developed structural unit root tests with different specifications to investigate the presence of unit root. Perron (1989) was the one to generate exogenous structural unit root tests. In the process of time, a lot of different structural unit root tests have been developed. In literature some of the structural unit root tests suffer from severe spurious rejections in finite samples when a break is present under the null hypothesis⁽¹⁾. (Narayan and Popp, 2010, p. 1426)

Narayan and Popp (2010) developed a new unit root test with two structural breaks. Narayan and Popp (2010) unit root test generalizes the one break unit root test by Popp (2008). The Innovational Outlier (IO) type test allows for structural breaks under the null and the alternative hypothesis and is applicable for all model specifications. (Narayan and Popp, 2013, p. 723).

Narayan and Popp (2010) test has two different specifications both for two trending data, one of them allows for two breaks in level (M1) and the other allows for two breaks in level as well as slope (M2). M1 and M2 models specifications differ in how the deterministic component, d_t , is defined,

$$\begin{aligned}
d_t^{M1} &= \alpha + \beta t + \Psi^*(L)(\theta_1 DU'_{1,t} + \theta_2 DU'_{2,t}) \\
d_t^{M2} &= \alpha + \beta t + \Psi^*(L)(\theta_1 DU'_{1,t} + \theta_2 DU'_{2,t} + \gamma_1 DT'_{1,t} + \gamma_2 DT'_{2,t}) \\
DU'_{i,t} &= 1(t > T'_{B,i}), \quad DT'_{i,t} = 1(t > T'_{B,i})(t - T'_{B,i}), \quad i = 1, 2.
\end{aligned} \tag{10}$$

where $T'_{B,i}, i = 1, 2$ denote the true break dates. θ_i and γ_i indicate the magnitude of the level and slope breaks, respectively. The IO-type test equation for M1 model has the following form,

$$\begin{aligned}
y_t^{M1} &= \rho y_{t-1} + \alpha_1 + \beta^* t + \theta_1 D(T'_B)_{1,t} + \theta_2 D(T'_B)_{2,t} + \delta_1 DU'_{1,t-1} + \\
&+ \delta_2 DU'_{2,t-1} + \sum_{j=1}^k \beta_j \Delta y_{t-j} + e_t
\end{aligned} \tag{11}$$

with $\alpha_1 = \Psi^*(1)^{-1}[(1 - \rho)\alpha + \rho\beta] + \Psi^{*'}(1)^{-1}(1 - \rho)\beta$, $\Psi^*(1)^{-1}$ being the mean lag, $\beta^* = \Psi^*(1)^{-1}(1 - \rho)\beta$, $\phi = \rho - 1$, $\delta_i = -\phi\theta_i$ and $D(T'_B)_{i,t} = 1(t = T'_{B,i} + 1), i = 1, 2$. $DU'_{1,t} = 1(t > T'_{B,1}), DT'_{1,t} = 1(t > T'_{B,1})(t - T'_{B,1}), i = 1, 2$. The IO-type test equation for M2 model is as follows,

$$\begin{aligned}
y_t^{M2} &= \rho y_{t-1} + \alpha^* + \beta^* t + \kappa_1 D(T'_B)_{1,t} + \kappa_2 D(T'_B)_{2,t} + \delta_1^* DU'_{1,t-1} + \\
&+ \delta_2^* DU'_{2,t-1} + \gamma_1^* DT'_{1,t-1} + \gamma_2^* DT'_{2,t-1} + \sum_{j=1}^k \beta_j \Delta y_{t-j} + e_t
\end{aligned} \tag{12}$$

In this equation, $\kappa_i = (\theta_i + \gamma_i)$, $\delta_i^* = (\gamma_i - \phi\theta_i)$ and $\gamma_i^* = -\phi\gamma_i, i = 1, 2$. In order to test the unit root null hypothesis of $\rho = 1$ against the alternative hypothesis of $\rho < 1$, t -statistics of $\hat{\rho}$ denote $t_{\hat{\rho}}$. The break dates are selected using the sequential procedure proposed by the Narayan and Popp (2010) test and appropriate critical values as provided in the Narayan and Popp (2010) paper are used to test the hypothesis for unit root. (Salisu and Mobolaji, 2013, p. 172). Narayan and Popp (2010) tabulated their test critical values for M1 and M2 models.

Narayan and Popp (2013) compare the Lumsdaine and Papell (1997), Lee and Strazicich (2003) and Narayan Popp (2010) two structural break unit roots test. Their study show that the Narayan Popp (2010) test has good size and stable power, and identifies the structural breaks accurately in finite samples by using Monte Carlo simulations. According to the findings in their study, the Narayan and Popp (2010) test is significantly superior to the Lumsdaine and Papell (1997) and Lee and Strazicich (2003) two structural break unit root tests.

3. Empirical results

In the first part of this study that investigates unemployment convergence in the NORDIC countries, the series' status of being linear or nonlinear was analyzed based on the test with the null hypothesis advantage developed by Harvey et al. (2008) that is not influenced by the stationarity levels of variables and the results are tabulated in Table 1.

Table 1. Linearity tests results

Country	Harvey Statistics
Denmark	3.23
Finland	8.52**
Iceland	0.71
Norway	9.54*
Sweden	30.73*

Note: The symbols *, ** and *** mean rejection of the null hypothesis of linearity at the 1%, 5% and 10% respectively.

According to the test results provided in Table 1, the series of Finland, Norway and Sweden are nonlinear whereas the series of other countries are linear. Based on this basic finding, the nonlinear unit root test developed by Sollis (2009) for nonlinear series was used and the results are tabulated in Table 2.

Table 2. Nonlinear unit root tests results

Country	k	$H_0: \phi_1 = \phi_2 = 0$	$H_0: \phi_2 = 0$
Finland	2	6.132349**	1.206230
Norway	1	13.94348*	0.142894
Sweden	2	6.696475**	0.099006

Note: The symbols *, ** and *** mean rejection of the null hypothesis of unit root at the 1%, 5% and 10% respectively.

According to the results in Table 2, the series for Finland, Norway and Sweden are stationary. We proceed to check whether shocks have symmetric or asymmetric effects for countries in which the unit root is rejected. This is performed by means of testing $H_0: \phi_2 = 0$ in the equation. These results indicate that the null of hypothesis of symmetric shocks is not rejected for all countries. The Narayan and Popp (2010) unit root test was used for the data of Finland and Iceland identified as linear and the results are tabulated in Table 3.

Table 3. Linear unit root tests results

Country	k	t-statistic	TB1	TB2
Denmark	2	-2.852	2006M12	2008M04
Iceland	2	-2.576	2004M04	2005M09

Note: The symbols *, ** and *** mean rejection of the null hypothesis of unit root at the 1%, 5% and 10% respectively.

According to the result of the unit root test with a structural break tabulated in Table 3, Denmark and Iceland unemployment rate series are not stationary.

When the results obtained are evaluated in general, the unemployment rates of Finland, Norway and Sweden converge to the NORDIC mean whereas the unemployment rates of Denmark and Iceland do not converge to the NORDIC mean. Therefore, it could be said that the finding of convergence implies that shocks to unemployment rate differentials are not persistent.

4. Conclusions

The Harvey et al. (2008) test was used in the first part of the study in order to identify whether the series are linear or not and the analysis was carried out by using the Sollis

(2009) nonlinear unit root test for the nonlinear series and the Narayan and Popp (2009) structural break unit root test was used for the stationary series. According to the results, the unemployment rates of Finland, Norway and Sweden converge to the NORDIC mean whereas the unemployment rates of Denmark and Iceland do not converge to the NORDIC mean. Based on these findings, it could be concluded that there are structural differences in the labor markets of the countries examined. As was indicated in the study by Blanchard and Wolfers (2000), the presence of a strong interaction between economic shocks and institutions should be accepted and the shocks experienced could change the negative effects on unemployment. It could then be said that if the structural problems of countries are solved and if the labor market becomes a flexible one, then convergence could take place. On the other hand, it should also be taken into account that the policies implemented against the institutions that cause rigidity in the labor market could have reflections on the neighboring countries with similar economic regimes.

Note

- ⁽¹⁾ See the Perron (1989), Zivot and Andrews (1992), Lumsdaine and Papell (1997) structural break unit root tests.

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Inflation targeting and volatility: Panel evidence

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Abstract. *This article studies the effect of the transition to the regime of inflation targeting on the economic performance of the country and its ability to ensure better price stability. In order to verify the performance of this passage, we examine four factors: fiscal position, trade openness, financial openness and financial depth. The results show that the state of monetary, fiscal and financial system in emerging and developed countries plays a major role in controlling the dynamics. These results also show that the adoption of inflation targeting reduces the volatility of inflation in many countries.*

Keywords: Inflation targeting, economic performance, volatility.

JEL Classification: E31, E42, E52, E58.

1. Introduction

Although the global economic conjuncture knew very high inflation rates in the early 1980s, the last two decades were marked by significant declines of its volatility. This performance was also remarkable in some economies in Latin America or Eastern Europe which have experienced high inflation rates in the past years. This improvement testifies to the world economic and budgetary stability. Despite the convergence towards macroeconomic stability, international monetary economic situation present some heterogeneity between economies. Indeed, the developed countries have a volatility of inflation controlled and weaker than that experienced by the rest of the world.

In this context, various factors can be identified and often depend on the economic and financial structure of the country. According to most economic studies, each economy with low fiscal and monetary institutions will be unable to achieve its objective. For Pétursson (2009), there are many factors that influence the volatility of inflation: the economic structure⁽¹⁾ of the country, the volatility of output and exposure to various economic crises and geopolitical effects. According to Feridun et al. (2005), the inflation target should be well studied and well defined while conducting monetary policy, in order to prevent negative results on the volatility of inflation and exchange rate.

In this work, we will try to determine the factors that may influence the volatility of inflation. Thus, we can mention the successful tools of the adoption of the inflation targeting policy in some countries more than in others.

The methods used to study the volatility of inflation and success of inflation targeting tools and the results obtained differ from one study to another. In the study of Pétursson (2009), after eliminating the insignificant variables, the author focuses on indicators of fluctuations in the exchange rate and performance of the monetary regime. Pétursson (2009) showed that the adoption of inflation targeting allows strengthening the nominal stability in emerging economies.

In other works, probit models were used to determine the factors of inflation volatility. The analysis of Amato and Gerlach (2002), for example, was based on a probit model that includes a set of structural indicators and other variables related to the dynamics of real shocks. Among these, we focus on the rate of trade openness or the measure of credibility. The authors find that the exchange rate targeting in inflation targeting countries can affect the performance and success of this strategy. In 2007, Mishkin and Schmidt-Hebbel used other indicators measuring the independence and credibility of the central bank. The results of their study indicated a significant negative relationship between inflation targeting and price growth. However, this relationship becomes insignificant when the sample is composed only of industrialized countries. Indeed, when the sample countries are emerging as followers of inflation targeting, the relationship remains negative and significant.

Carare and Stone (2006) tried to introduce, in their work, financial and fiscal indicators. The goal is always the same: to test their influence on the stability of inflation and thus the choice of inflation targeting regime. The results obtained by Carare and Stone (2006) present a positive and significant relationship between financial development indicators⁽²⁾ and the likelihood of pursuing a country of inflation targeting strategy. Another study was

developed by Hu (2006) in which the author used a regression in panel. This study joined certain macroeconomic indicators and other institutional indicator like the tax position. Hu (2006) gave great importance to the control variables, such as the consumer prices index (CPI) or also the Gross Domestic Product (GDP) growth rate. The author showed that a healthy fiscal situation is significantly and positively associated with the choice of inflation targeting. Besides, a central bank is more likely to adopt inflation targeting with higher financial performance, institutional capacity and a system of flexible exchange rates.

In this article, we will analyze the volatility of inflation through four factors namely: the tax position, trade openness, financial openness and financial depth. This work is made up of two parts. The first presents the methodology and data. The second reveals the results, the interpretations and the effects of the transition to inflation targeting policy on price dynamics.

2. Methodology and data

2.1. Data description

Our area of the study countries include Australia, New Zealand, the United Kingdom, Chile, Canada, South Africa, Indonesia, Sweden, Brazil and Turkey and the period of analysis ranges from 1997 Q1 till 2010 Q12. This choice is made due to the unavailability of data in some countries, particularly certain European countries. Our objective is to investigate if the stability of inflation reflects the image of a new world economic conjuncture or if it is the new monetary rule which allowed the achievement of these objectives.

In this study, we have differentiated our sample⁽³⁾ as follows:

1st sample: all countries: [AUS (1993Q2) + CAN (1991Q1) + NZ (1990Q1) + SWE (1993Q1) + UK (1992Q4) + SA (2000Q1) + BRZ (1999Q2) + CHL (1999Q3) + IND (2005Q3) + TUR (2006Q1)]

2nd sample: emerging countries: [SA (2000Q1) + BRZ (1999Q2) + CHL (1999Q3) + IND (2005Q3) + TUR (2006Q1)]

3rd sample: all industrialized countries: [AUS (1993Q2) + CAN (1991Q1) + NZ (1990Q1) + SWE (1993Q1) + UK (1992Q4)]

All variables in these countries are collected from the database of the IFS (International Financial Statistics).

2.1.1. Fiscal position (PB_t)

It is the result of the budgetary balance weighted by GDP. The fiscal position is in surplus when the variable is positive and in deficit when it is negative. Indeed, in the case of a negative balance, the central bank will suffer pressure from the authorities to finance this insufficiency. Thus, the consolidation of the fiscal balance of the government causes a deviation of monetary authorities in their central objective of price stability. In this case, they adopt an expansionary monetary regime. Unfortunately, this policy promotes inflation following the increase of currency in circulation. However, when the budget balance is in surplus, the monetary authorities are free from any pressure. They can therefore apply their monetary regime in an independent and autonomous way. We expect the change of sign of this coefficient for a negative value.

2.1.2. Trade openness (OC_t)

This variable is measured by the ratio of exports and imports relative to GDP. Trade openness is an indicator of inflation. Indeed, the more this degree is important the more the economy is exposed to exchange rate risk and therefore it is under the threat of inflation. However, if central banks take into account this trade openness in the transition to inflation targeting strategy, the stability of inflation volatility will be guaranteed. For this reason, we expect the sign of this indicator to be negative for the countries that have opted for inflation targeting.

2.1.3. Financial openness (OF_t)

It is the ratio of external debt by the GDP, we use the empirical idea, applied by Lane and Milesi-Ferretti (2001), given the absence of data for some countries. According this approach, the stock of external debt is estimated by grouping all of the investment in debt "investment debt portfolios." In this case, the sign of this indicator must be positive. Indeed, the inflation control becomes a difficult process to achieve when the country enjoys financial openness.

2.1.4. Financial depth (PF_t)

Financial depth is measured by the ratio of M2 by GDP. This is an indicator reflecting the level of the monetization of the economy (Williamson and Mahar 1998). From this ratio, we can judge the financial system's ability to raise funds and react to economic shocks. If this ratio is important, the economy is more able to finance its insufficiencies. Indeed, the independence of central banks and their capacities to achieve price stability are returned by this variable. Therefore, the expected effect of this indicator is negative.

The estimation by ordinary least squares method revealed some problems related to violations of fundamental assumptions effectiveness estimates. It is for this reason that the correction heterosedasticity or the correlation requires switching to another model. In this study, we will use a random effects model which appears fundamental to identify the factors that may affect the inflation dynamics.

2.2. Random effects model

In this study, we used a random effects model defined as:

$$y_{it} = \alpha + \beta'x_{it} + \mu_{it}$$

$$i = 1, \dots, N, \quad t = 1, \dots, T \quad \text{et} \quad \mu_{it} = \mu_i + \varepsilon_{it}$$

In such a model, the explanatory variables are supposed to be strictly exogenous. Then, we proceed to a composition of the hazard in two terms of errors not correlated between them:

- μ_i is a first stable hazard but which includes the influence of the variables. These variables, despite their stability over time, are specific to each individual. For this reason, it is assumed that:

$$E(\mu_i / x_{1it}, \dots, x_{Kit}) = 0$$

$$E(\mu_i^2 / x_{1it}, \dots, x_{Kit}) = \sigma_u^2$$

$$E(\mu_i \mu_j / x_{1it}, \dots, x_{Kit}) = 0, \quad i \neq j$$

- a hazard ε_{it} that takes into account the specific omitted variables to each individual, but this time those vary over time. For that, we suppose that:

$$E(\varepsilon_{it} / x_{1it}, \dots, x_{Kit}) = 0$$

$$E(\varepsilon_{it}^2 / x_{1it}, \dots, x_{Kit}) = \sigma_\varepsilon^2$$

$$E(\varepsilon_{it} \varepsilon_{jt} / x_{1it}, \dots, x_{Kit}) = 0, \quad i \neq j \text{ ou } t \neq t'$$

Thus, we have:

$$E(\mu_i / x_{1it}, \dots, x_{Kit}) = 0, \quad E(\mu_i^2 / x_{1it}, \dots, x_{Kit}) = \sigma_u^2 + \sigma_\varepsilon^2$$

$$E(\mu_{it} \mu_{it'} / x_{1it}, \dots, x_{Kit}) = \sigma_u^2, \quad t \neq t'$$

$$E(\mu_{it} \mu_{jt'} / x_{1it}, \dots, x_{Kit}) = 0, \quad i \neq j \text{ et } t \neq t'$$

According to our assumptions, the covariance matrix between μ_i and μ_j is zero. We require as long as the random are not heteroscedastic. That is why there is no correlation of random variables among individuals but in parallel there is a correlation for each individual random. Under these assumptions noted above, the variance of the random is:

$$\text{var}() = \mu^2 + \varepsilon^2$$

At first, our estimates should take into account the variance components. Then, with the (GLS) method (generalized least squares), we use these estimates to estimate the following equation:

$$y_{it} = \alpha + \beta' x_{it} + \mu_{it}$$

In conclusion, we must begin by testing a model with only one individual effect. It appears interesting in our basic model to define the periods before and after the transition to inflation targeting regime. But before approaching the empirical part, we need to verify the correlation problems by resorting the Hausman test.

2.3. Hausman test (1978)

The goal of this test is double: to try, while being based on the null hypothesis that the regressions are strictly exogenous and to differentiate between fixed and random effects. To summarize, the effectiveness of the estimator is synthesized by this hypothesis. In other words, the idea of Hausman tends to find any correlation between the parameters or even going to look for defects in specification.

$$\begin{cases} H_0: \text{la variable } X \text{ est exogène} \\ H_1: \text{la variable } X \text{ est endogène} \end{cases}$$

The two estimators for model parameters studied can then be written as follows:

- The first estimator is unbiased. In this case, we note an absence of correlation, since it is under the null hypothesis of correct specification of the model.
- The second estimator, conversely, is assumed to be biased in both cases.

The terms of covariance between the two estimators appear finally in its matrix. In this case, the Lemma is the most appropriate way to avoid this problem and we will thereafter:

- $\hat{\beta}_1$ reached the asymptotic Cramer Rao bound;
- $\sqrt{N}(\hat{\beta}_1 - \beta)$ et $\sqrt{N}(\hat{\beta}_2 - \beta)$ are asymptotically distributed according to the normal laws of covariance matrix respects V0 and V1;
- asymptotic distributions known by $\sqrt{N}(\hat{\beta}_1 - \beta)$ and the difference given by $\sqrt{N}(\hat{\beta}_2 - \beta_1)$ are not correlated.

N is the sample size. $\hat{\beta}_1$ and $\hat{\beta}_2$ are two estimators. β is a convergent supposed vector and asymptotically normally distributed with $\beta \in R^K$.

Therefore, we will have:

$$var(\hat{\beta}_1 - \hat{\beta}_2) = var(\hat{\beta}_1) - var(\hat{\beta}_2)$$

Following this lemman, Hausman defines its specification test as follows:

$$H = (\hat{\beta}_1 - \hat{\beta}_2)' [var(\hat{\beta}_1 - \hat{\beta}_2)]^{-1} (\hat{\beta}_1 - \hat{\beta}_2)$$

Before turning to modeling, we must remeber that this statistic follows a Chi squared of K degree of freedom. That is why this parameter is distributed asymptotically.

2.4. Empirical analysis

The choice of all countries which will constitute our study appears fundamental. However, this has led us to minimize our choice of method estimation. When we have more temporal data than individuals forming the sample of our model, it is preferable to proceed to panel data estimation. Through this method, the two dimensional factors will be incorporated via a temporal and individual method of data. Also, this use takes into account the heterogeneity between the various individuals in the sample. However, in most cases, this type of model is used to identify the actors influencing the inflation dynamics. It is mainly used to analyze the effect of the transition to inflation targeting between countries which adopt it and those which adopt other monetary regimes.

$INFVOL_{i,t}^{(4)}$ reflects the dynamics of inflation at the moment "t" and for every country "i". We can write it as:

$$INFVOL_{i,t} = \mu + \gamma_1 OF_{i,t} + \gamma_2 PF_{i,t} + \gamma_3 OC_{i,t} + \gamma_4 PB_{i,t} + \gamma_5 D_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t} +$$

where:

μ represents a constant;

γ_i are coefficients with i ranging from 1 to 5;

α_i reflects a fixed effect of the dimension of the economy;

δ_t represents a fixed effect for the time dimension;

$\varepsilon_{i,t}$ is the error term;

The dummy variable $D_{i,t}$ is equal to 1 if the country adopt inflation targeting, if not it is equal to 0;

$PB_{i,t}$ is a fiscal position;

$OC_{i,t}$ reflects trade opening;

$PF_{i,t}$ represents the financial depth;

$OF_{i,t}$ is financial openness.

We will try to promote an estimate random effects rather than a fixed effects model. The disadvantage of the latter model lies in the fact that α_i and δ_t representing non-random constant effects. These effects are used to change the value of μ following two dimensional parameters "i" and "t". In the case of random effects models, we assume that the two variables identified α_i and δ_t represent two random words. Thus, they have an important effect on the entire model and not on the constant model.

3. Results and interpretations

Our model is based on the panels random effects method. The results are summarized in Table 1. These results will be classified into three groups. The first contains an estimate of the total sample (ToT), the second includes all developed countries (Dev), and finally, the last group gathers emerging countries (EmE).

Table 1. Random effects estimation

	Total sample (I)			With inflation targeting (II)			Without inflation targeting (III)		
	ToT	EmE	Dev	ToT	EmE	Dev	ToT	EmE	Dev
μ	0.1754	0.506*	0.892**	0.413	0.465	0.806	0.825	-	-
	(-0.224)	(0.367)	(0.457)	(0.223)	(0.312)	(0.4425)	(1.786)	-	-
OF_{it}^a	-0.035*	0.217***	-0.0717***	-0.036*	0.2117***	-0.0817	-121975.2	-	-
	(0.0214)	(0.045)	(0.019)	(-0.0215)	(0.0579)	(0.0217)	(112978)	-	-
PF_{it}^b	0.197***	0.015	0.306***	0.106***	0.0213	0.2396***	1.1212	-	-
	(0.063)	(0.0085)	(0.068)	(0.071)	(0.096)	(0.088)	(1.217)	-	-
OC_{it}^c	0.007	-0.0473	-0.638	0.055	-0.0456	-0.0463	-1.0643	-	-
	(0.193)	(0.245)	(0.549)	(0.217)	(0.2517)	(0.503)	(1.003)	-	-
PB_{it}^d	-3.0396***	-2.35**	-3.896***	-2.796***	-2.425**	-3.49***	-4.865	-	-
	(0.384)	(1.26)	(0.89)	(0.782)	(1.3786)	(0.9867)	(4.382)	-	-
D_{it}^e	0.1417	-0.213	0.0713	-	-	-	-	-	-
	(0.178)	(0.274)	(0.113)	-	-	-	-	-	-
R^2									
within	0.132	0.0508	0.1851	0.1273	0.0699	0.185	0.1583	-	-
between	0.0327	0.7343	0.5861	0.0021	0.7172	0.4931	1.000	-	-
overall	0.0769	0.1123	0.2113	0.0653	0.1325	0.2130	0.1903	-	-
No. of observations	310	180	130	255	130	125	45	-	-
Hausman test	1.73	12.60	2.87	2.67	10.54	2.432	0.89	-	-
	[0.8215] ^p	[0.0136] ^p	[0.436] ^p	[0.000] ^p	[0.1203] ^p	[0.502] ^p	[0.3672] ^p	-	-

The standard deviations of the coefficients are shown in brackets.

***: Significance threshold to 1%.

**: Significance threshold to 5%.

*: Significance threshold to 10%.

p: p-value of the Chi2 statistic (p).

a: financial openness.

b: Fiscal position.

c: trade openness.

d: budgetary position.

e: dum.

In the first part of Table 1, we classify the estimates for the entire sample. Thus, we find the developed and emerging countries adopting or not inflation targeting. The second part contains only the countries having chosen this new monetary rule. The last class contains countries opting for other monetary regimes. By studying the degree of trade openness, we notice a variation of coefficient of a group of countries to another. This coefficient is

negative in the case of emerging countries. It is the same for the developed economies of the groups (I) and (II), and also for the total group (III). Indeed, during the transition to inflation targeting, an important commercial opening has a remarkable negative effect on inflation volatility. Moreover, the M2/GDP ratio reflecting the "financial depth" shows a positive and significant sign at a threshold of 1%. This sign is detected both for the entire sample and the developed countries of groups (I) and (II). However, in the case of emerging countries, this indicator, although positive, is not significant. These coefficients are opposed to the initial hypothesis advanced by Hu (2003) who linked the stability of the low level of inflation to the importance of M2/GDP ratio.

The results show that the indicator of "financial openness" is generally significant apart from countries that practiced inflation targeting. However, the sign of this coefficient varies from one subgroup to another. In the first sample, i.e. the totality of the countries, it is negative. It is the same for developed countries (DeV) of the groups (I) and (II). This sign becomes positive for the case of emerging economies (EmE) of groups (I) and (II). It appears to us that, in the case of emerging economies, external debt affects positively the volatility of inflation. In the case of industrialized economies, this impact is clearly negative. In order to explain this phenomenon, we notice that the debts of developed economies are in local currencies, and therefore they are less exposed to the risk of exchange rate compared to the emerging economies. Therefore, we conclude that the external debt acts but weakly on the inflation dynamics.

The indicator of "fiscal position" informs us about the fiscal situation of the country. For a 5% threshold, the coefficient reflects a negative and significant sign. According to our results, in the case of economies with inflation targeting, 1 million dollars more leads to a decline of 2.42% of the inflation volatility in emerging countries. The same variation entailed its decrease of 3.49% in developed countries.

Such a result confirms the first hypothesis which stipulates that the monetary and financial development facilitates the transition to any monetary regime whose main objective is the inflation stability. Similarly, any positive fiscal balance allows the government to cope with these unforeseen shocks. The economy does not need to resort to the financing of the central bank through expansionary policies which can lead to greater inflation. In the case of countries which have not opted for the inflation targeting regime, all the coefficients are not significant. Because of a lack of information and data for subgroups of emerging and developed economies, we could not carry out our estimations. Indeed, there is a strong similarity between the results of the two samples (I) and (II). Therefore, the coefficients are the same for developed economies whether the first or the second group. Thus, all countries and emerging countries have the same results. This similarity can be explained by the high number of countries included in the sample and which passed to inflation targeting compared to the others. This result is confirmed by the non significance of the results of group (III) and explained among others by the lack of observations and data.

To validate these coefficients, we use the Hausman test. This test is applied to the specification tests of the individual effects in panel to distinguish between fixed and random effects. By applying it to all the countries in the sample, we identified any

existing correlation or any defect specification. We validated the first null hypothesis. Thus, we can check the absence of estimation bias between the coefficients and the absence of autocorrelation problem.

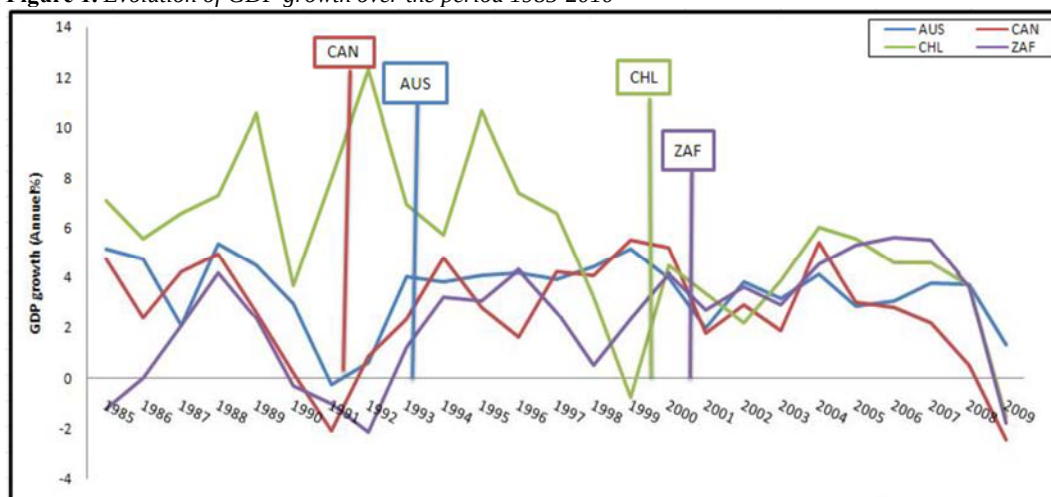
In our case, according to the results found, the null hypothesis is that covariance accepted, except for sample (I) for emerging countries as well as the total group countries (II).

We present in the following graphs (Figure 1, Figure 2 and Figure 3) the evolution of the GDP growth, domestic credit to the private sector and the commercial openness of Australia, Canada, Chile and South Africa⁽⁵⁾ in order to see the effect of inflation targeting the evolution of these variables.

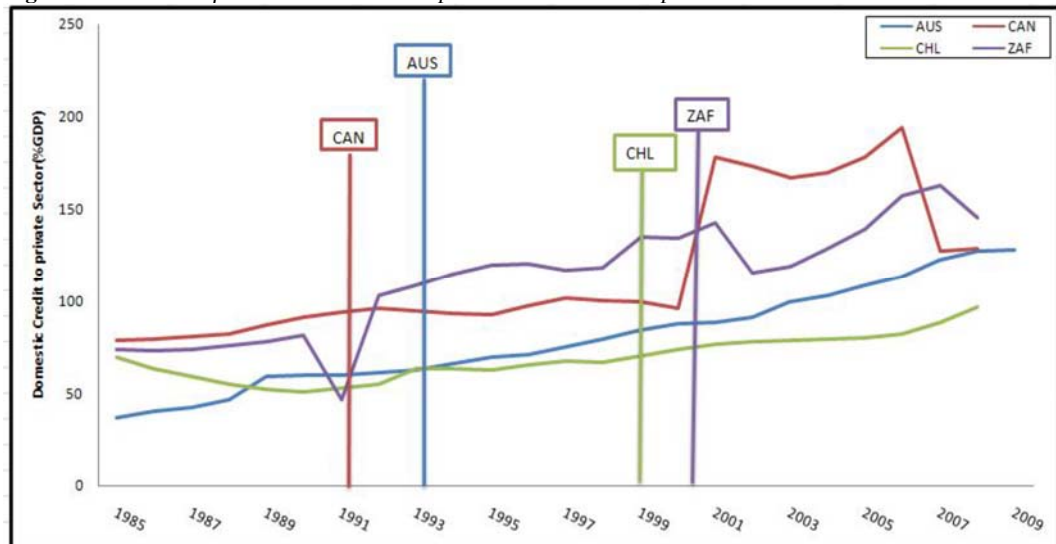
According to the first graph, we can see that, between 1991 and 1993, the change is not only positive but also largely steady for the four countries. This is explained by the introduction of new monetary regime which ensured a stable financial and economic environment. In the second graph, we have shown the importance of domestic credit provided to the private sector, defined by Leyva (2008), as the most relevant financial indicator. We also note a positive and stable development for the Australian and Canadian experience between 1991 and 1993.

According to the first graph, we can see that between 1991 and 1993, the change is not only positive but also largely steady for the four countries. This is explained by the introduction of a new monetary regime which ensured a stable financial and economic environment. Already, Tugcu and Ozturk (2015) reported in their macroeconomic effects of inflation targeting studies that adopting this new regime increases real GDP. In the second graph, we showed the importance of domestic credit provided to the private sector, defined by Leyva (2008) as the most relevant financial indicator. We also note a positive and stable development for the Australian and Canadian experience between 1991 and 1993.

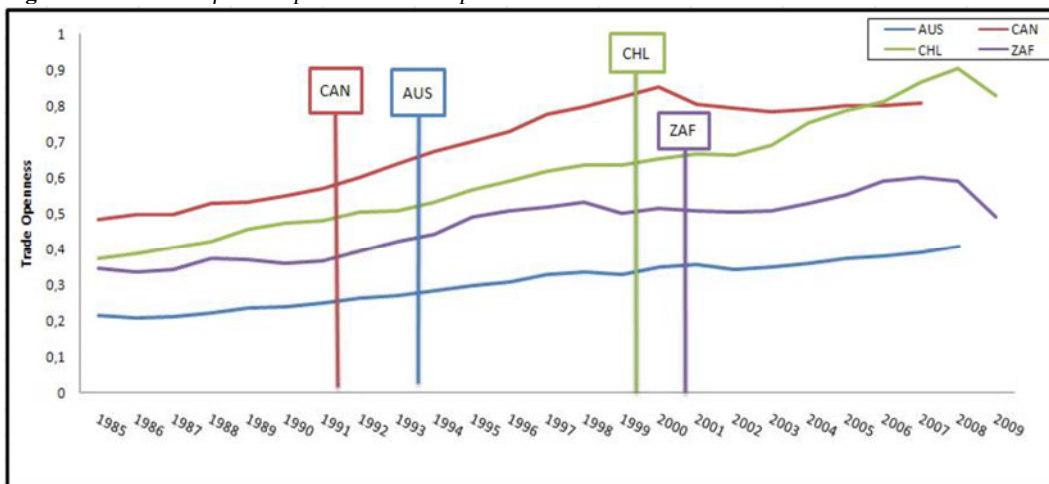
Figure 1. Evolution of GDP growth over the period 1985-2010



Source: WDI Database (2009).

Figure 2. Evolution of domestic credit to the private sector over the period 1985-2010

Source: WDI Database (2009).

Figure 3. Evolution of trade openness over the period 1985-2010

Source: WDI Database (2009).

Concerning trade openness, we could show, by our model, an improvement of this parameter during the period after transition to the new regime. Similarly, GDP per capita recorded remarkable growth.

Conclusion

The study of inflation volatility over a set of countries allowed us to verify the positive effect of inflation targeting the economic performance. The results of the analysis of inflation rates fluctuations show that the transition to the new monetary regime of inflation targeting has improved the economic growth for the countries concerned with

the study. In this sense, we have to prove the idea defended by Hyvonen (2004), Vega and Winkelried (2005) and Batini and Laxton (2007). Therefore, the state of the monetary system, budget and finance plays a major role in controlling the inflation dynamics in developed and emerging countries. This conclusion is demonstrated in both emerging and developed economies. However, these results are more important in the emerging world for the high vulnerability of their markets likely to have high rates of inflation.

The results were in favor of the existence of a strong negative relationship between the surplus and inflation volatility for countries using inflation targeting. However, it is easier to put pressure on central banks in the case of budget surplus in order to allow automatically a stabilization of inflation volatility. The approach that defines the relationship between external debt and inflation dynamics, is verified in this study and specifically for the case of emerging economies. Indeed, these are increases in debt securities in foreign currencies that cause a high risk of exchange and lead eventually to large shocks and fluctuations in inflation dynamics. Already, Bildirici and Ersin (2007) reported that the credibility and fiscal stability of developed countries play a crucial role in price stability.

In addition, we could prove the existence of an ambiguous effect of trade dependence on the volatility of inflation in the transition to inflation targeting regime. The financial depth variable has helped us to find a strong relationship between the financial situation of the country and its inflation rate. Indeed, the volatility of inflation tends to drop, whenever the financial system is more solid. Hence, the macroeconomic importance of the financial system that continues opt for to protect the country's economy by providing funds to cope with any shock or disturbance.

Notes

- (1) The income per capita or the size of the economy can be evoked.
- (2) The two financial development indicators used are the liquid liabilities reported in the financial system to GDP and market capitalization as a percentage of GDP.
- (3) AUS : Australia, NZ : New Zealand, UK : United Kingdom, CHL : Chile, CAN : Canada, SA : South Africa, IND : Indonesia, SWE : Sweden, BRZ : Brazil, TUR : Turkey.
- (4) The volatility of inflation is calculated by using standard deviation sliding over twelve months.
- (5) We chose these countries because they are considered as reference country in the success of inflation targeting.

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Economic structure of educational process and its implications for the higher education reform

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Abstract. *Playing a pivotal role in the development of the modern society, higher education industry has reached its capacity at least a decade ago and since then has lost its former characteristics of a public good. Funding challenges and non-consistency in quality of output dominate the modern discussion on tertiary education policies in search for the optimal way of reforming the sector. None of the policies so far had a close look at the operational structure of colleges and universities from the economic perspective, which by the author's opinion is the reason behind the lack of progress in reforming the sector. This study presents a discussion on economic structure of different functions within the higher education process and suggests the levels of competition and regulation most appropriate for each of these functions. The proposed option for the higher education reform allows greatly reducing the costs of obtaining a post-secondary qualification, while simultaneously addressing the quality issues.*

Keywords: Higher education reform, market structure, market failure, natural monopoly.

JEL Classification: H41, I23, I28, L10, O15, O40.

1. Introduction and literature review

Trow (1973) suggested that when the higher education enrolments is between 20 and 30 percent of the total 'relevant university-age' population the society moves to a mass higher education system and, when this proportion exceeds 30 percent, the society enters an era of universal higher education. Trow argued that with enrolment beyond the 15 percent, when the postsecondary education becomes accessible not only to the elite but to all socio-economic groups, the industry in its current shape wouldn't be able to accommodate all seeking a degree, and therefore, must be reformed. The 30 percent threshold of 'massification' had been already passed in some major western European countries such as Germany, France, UK and Italy by the end of the 20th century (Altbach et al., 1999) and it has become obvious that Trow was absolutely right: the pressures from the number of enrolments on the budget and the heterogeneity in the quality of output are the facts that call for an urgent reform of the higher education sector.

Although the higher education loan schemes in some developed countries such as Higher Education Loan (HELP) in Australia are relatively more cost-effective compared to the free higher education in countries such as Germany and Russia (Altbach et al., 2009), they are rapidly becoming unsustainable due to a large proportion of loans that will never be repaid and the lengthy period of time the performing loans are paid back (Norton and Cherastidham, 2016). In order to reduce financial pressure on the budget, a number of countries encourage private post-secondary institutions to enter the market and by privatising public universities (Amaral et al., 2003; Herbst, 2007). However, privatisation usually results in a significant increase of tuition fees and a decrease in affordability of higher education for potential students from certain socio-economic groups as well as a long list of other non-desirable social and economic outcomes in the long run (Thaddieus and Rabovsky, 2011).

All modern attempts to address the funding issues and reform the higher education sector suffer from one common drawback – they heavily rely upon universities in delivering the change, while neither the administrators nor the academic staff have an incentive to replace their comfortable working arrangements with fierce competition for the student enrolments. Other economic agents at the higher education market such as students, parents, and publishers also have no interest in changing a clear and established system with a new one. A situation when economic agents have no incentives to achieve a socially desirable outcome is commonly referred to as a market failure, which further implies that delegating the change management to the educational institutions is destined to fail in achieving the goals of the reform. The situation is much worse in the post-communist countries due to the traditionally low salaries of academic staff (US\$433 per month in Russia, for example) that resulted in brain-drain and a wide-spread corruption within the sector (ICEF Monitor, 2013; Kurilla, 2011; Darden, 2008; Knox, 2008).

Further, in response to 'massification' and the resulting budgetary pressures, the governments in many countries are considering deregulating tuition fees (or have already allowed universities to set their fees) and reducing the number of government supported university places (Altbach et al., 2009). The major concern is that this premature push towards commercialisation takes place in an absence of any proper preliminary economic

analysis of the industry, while historical evidence suggests that fee deregulation, by itself, cannot solve the budgetary problems and would definitely result in the long-run negative spill-over effects for the rest of economy such as reduction in accessibility for the lower socio-economic groups (Lucas, 2001), slowing down the national growth in human capital and fostering corruption within the sector and beyond (see, for example, Banerjee and Duflo, 2008; Bussolo, De Hoyos et al., 2007; Kharas 2010; Ravallion, 2009, Shrivastava and Shrivastava, 2014).

In addition to the funding issues, higher education is suffering from problems associated with heterogeneity in the quality of educational output. Many higher educational institutions across the world are in charge of their own quality management with only some 'threshold standards', imposed upon institutions delivering degrees from Bachelor and above (e.g. Thompson-Whiteside, 2013), while thousands of post-secondary colleges with programs up to a Diploma level remain totally unregulated, despite their graduates are able to claim credits in electives and even core subjects when starting a Bachelor degree at a university. Under this kind of arrangements, it is absolutely impossible to achieve any consistency in quality, given an incentive for the institutions to maintain a financially optimal passing rates no matter what they actually are.

This study looks at the economic structure of the educational process and discusses its implications for the higher education reform. The rest of the paper is organised as following. Section 2 presents the modern trends in higher education, while Section 3 considers the structure of the sector from the educational process perspective. Section 4 looks at the quality issues in higher education. Section 5 concludes.

2. Current trends in higher education

Being an economic hub for production of leaders for virtually all sectors of the economy, starting from the childcare and finishing with public administration and space science, higher education is a truly unique industry that deserves very special attention. Faults in higher education put an enormous constraint on the development of entire country and frequently make restructuring of other industries impossible because of a lack of competent leaders and ground staff capable of managing and delivering these reforms. For example, despite a high quality effort of the National Assessment Program – Literacy and Numeracy (NAPLAN), the reform of the Australian secondary and primary education is not progressing well, with literacy and numeracy of Australian school students not improving since 2008 due to a poor quality of a significant proportion of teachers supplied by the Institutes of TAFE and universities (Bagshaw and Smith, 2016).

As discussed above, massification stretched the budgets in many countries beyond their capacity and made the existing funding systems unsustainable. Within the wide spectrum of modern approaches to higher education funding, at least in the first approximation, the underlying ideologies can be generally classified into four groups: capitalist; pseudo-capitalist, semi-socialist and socialist. The capitalist approach, with the US being the only example, looks at the higher education from a neo-liberal perspective and assumes it to be predominantly a private good. Therefore, while generally acknowledging the positive

spill-over effects from this sector to the rest of the economy, capitalists leave an absolute majority of private individuals to take care of their own education (Sallie Mae, 2014). The accessibility issues to the lower socio-economic groups to higher education in the US are deal with a very specific to this country's practice of alumni, personal and corporate contributions to the university budgets (Altbach et al., 2009; Saunders, 2010).

The pseudo-capitalist approach assumes that higher education is a private good with significant positive externalities and, in order to help individuals in accessing higher education, provides the students with educational loans such as HELP in Australia (Study Assist, 2016) and SLS in New Zealand (Inland Revenue, 2016). The governments in these countries do understand that a large proportion of these loans will never be repaid and the reminder of the loans will be repaid over a very lengthy period of time (Australia, 2016) but maintain and even increase the level of funding due the political pressures, effectively providing free education to a large proportion of their students similar to the socialist countries.

Semi-socialists view tertiary education mostly as a public good, assume that positive externalities greatly outweigh the current funding costs in the long run and tend to provide free higher education to the citizens. This is observed in the majority of the post-communist countries such as the Russian Federation (Carnoy et al., 2014). However, due to the budgetary constraints, the public funding is available only to a certain proportion of applicants with high secondary school and university entry exam results or to the ethnic minority groups (Carnoy et al., 2014), with the rest falling back to a pure capitalist model of funding.

Finally, the socialist ideology is represented by a diverse range of countries such as Vietnam, Bahrain, Kuwait (Coffman, 2003) and most states of Germany (Thomsen and von Haagen-Giebel, 2016), where the post-secondary education is considered to be a public good and is totally funded by the government with some minor restrictions to the poor quality students. Overall, all modern approaches to the higher education funding do not perform well in their current settings and are actively seeking to reform the higher education sector.

Although not at full strength yet, the higher education, or at least a large proportion of it, is moving on-line. Most universities are using learning platforms such as Blackboard and Moodle to provide the subject information, teaching material and facilities to submit and mark assignment as well as to communicate with the students (Guri-Rosenblit, 2009). Worth to note though, that most instructors today are opposing recording lectures and tutorials on video and uploading them onto the learning platforms in fear of exposing their shortcomings and becoming the targets for criticism from their supervisors and colleagues. Nevertheless, despite cultural and political resistance distance education is rapidly becoming a popular option for post-secondary studies for an increasingly larger number of students with English language domineering in communication in education and science, the stock of educational resources such as databases and ownership of publications (Altbach et al., 2009).

Finally, globalisation is a significant factor that influences modern higher education. With an ever increasing number of students studying abroad, many countries are seeking to achieve global interchangeability between universities. Examples are Bologna Process and Lisbon Strategy in Europe, ENLACES in Latin America, Brisbane Communiqué in the Asia-Pacific region (Altbach et al., 2009). Bologna Process is the most coherent effort to address the modern challenges in higher education. Under the proposed by Bologna common degree structure, 29 participating countries agreed on a credit transfer system and approaches to quality assurance with a view to facilitate free mobility of educators and students between countries and institutions (Crosier and Parveva, 2013; Lorenz, 2010).

3. The components of the educational processes and market failure in higher education⁽¹⁾

Despite full participation of countries with semi-socialist and socialist funding practices in the Bologna Process, the mainstream approach to the higher education reform stated by Bologna is deeply rooted in neo-liberalism, which implies a minimum interference from the government into the operations of individual institutions (Baltasiu and Bulumac, 2012), thus, ignoring the market failure that is clearly present in the sector and identifiable by the heterogeneity in the quality of educational output and the constantly rising costs of tertiary education (Lemke and Sughart, 2016). Bologna attempts to transform the sector by standardising degrees, inducing competition between educational institutions and by introducing quality management practices (Mansberger, 2006). However, Bologna Process is an attempt to reform the sector without any serious restructuring of the educational institutions themselves and, in presence of several sources of market failure, cannot bring about the optimal socially desirable outcome for reasons discussed below.

Similar to the electricity market, the market for higher education has sections that exhibit different market structures and, therefore, require different levels of regulation and competition in order to achieve the socially optimal result. Let's suppose that the higher educational process is divided into four main functions: curriculum, assessment, teaching and administration. The first area, curriculum, is dealing with structuring programs and courses and developing teaching materials. Currently in our interdependent world, most programs and subjects, especially the core subjects in a business degree, are so similar that one already can call them standardised. Given this, a logical answer to the question whether we need tens of thousands universities globally with an army of academic staff duplicating each other's work semester after semester is a definite 'no'. Access to the course structure, content and basic teaching material has a near zero marginal cost of using them and, thus, might become a public 'good', perfectly fitting into its characteristics of non-excludability and non-rivalry in consumption.

Assessment is concerned with writing exam and assignment papers according to the course content and specified learning outcomes. Assessment items, especially with respect to the final exams, can be randomly developed from a large, - although yet to be created, - and constantly updated test banks with random variation applied to parts of each exam question. This function also can be made a public 'good' to the extent of providing free of charge practice and diagnostic tests to the public for self-assessment of their preparedness to do

the course and sit the exam. Curriculum and assessment have all the features of a natural monopoly and is a clear case where competition between universities and colleges has resulted only in an increase in operational costs and the tuition fees and produced a belief that there might be such a thing as a poor quality university degree. Therefore, these two functions must be regulated by the government with competition restricted, at least within the national borders.

Teaching and academic administration provide services that are differentiated in their type and quality and, if separated from curriculum and assessment development, the former would exhibit all features of monopolistically competitive market and the latter is most likely to become an oligopoly. Current bureaucratic restrictions prevent competition between academics in teaching and put a significant burden on introducing innovative practices in teaching and academic management. If teaching separated from all other functions, competition will ensure that teaching is done by the best educators with the best modern teaching resources. A certain degree of competition under the government monitoring in academic administration will result in administration services being delivered by those who are able to offer the best environment and integrity for examination venues and reliability in keeping administrative records.

Frequent assessment sessions will remove duplication in teaching, which is the second largest source of inefficiency in higher education after duplication in curriculum and assessment development. In Australia, for example, where on the one hand the problems associated with the quality of education have been freely passed from the secondary schools to the universities after removal of vital prerequisites in many subject in late 1990s, on the other hand, a large proportion of students have to 'restudy' the material already covered at the high school and spend a whole semester studying with students who are lagging far behind. The exams might be conducted any time according to the student demand instead of waiting until the end of the teaching period.

The developments in the information and communication technology put ever-increasing pressure on traditional university teaching (Altbach, 2009). With teaching and learning going on-line, we might not need huge campuses that currently are blown out of proportion in urban areas where land prices are extremely high. Only some of the buildings will be required as examination theatres or used for face-to-face classes. There is an enormous amount of money to be saved if these real estate items are removed from the balance sheets of the universities and when thousands of academic, administrative and maintenance staff disappear from the universities' payrolls.

The marginal cost of an extra student studying on-line in the case of natural monopoly is approximately zero, which allows the government to pay just a few millions of dollars in annual fees to the program provider for an access to the educational material on an E-Learning platform such as Blackboard or Moodle for all citizens. There will be no need for subsidies in higher education and the tax burden will not be passed to the future generations. The costs of occupying a seat in the examination theatre, marking the exam paper, maintaining academic records and issuing degree certificates are very low and might not exceed a hundred dollars per subject, the amount of money a student can earn by working at McDonalds.

Paying out of own pocket always helps allocating resources where they are most needed and ensures that the funds are used in the most efficient way. The current student loan system might still exist to cover for the face-to-face teaching but only for those who need some extra help in their studies. The difference with the current system though is that the number and the content of these extra classes will be driven by the student demand and will not be set by the universities from the supply side. In such a system, the currently dominant doctrine ‘opportunity for everyone, university for some’ changes to ‘opportunity for everyone, university for everyone who wants it’.

The discussion above yields the conclusion that the future structure of the higher education is either a global monopoly or, more likely, an oligopoly with a few nations competing on a global scale. This means that there will be either one or just a few key providers of academic programs with the rest being engaged in service teaching and administration for the leaders or concentrating purely on research. The most uncomfortable thought though is that, separation of teaching from curriculum, assessment and administration implies that educational units such as universities and colleges will disintegrate, not necessarily due to the political resolutions but simply because of their inability to compete with a natural monopoly in curriculum and assessment.

To reform the sector, the government has to perform several tasks. Firstly, it must develop educational programs using a government corporation or by outsourcing the task to an existing tertiary education provider and make these programs freely available on-line. Secondly, the government must force all students at all accredited higher education institutions sit central exams at approved examination centres. Finally, the government must set up an academic administration facility for hosting and building test banks, monitoring exam invigilators and processing exam papers. The test bank must invite contributions from all practicing academics and put experts in corresponding teaching fields in charge of assessing proposed exam questions. The transition of institutions and their staff from being fully in command of the students to the situation when universities have to compete for each student by offering a better quality education and meeting every individual student needs will eventually increase the efficiency of the sector.

There are some seemingly unimportant events currently happening in the Australian tertiary education that indicate that we are already preparing for a significant change. Firstly, in 2014 Australia abolished university based student number system and introduced a universal student number (USI) (Student Identifiers Act, 2014), which will facilitate free movement of students between Australian universities. Secondly, there is a growing consensus within the ranks of academics and university administrators that a controlled exam is the most reliable indicator of educational quality and that continuous assessment is the way to motivate the students (see, for example, William, 2013). Continuous assessment has proved to be a powerful stimulator of learning activities and, if introduced, is able to significantly increase the passing rates for most challenging subjects even in cases when students are underprepared for tertiary studies (Mikhailitchenko, 2011). Assessment driven teaching works very well in traditional classes with heterogeneous student

population and is particularly important for students studying on-line because it allows them quickly identifying the gaps in knowledge and receiving an almost immediate feedback.

4. Quality issues in higher education

Apart from the cost reduction, there is another very important reason why teaching must be separated from curriculum, assessment and administration. It is related to the quality issues in tertiary education. The modern funding system of the tertiary education in countries such as Australia dictates minimum passing rates in order to prevent the outflow of students to the competitors irrespective of the actual student performance. With an exception for a few schools with high academic and research ranking, Australian universities simply are neither in a position to enforce any reasonable pre-requisite requirements for their students nor are they able to afford strict assessment marking rules and, therefore, have to pass an unidentified proportion of students who actually failed subjects.

Although the literature on student academic integrity is abundant (see, for example, Bernardi, 2004; Magnus et al., 2002; Sheard and Dick, 2003; Hrabak et al., 2004; Rettinger et al., 2004; McCabe, 2005; Teixeira and Rocha, 2010), the evidence of cheating by academics is extremely limited. Some indications of result manipulation, such as absence of marks within a close proximity to the passing rate or the re-examination results published on condition of strict anonymity, do exist though. For example, Mikhailitchenko (2011) constructed a detailed histogram of a subject final results for an AACSB accredited Business School at an Australian university and found that there were no marks between 45 (inclusive) and the passing mark of 50. Further, at an overseas institution which was in the process of seeking accreditation with AACSB, diagnostic tests showed that more than a half of the students commencing their university studies after completing a tertiary preparation program couldn't handle basic arithmetic despite having passing grades in a foundation mathematics course that included not only arithmetic but also algebra, calculus and basic statistics (Mikhailitchenko, 2013).

Further complications for quality in tertiary education are stemming from the technological progress. Globalisation and ICT developments, unfortunately, do not only facilitate teaching and learning; they also facilitate contract cheating and contribute negatively to the existing quality problems (Teixeira and Rocha, 2010; Jacks, 2016; Mogul, 2016). Easy-to-detect but hard-to-prove contract cheating might reach a significant proportion of all submitted written assignments. However, given legal and technical difficulties as well as existence of internal political pressures within educational institutions when dealing with this problem, it is currently impossible to research and quantify the phenomenon for the industry as a whole beyond some basic exploration.

The recent move of the Australian Federal government to remove the cap on tertiary student enrolments (Norton, 2013) was a sensible solution to address the accessibility for the students and ease the financial constraints previously put on the institutions. However, by lowering the academic requirements for admission and overcrowding the lecture theatres

as it is happening across the world (Altbach et al., 2009) and with no increase in the number of teaching staff (Bexley, 2013), the government effectively allowed to lower the academic standards, which can be assessed by looking at the negligible changes in the attrition rates after the Australian Tertiary Admission Rank (ATAR) has been dramatically reduced (DIICCSRTE, 2013).

In 2012 the Federal Government of Australia established Tertiary Education Quality and Standards Agency (TEQSA) as a regulatory body in higher education responsible for quality and the standards (Massaro, 2013). TEQSA principles are based on the 2008 *Review of Australian Higher Education* (Bradley Review, 2008), which stipulated a move from norms and relative standing to standardised criteria in assessing academic achievements of university graduates. The very same approach was previously manifested but never applied by the TEQSA's predecessor, Australian Universities Quality Agency (AUQA) (Bradley, 2008). However, due to the certain limitations in its setting such as lack of academic experience of its commissioners and the complexity and confusion within this agency, TEQSA is unlikely to deliver what it was created for (Massaro, 2013). In addition, TEQSA, precisely following the steps of AUQA, is planning to measure the capability of institutions to deliver quality output rather than measuring the actual quality.

A more efficient and reliable solution for quality monitoring and assessing the outcomes would be a total separation of teaching from the other processes such as curriculum, assessment and administration. This can be achieved by the government launching a quality educational portal with high-tech teaching material and a universal access, setting up rich test banks for the subjects and introducing compulsory central final exams for all accredited institutions. Transparency and accountability in marking can be achieved by marking on-line on learning platforms such as Blackboard or Moodle with no exam paper containing any information about the students other than the USI.

Teaching function, where the quality of the output should be measured by the students themselves according to their expected final grades, doesn't require any monitoring or regulation beyond the requirement to publish the results and student satisfaction data. The market will be able to provide sufficiently strong signals to the teaching institutions and individual instructors regarding the quality of their input through the student demand for their services and not by the potential of the institutions to deliver as reflected in TEQSA's accreditation process. Competition between institutions, individual instructors and regional markers will result in selection of the best in the field and in a quick adjustment of teaching methods to the student needs with no absolutely government intervention.

Under the proposed system, despite universities disappearing in their current form, there will be no redundancy for the existing academics as dramatic reduction in costs of education will bring about an immediate increase in the number of enrolments. The government needs to regulate only the curriculum and assessment section and to some extent monitor the administration of examination venues, marking and record-keeping. The academics must be properly stimulated to take an active part in building test banks, developing quality teaching materials such as video lectures and tutorials and marking the exam papers with diligence and integrity.

5. Conclusion

The study looked at the process of higher education from the economic perspective and suggested to separate the four functions that are currently performed by each curriculum developing educational institution across the world. Curriculum and assessment, where the efforts of millions of academics are currently duplicated, are natural monopolies and, due to the commonly known failures associated with this marked structure, must be either owned or regulated by the government. The government is expected to introduce central examinations for all accredited institutions, set up learning portals and organise sufficiently large and constantly upgradable test banks. Certain degree of monitoring is required for academic administration including exam marking, where oligopoly might be a more appropriate structure due to the costs associated with the quality control.

The market forces are able to direct teaching to meeting the students' demand according to the students' needs and abilities with the final grades being the best indicator of the teaching quality. Tertiary educational institutions will compete for the students by employing the best instructors and providing the best learning facilities. Final examinations might be conducted at any time when the student demand is sufficient for profit generating, which, together with the removal of the need for advanced students to spend as much time in lectures and tutorials as for their disadvantaged classmates, deletes a duplication in teaching and learning effort.

Although the proposed change might look extremely radical and might require a lot of discussion to satisfy all stakeholders, everyone will benefit from this reform in the long run. With a sharp decrease in costs, the number of enrolments is expected to increase dramatically, which ensures employment for all existing teaching and administrative staff and a growing need for more of them. Despite one video lecture or tutorial replaces hundreds of thousands of them taught by tens of thousands of lecturers over several decades, it cannot substitute a face-to-face experience for those who are underprepared and prefer a blended mode of study. Students will have a range of benefits such as being able to earn for their education themselves, avoiding higher education debt and the removal of the requirement to complete high school and enrolling into a Bachelor degree starting as early as within two years before completing their secondary education.

Reliance on educational institutions in both neo-liberal and socialist approaches cannot yield any significant positive change because in cases of market failure the market agents cannot act in the best public interest. Educational institutions will not be interested in reforming themselves unless they have no other alternative. Therefore, the government must rely on individual academics and not on institutions in developing programs and courses, contributing to the stock of on-line teaching material and writing questions for the assessment banks.

We have reached a point of time when it is possible to move forward and, after making primary and then secondary education free several decades ago, initiate a reform that leads to a high quality low-cost universal higher education system up to a Bachelor or even

Masters level and reap off all social and economic benefits of a better educated society. The suggested reform simultaneously solves accessibility and quality issues at virtually no cost to the society and huge savings to the budget. This type of reform is desirable, possible and inevitable with the only question remaining of when and in which country it begins.

Note

- ⁽¹⁾ The author doesn't insist that the proposed changes must be the same for all study majors. However, the model does fit well in most Business degrees, where the author has sufficient experience in teaching, administration, curriculum and assessment development.

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Sustainability of social security systems in EU countries: Panel cointegration analysis with multiple structural breaks under cross-sectional dependence

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Abstract. *In this study, the sustainability of social security policies in EU countries was analyzed by panel data method with multiple structural breaks under cross-sectional dependence for the 1990-2013 periods. The existence of cointegration was tested by Basher and Westerlund (2009) method and series were found to be cointegrated. Cointegration coefficients were estimated by AMG method and it was determined that social security policies are sustainable in a weak form in these countries; when the social security systems' expenditure is increased by 1%, revenues are increased by 0.86% and revenues of the system cannot compensate the expenses. Austria has the highest rate of sustainability of the social security system while Ireland and Finland have the lowest rates.*

Keywords: social security system, sustainability; cross-sectional dependence; panel cointegration with multiple structural breaks; European Union.

JEL Classification: H55, P21, Q01.

1. Introduction

Many countries in the world spend a lot of effort to produce more goods and services with their factors of production in order to be more powerful in terms of politics and economics. Since companies encourage their employees to work and produce more, their working conditions often become worse and there is an increase in the risk of work-related accidents, ill-health or death. In this regard, the necessity of an advanced social security system, which guarantees the safety of life and property and a peaceful life during and after working, has become very important all over the world. Today, countries attempt to create an effective and sustainable social security system that provides a comfortable and happy life for their people. A social security system typically includes health care, maternity benefits, occupational accident benefits, old age benefits, unemployment compensation and survivors' benefits (ILO, 2014). According to the European Union (EU), the sustainability of a social security system depends on solidarity, universality, social justice and rights, the judicial process and democracy (Council of Europe, 2011: 13). A useful way of achieving the objectives of a well-designed and manageable social security system is having more information about the financial development and situation of this system (Settergren, 2008). In this context, more information is needed about the social security system in order to enable the sustainability of the public social security system and to eliminate future shocks and uncertainties. In general, social security systems face three basic problems:

- The rapidly increasing rate of aging.
- Changes in the labour market.
- Changes in family structures.

(ILO, 2001: 3).

Both developed and developing countries encounter these problems (Holzmann and Jousten, 2012: 606). The International Social Security Association (ISSA) examines demographic changes and transformations affecting the social security system under seven topics as follows:

- Aging.
- A smaller and more irregular family structure.
- Extensive transformations in the labour market.
- Urbanization.
- Mismatches in the life cycle.
- Changes in immigration and
- Changes in social structure.

(ISSA, 2010: 6-17).

The aging population results in huge financial pressure on public pension systems (Staubli and Zweimuller, 2013: 18). This problem is more urgent for some regions and countries (Table 1).

Table 1. *Projections of population aging in the world*

	Population over 60 (% of total population)					Population over 80 (% of total population)				
	2000	2005	2010	2030	2050	2000	2005	2010	2030	2050
World	9.9	10.2	11.0	16.5	21.9	1.1	1.3	1.5	2.3	4.3
Developed regions *	19.5	20.1	21.8	28.8	32.6	3.1	3.7	4.3	6.4	9.5
Less developed regions**	7.5	8.0	8.6	14.2	20.2	0.7	0.8	0.9	1.6	3.5

* Developed regions comprise Europe, North America, Australia/New Zealand and Japan. ** Less developed regions comprise all regions of Africa, Asia (excluding Japan), Latin America and the Caribbean plus Melanesia, Micronesia and Polynesia. Source: ILO (2011). World Social Security Report 2010/11: Providing Coverage in Times of Crisis and Beyond. ILO, Geneva, 139-143.

Considering Table 1, it is clear that aging of the world population will rapidly increase and the most important socio-economic problem countries will face will be their aging populations and the sustainability of their social security systems. In recent years, the elderly dependency ratio seems to have been constantly increasing in most of the developed countries. Due to this increase, the taxes received from the active population are insufficient to maintain state pension funds.

In 2010 years, 20% of the EU population was over 60 years old and this ratio is expected to increase by 2030 by up to 30% (ISSA, 2013: 2). Particularly the immigrant population in the EU is contributing to the aging trend (Bolzman, 2012: 100). In addition, the majority of EU countries are experiencing serious difficulties in maintaining their state pension systems (European Actuarial Consultative Group, 2012: 17).

Low fertility rates and increases in life expectancy have forced the majority of European countries to make important legal changes to the rules on early retirement (Angelini, 2009: 3) and increase the mandatory retirement age (UN, 2013: 56). Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy and the United Kingdom have all legislated to increase the retirement age (Fuente and Doménech, 2013: 114). Developed countries are trying to take precautions by encouraging extended participation of elderly people in working life and by promoting complementary private pension systems in order to reduce the financial burden of pension obligations on the state. (United Nations, 2013: 56). In this context, the EU Commission proposes implementation of the following components for the pension reform (COM, 2012: 10-14):

- Establishing a link between increasing life expectancy and retirement age,
- Limiting early retirement or other ways for early retirement,
- Promoting longer working life by improving access to lifelong learning programs,
- Improving the relationship between the quality of labour and enterprises,
- Improving employment opportunities for older people,
- Supporting active and healthy aging,
- Equalization of the retirement age of women and men,
- Promoting the complementary pension system to increase the retirement income.

In EU countries, tax incomes have become the most important source of income for all coverage and sustainability of social security systems (O'Cinneide, 2010: 47). An important means of increasing tax income derived from the active population is to increase the participation rate of the population that are of working age (Woods, 2000: 27). Information about the participation rate of the labour force in the countries is presented in Table 2.

Table 2. *Projections of labour force to population ratios at ages 15–64 in the world*

	Labour force participation rates of population at ages 15–64 (%)			
	2000	2005	2010	2020
World	70.3	69.9	69.9	69.8
Developed regions *	71.3	71.7	72.3	73.1
Less developed regions**	70.1	69.5	69.3	69.2

* Developed regions comprise Europe, North America, Australia/New Zealand and Japan. ** Less developed regions comprise all regions of Africa, Asia (excluding Japan), Latin America and the Caribbean plus Melanesia, Micronesia and Polynesia. Source: ILO (2011). World Social Security Report 2010/11: Providing Coverage in Times of Crisis and Beyond. ILO, Geneva, 155-159.

Considering the data presented in Table 2, the participation rate of labour force was 70.3% worldwide in 2000; however, it is expected to fall down to 69.8% in 2020. In social security systems with premiums, actuarial balance is the criterion is widely used for assessing the financial stability of social insurance institutions. Actuarial balance for any period is the difference between the present value of annual incomes in that period and the current costs in the same period (Plamondon et al. 2002: 52-53; Billig and Ménard, 2013: 46).

In recent years, the sustainability of social security systems has become one of the most important issues in developed and developing countries. There are many studies on this issue. These studies have often focused on testing the sustainability of a current social security system and the effects of reforms undertaken to improve sustainability. In this regard, in the study of Brugiavini and Galaso (2004), to determine the sustainability of the social security system and identify political impacts of the aging in Italy, it has been stated that the impacts of reforms are positive and some new steps should be taken. Fehr and Haberman (2006) investigated the effects of pension reforms developed to improve the sustainability of the current pension system in Germany and concluded that reforms mitigate this burden by fifty percent on future generations. Bloom et al. (2007), via panel data analysis was applied for 63 countries for 1960-2000 periods; they found that aging damaged the sustainability of social system in these countries.

Chateau et al. (2008) investigated the impact of pension reforms and aging on the capital and labour market in the United Kingdom, Germany and France and stated that sustainability of pension system is difficult to finance without debt in the long term. In the study of Zhang and Zhang (2009), which examined the relationship between human capital investments and economic growth, it has been determined that as the age of mandatory retirement gets lower, the level of savings and human capital reduces. In the same study, it has been stated that a lower mandatory retirement age reduces the growth rate.

Kitao (2013) tried to determine the sustainability of the US social security system by addressing the three social security policies as follows:

- Increasing income taxes by 6 points,
- Reducing one-third of the social aids allocated for employees,
- Increasing retirement age from 66 to 73 and reducing social aids provided for personnel.

In the analysis, it has been indicated that the social security system of the US is not sustainable. Staubli and Zweimüller (2013) studied the effect of increased retirement age

in Austria on employment and determined that increased retirement age increases employment rates of male workers by 9.75% and female workers by 11% and improves the sustainability of the social security system. Burz (2013) created the social security sustainability index utilizing the socio-economic characteristics of EU countries. According to the study, Sweden, Ireland, Netherlands, Luxembourg and Finland have the highest index values, whereas Latvia, Lithuania and Bulgaria have the lowest index values.

In the study of Miyazaki (2014), the impact of increased official retirement age on economic variables was investigated and it was found that increased official retirement age does not increase the amount of production and this policy may reduce the benefits of social security system. In the empirical study of Bonasia and Siano (2014) conducted in Italy, the factors negatively affecting the sustainability of social security system were determined as a worsening in elderly dependency, decline in the birth and employment rates and early retirement.

The aim of this study was to investigate the sustainability of social security systems in EU countries by using the data of revenues and expenses for the period of 1990-2013 via panel cointegration analysis with multiple structural breaks under cross-sectional dependence. In the second section of the study, empirical analysis was conducted and study was completed with results and suggestion sections. Considering the analysis methods and actuality of the subject, we believe that this study will provide a contribution to research on this subject and draw the attention of policy makers on this issue once again.

2. Analysis

2.1. Data set

In this study, logarithmic forms of the data for incomes (IN) and expenditures (EXP) of social security system of 12 countries (Belgium, Denmark, Germany, Ireland, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Switzerland) that we could obtain data sets of social security systems among EU15 countries for the period of 1990-2013 were used. The data was obtained from UNCTAD, the World Bank and IMF.

2.2. Model

In the study, the following model was developed, in order to examine the sustainability of social security policies, based on the Hakkio and Rush (1991) model, which was developed to analyze the sustainability of the budget deficit in the US and adapted to the analysis of sustainability of the current account in the US by Husted (1992).

$$IN_t = \beta_0 + \beta_1 EXP_t + \varepsilon_t \quad (1)$$

In the studies of Hakkio and Rush (1991) and Husted (1992), under the existence of cointegration condition, when $\beta_1=1$, the policies discussed are accepted as sustainable. Quintos (1995) has flexed this condition a little bit and stated that the relevant policy is

strongly sustainable if the coefficient is equal to one; however, it is sustainable in a weak form if the value of coefficient is between the range of zero and one.

2.3. Method

In the study, the relationship between cross-sections (counties) forming the panel was investigated by $CDLM_{adj}$ (Adjusted Cross-sectional Dependence Lagrange Multiplier) test, which was developed by Breusch and Pagan (1980) and adjusted by Pesaran et al. (2008). Stationarity of the series was tested by the method of PANKPSS (Panel Kwiatkowski-Phillips-Schmidt-Shin), which was developed by Carrion-i-Silvestre et al. (2005). This method considers the cross-sectional dependence and structural breaks in the series. The homogeneity of cointegration coefficients was tested by the method developed by Pesaran and Yamagata (2008). The existence of cointegration relationship between series was tested by the method developed by Basher and Westerlund (2009) which takes cross-sectional dependence and structural breaks in cointegration vector into account. Cointegration coefficients were estimated by using the AMG (Augmented Mean Group) method developed by Eberhart and Bond (2009) which considers the cross-sectional dependence.

2.3.1. Testing cross-sectional dependence

It is necessary to consider whether cross-sectional dependence significantly affects the results (Breusch and Pagan, 1980). Therefore, before starting the analysis, it is necessary to test the existence of cross-sectional dependence in series and cointegration equations, taking into account the choice of unit root and cointegration tests to be applied. Otherwise, the analysis will produce biased results (Pesaran, 2004: 14).

Studies to investigate the existence of cross-sectional dependence began with Berusch and Pagan (1980) CDLM test. This test gives biased results when the group average is equal to zero, but individual average values are not equal to zero. Pesaran, Ullah and Yamagata (2008) adjusted this deviation by adding variance and average value into test statistics. Therefore, its name was changed to $CDLM_{adj}$. The initial version of CDLM test statistics is as follows:

$$CDLM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \sim \chi_{\frac{N(N-1)}{2}}^2 \quad (2)$$

After making adjustments, the equation has become as follows:

$$CDLM_{adj} = \left(\frac{2}{N(N-1)} \right)^{1/2} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \frac{(T-K-1)\hat{\rho}_{ij} - \hat{\mu}_{Tij}}{v_{Tij}} \sim N(0,1) \quad (3)$$

Where μ_{Tij} represents the average and V_{Tij} represents the value of variance. The test statistics obtained from this equation show standard normal distribution asymptotically. The null of this is no cross-sectional dependence (Pesaran et al., 2008). In this study, the

existence of cross-sectional dependence in variables and cointegration equations was tested by $CDLM_{adj}$ test and the results obtained are presented in Table 3.

Table 3. *Cross-Sectional dependence test results*

Variables	Test statistics	Probability value
IN	7.419	0.000
EXP	7.111	0.000
Cointegration Equation	125.192	0.000

According to the results given in Table 3, the null hypothesis of the variables and regression model was strongly rejected and it has been concluded that there is a cross-sectional dependence among these countries. In this case, an economic shock suffered by one of these countries affects the others. Therefore, countries should consider practices of other countries while developing economic policies. In addition, while choosing methods to be used in the next steps of the analysis, test methods taking cross-sectional dependence into account were preferred.

2.3.2. Panel unit root test

The first problem encountered in the panel unit root test is whether cross-sections forming the panel are independent from each other. At this point, panel unit root tests are divided into two groups, namely first and second generation tests.

First generation tests are Maddala and Wu, (1999); Hadri, (2000); Choi (2001); Levin, Lin and Chu, (2002); Im, Pesaran and Shin, (2003) and Breitung, (2005) tests. These tests are developed on the assumption that cross-sections forming the panel are independent from each other and all cross-section units are equally affected by a shock received by a single unit of the panel. However, it is a more realistic approach that cross-section units are affected at different levels by a shock received by a single unit of the panel.

Second generation tests analyzing the stationarity by considering dependency between cross-sections are developed in order to correct this unrealistic approach offered by first generation tests. The major second generation unit root tests are Taylor and Sarno, (1998) MADF (Multivariate Augmented Dickey Fuller); Breuer, Mcknown and Wallace, (2002) SURADF (Seemingly Unrelated Regression Augmented Dickey Fuller); Bai and Ng (2004) and Pesaran, (2006a) CADF (Cross-sectional Augmented Dickey Fuller).

However, these tests give biased results, indicating that there is unit root when structural breaks exist in the series (Charemza and Deadman, 1997: 119). In order to correct these biased results, Carrion-i-Silvestre et al. (2005) have developed the PANKPSS test to check the stationarity of the series when cross-sectional dependency and multiple structural breaks exist. The aim of this test is being able to test the stationarity of the series in case of the existence of structural breaks in average values and trends of the series forming the panel. In addition, in each cross-section forming the panel, it allows structural breaks to occur at various numbers and different dates. Thus, the stationarity of the series can be calculated for both the whole panel and each cross-section separately (Guloglu and Ispir, 2011: 209). The test model is as follows:

$$Y_{it} = \alpha_{it} + \beta_{it}t + \varepsilon_{it} \quad i = 1, 2, \dots, N \text{ and } t = 1, 2, \dots, T \quad (4)$$

$$\alpha_{i,t} = \sum_{k=1}^m \theta_{i,k} D_{1i,t} + \sum_{k=1}^m \gamma_{i,k} D_{2i,t} + \alpha_{i,t-1} + u_{i,t} \quad (5)$$

$$\beta_{i,t} = \sum_{k=1}^n \varphi_{i,k} D_{1i,t} + \sum_{k=1}^n \delta_{i,k} D_{2i,t} + \beta_{i,t-1} + v_{i,t} \quad (6)$$

D_1 and D_2 are dummy variables and defined as follows:

$$D_1 = \begin{cases} 1, & t = T_B + 1 \\ 0, & \text{otherwise} \end{cases} \quad D_2 = \begin{cases} 1, & t > T_B + 1 \\ 0, & \text{otherwise} \end{cases}$$

In this equation, T_B represents the breaking point and allows structural breaks (m-times) in the constant term and structural breaks (n-times) in the trend. The Carrion-i-Silvestre et al. test (2005) was designed to allow up to five structural breaks. This test identifies structural break dates as the points, where the sum squares of residual has the lowest value, by following the procedure of Bai-Perron (1998). Bai-Perron (1998) proposed two different processes to determine the structural break points: The first one is based on a modified version of the Schwarz information criterion developed by Liu, Wu and Zidek (1997) and the second is based on F statistics. Carrion-i-Silvestre et al. (2005: 164) used the first process for the model with trend and the second process for the model without trend while determining the number of structural breaks. The null of this test is stationary. Estimated test statistics are compared with critical values calculated using the bootstrap (Carrion-i-Silvestre, et al., 2005: 164). In this study, the stationarity of the series was tested by using the PANKPSS method and test statistics obtained and critical values are presented in Table 4.

Table 4. Panel unit root test results

	<i>IN</i>	<i>Break date</i>	ΔIN	<i>EXP</i>	<i>Break date</i>	ΔEXP
Belgium	3.454	1993;2000;2007	1.737***	6.035	1993;2001;2007	0.910***
Denmark	0.956	-	0.759***	2.851	-	0.643***
Germany	0.488	1991;1994;2001	0.581***	0.386	1991;1994;2001	0.643***
Ireland	0.379	1996;2000;2005	0.196***	0.379	1996;2001;2006	0.040**
France	3.450	1993;1999;2005	1.968***	2.172	1992;2000;2006	0.050**
Italy	0.351	1995;2001;2006	0.073**	0.296	1995;2002;2007	0.060**
Luxembourg	3.396	1993;1999;2006	0.124***	3.772	1993;2000;2007	0.436***
Netherlands	0.164	1998;2002;2007	0.139***	1.487	1992;2001;2007	0.323***
Austria	4.203	1992;1998;2006	0.143***	4.132	1992;1998;2006	0.707***
Portugal	1.355	1991;1999;2005	0.140***	1.289	1991;1999;2005	0.837***
Finland	3.262	1993;2000;2006	0.174***	6.029	1993;2002;2008	0.110***
Switzerland	0.177	1992;1999;2009	0.135***	1.525	1992;2000;2009	0.106***
Panel	125.425	-	12.38***	173.998	-	45.80***

Note: Critical values are obtained with 1000 replication by using bootstrap. ** and *** shows 5% and 1% significance levels respectively. Structural break dates were determined by the model which considers breaks in level and trend. Because of the short time dimension of the data set, it is allowed a maximum of three structural breaks.

Considering the results given in Table 4, series were found to be non-stationary in levels for the whole panel and countries, they became stationary when their first difference is taken, that is $I(1)$. In this case, the existence of the cointegration relationship among the series can be tested. The test method identified the structural breaks in countries successfully. According to the results obtained, the years of 1992-1993 correspond to the

year when Maastricht criteria, which is also known as the Treaty on European Union, were accepted and the name of European Economic Community has been changed to European Community; the year of 1995 corresponds to the year when Austria, Sweden and Finland were accepted to the Community; the years of 1998-2000 corresponds to the year when non-member states Iceland and Norway were also included in the free movement area. In 2002, the Euro was accepted as the common unit of currency by 12 member states. In 2004, the number of member states increased up to 25 by including 10 more countries (the Czech Republic, Estonia, South Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia) and 27 in 2007 by accepting Bulgaria and Romania as members of the EU. In addition, the global economic crisis of 2008 significantly affected the data of the countries.

2.3.3. Testing the homogeneity of cointegration coefficients

The first studies regarding the homogeneity of slope coefficient in the cointegration equation was firstly conducted by Swamy (1970). The Swamy test was refined by Pesaran and Yamagata (2008). This test evaluates whether slope coefficients in the cointegration equation are different between cross-sections. The null of these slope coefficients are homogeneous. Pesaran and Yamagata (2008) have developed two different test statistics in order to test this hypothesis:

For larger samples:

$$\hat{\Delta} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - k}{2k} \right) \sim \chi_k^2 \quad (7)$$

For smaller samples:

$$\hat{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - k}{v(T, k)} \right) \sim N(0, 1) \quad (8)$$

Where, N : the number of cross-sections, S : Swamy test statistics, k : the number of explanatory variables and $v(T, k)$ standard deviation, respectively. Homogeneity test of the slope coefficient for Equation (1) was performed and results obtained are presented in Table 5.

Table 5. Slope homogeneity test

	Test statistics	Probability value
$\tilde{\Delta}$	-1.137	0.872
$\tilde{\Delta}_{adj}$	-1.212	0.887

According to the results presented in Table 5, the null hypothesis is accepted and slope coefficients were accepted to be homogenous in the cointegration equation. In this case, comments on the whole panel is reliable.

2.3.4. Panel cointegration test with structural breaks

This method, which was developed by Basher and Westerlund (2009), was used to test the existence of cointegration relationship between non-stationary series in level in case of the existence of cross-sectional dependence and multiple structural breaks. This method allows structural breaks in constant term and trend. The test statistics developed by Basher and Westerlund (2009: 508):

$$Z(M) = \frac{1}{N} \sum_{i=1}^N \sum_{j=1}^{M_i+1} \sum_{t=T_{ij-1}+1}^{T_{ij}} \frac{S_{it}^2}{(T_{ij} - T_{ij-1})^2 \hat{\sigma}_i^2} \quad (9)$$

Where:

$\hat{W}_{st}$ is the regression residual obtained by using any efficient estimator of the cointegration vector such as the fully modified least squares (FMOLS) estimator. $\hat{\sigma}_i^2$ is the usual Newey and West (1994) long-run variance estimator based on $\hat{W}_{st}$. $Z(M)$ becomes the following when it is abbreviated by taking cross-sectional averages as follows:

$$Z(M) = \sum_{t=T_{ij-1}+1}^{T_{ij}} \frac{S_{it}^2}{(T_{ij} - T_{ij-1})^2 \hat{\sigma}_i^2} \sim N(0,1) \quad (10)$$

The test statistic obtained is distributed normally. The null of this test is existence of cointegration. In the study, Basher and Westerlund cointegration tests (2009) were conducted and results are presented in Table 6.

Table 6. Panel cointegration with multiple structural breaks test results

	Test Statistics	Probability Value	Decision
No Breaks in Level	-0.365	0.880	There is cointegration
No Breaks in Level and Trend	1.914	0.016	There isn't cointegration
Breaks in Level	19.712	0.256	There is cointegration
Breaks in Level and Trend	-16.871	0.764	There is cointegration

Note: Probability values are obtained with 1000 replication by using bootstrap.

Considering the results given in Table 6, there is cointegration relationship between the series. According to this finding, it has been concluded that these series act together in the long term, long term analyses to be conducted with level values will not include spurious regression problems and the results that will be obtained will be reliable. In addition, structural break dates estimated in cointegration equations of the countries are given in Table 7.

Table 7. *Dates of structural breaks estimated in cointegration equation*

Countries	Structural break dates
Belgium	1993; 1997; 2008
Denmark	1996; 2001
Germany	-
Ireland	1998; 2008
France	1996; 2004; 2008
Italy	-
Luxembourg	1999; 2004; 2008
Netherlands	-
Austria	1994; 2007
Portugal	1995
Finland	1993; 2005
Switzerland	-

Note: Structural break dates were determined by the model which considers breaks in level and trend. Because of the short time dimension of the data set, it is allowed a maximum of three structural breaks.

Structural break points given in Table 7 were included by dummy variables in the process of cointegration coefficient estimation.

2.3.5. Estimating cointegration coefficients and error correction model

The first estimator developed to estimate cointegration coefficients in case of the existence of cross-sectional dependence is Pesaran (2006) *CCE* method (Common Correlated Effects). This method calculates the cointegration coefficient of the whole panel by taking the arithmetic mean of the individual coefficients using *CCMGE* (Common Correlated Mean Group Effects) method after estimating individual cointegration coefficients. However, it is more reasonable to say that the impact of countries on the overall panel varies due to the differences in their economies. In the *Panel AMG* (Augmented Mean Group) method developed by Eberhardt and Bond (2009), the result of the entire panel was calculated by weighting the individual coefficients and taking cross-sectional dependences into account. It is more reliable than *CCMGE* (Eberhardt and Bond, 2009: 1). The *Panel AMG* method can take both common factors and dynamic impacts in the series into account, produce effective results even in unbalanced panels and can be used in the existence of the endogeneity problem related to the error term (Eberhardt and Bond, 2009: 4). In this study, cointegration coefficients were estimated by the method of *Panel AMG* and results are presented in Table 8.

Table 8. *Cointegration coefficients and error correction mechanism*

Countries	EXP	D ₁	D ₂	D ₃	Constant	ECT _{t-1}
Belgium	0.91***	-0.016	0.015	0.006	0.87	-0.77***
Denmark	0.90***	-	-0.005	-0.059	0.83	-0.74***
Germany	0.88***	-	-	-	1.40	-0.70***
Ireland	0.70***	-	-0.019	-0.055	2.21	-0.52***
France	0.85***	0.004	-0.015	0.023*	1.75	-0.46***
Italy	0.96***	-	-	-	0.44	-1.01***
Luxembourg	0.90***	-0.003	-0.028	0.38	0.84	0.006
Netherlands	0.78***	-	-	-	2.32	-0.77***
Austria	1.02***	0.004	-	-0.006	-0.26	-0.68***
Portugal	0.94***	-0.061	-	-	0.49	-0.54**
Finland	0.70***	-0.068**	-	0.001	3.00	-0.51***
Switzerland	0.76***	-	-	-	2.26	-0.57***
Panel	0.86***	-0.011	-0.004	-0.004	0.93	-0.58***

Note: Autocorrelation and heteroscedasticity problems in estimations were corrected with Newey-West method. *, ** and *** %10, %5 and %1 significance levels, respectively.

According to the results presented in Table 8, since the coefficient of expenditure variable is smaller than one, social security policies in all countries are sustainable in a weak form. In these countries, when expenditures of the social security system are increased by 1%, their revenues also increase by 0.86% and revenues of the system cannot meet the expenditures. Austria seems to have the highest level of sustainability in terms of social security systems. In this country, revenues of the system exceed the expenditures and therefore their system is strongly sustainable. Ireland and Finland have the lowest level of sustainability for their social security systems. In these countries, revenues of the system can meet only 70% of the expenditures. The results are consistent with the studies of Chateau et al. (2008) and Burz (2013) in the literature.

In the analysis, the error correction model was estimated and coefficients of error correction term were also estimated by panel AMG methods. The findings are presented in the last column of Table 8. According to these results, the coefficient of error correction term was found to be negative and statistically significant in the panel in general and all countries except Luxembourg. Thus, deviations occurring in short term between the series acting together are eliminated and the series converges back to long-run equilibrium value. Long-term analyses for these countries are reliable.

3. Conclusions

In this section, the main findings of the study and various suggestions within the scope of analysis are proposed. In the study, the sustainability of social security policies were analyzed by taking logarithmic forms of the data for incomes and expenditures of social security system of 12 countries that we could obtain data sets of social security systems among EU15 countries for the period of 1990-2013 into account. The model to be estimated was developed by following Hakkio and Rush (1991), Husted (1992) and Quintos (1995).

The existence of cross-sectional dependence among countries was analyzed by $CDLM_{adj}$ test developed by Pesaran et al. (2008) and it has been decided that there is cross-sectional dependence among countries. Therefore, in the following sections of the analysis, second generation test methods considering this cross-sectional dependence was used. The stationary of series was tested by one of the second generation test methods PANKPSS developed by Carrion-i-Silvestre et al. (2005) and series were found to be non-stationary in levels, but they have become stationary in their first differences. The existence of cointegration relationship between series was tested by a method developed by Basher and Westerlund (2009) which considers cross-sectional dependence and structural breaks in cointegration vector. It has been determined that cointegration relationship exists between the series. The homogeneity of cointegration coefficients was analyzed by Pesaran and Yamagata (2008) method. Cointegration coefficients were estimated by AMG method, which takes cross-sectional dependence into account, developed by Eberhart and Bond (2009).

According to the results, social security policies in these countries are sustainable in a weak form. In these countries, when expenditures of the social security system are increased by 1%, their revenues also increase by 0.86% and revenues of the system cannot meet the expenditures. Austria has the highest level of sustainability. In this country, revenues of the system exceed the expenditures. Ireland and Finland have the lowest level. In these countries, revenues of the system can meet only 70% of the expenditures.

Based on findings of this study; the sustainability of social security systems in EU countries is partially weak and policy makers should take necessary measures by spending special effort in this area. EU countries couldn't overcome the negative impacts of the global crisis that took place in 2008 and there are countries such as Greece, Ireland, Italy, Spain and Portugal struggling with high public debt. It is clear, then, that having social security systems which don't have a deficit and positive effect on public deficit is important.

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The evolution of corruption and its current state – A case study on Romania

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Abstract. *This paper represents an overview of the corruption phenomenon that can take different forms depending on the actors involved: favouritism, fraud, nepotism, protection tax, embezzlement, influence peddling, bribery and extortion. No corruption would occur without the participation of companies, banks and governments which feeds and facilitate corruption through their actions. Companies pay bribes, neglect or refuses to disclose payments creating an environment conducive to misappropriation. Companies also exploit the gaps in laws for the poor but resource-rich countries to avoid taxes and depriving them of much needed income. Banks feed corruption by offering loans secured by properties with low transparency, thereby enabling money estrangement without citizens knowing this. More than that, banks have shown over time that they are willing to accept huge volumes of money from corrupt governments, officials or businessmen looking to draw income from the legitimate economy of the country without paying taxes. The model developed in this research paper represents a study created for the perception of the Romanian population regarding its awareness on corruption and national core values.*

Keywords: corruption, national values, governance, public institutions.

JEL Classification: D71, D72, D73.

1. Introduction

The governments of developed countries facilitate corruption by their failure to properly regulate laws on banks and companies, without putting in place legal and legislative mechanisms to reduce bribery, money laundering and other corrupt activities (Ackerman and Carrington, 2013, pp. 116-121).

Over time there have been periods when the scourge of corruption has exploded, “destroying” both the population and the country from an economical point of view.

The term corruption is used by Paul of Aleppo, when talking about governor of Craiova, which had the power to command, to confiscate goods and punish without reporting to the ruler of the country, voivode or prince, position which apparently has been suspended during the regime of Șerban Constantin: “... he abolished both the rank and exercise of that authority so it does not arise here wickedness and corruption.” (ASPSSRR, 1976)

2. Literature review on corruption and Romanian history

The research is opened by examples about the condition of Romanian aristocracy are offered by Nicolae Bălcescu in his work, “Romanians under Prince Michael the Brave”: “...The aristocracy was no longer representing anything, it has lost military virtues, it became corrupt.” (Bălcescu, 1998) He also talks about the betrayal of local landowners, who wanted to sell Mihai: “The sultan, who could not succeed to injure Mihai with the king and Báthori, was luckier near the Romanians, from which gain what he could not have from foreigners. Aga was sent to search between landowners what was most probably to find: corrupted people which for a vile ambition and greed stand ready to sell their landowners. A terrible conspiracy was formed, headed by the greatest: Dumitru, the oldest of the counsellors and Chiesar with a son of his own. (...) He put garrisons near the Danube, to receive his enemies who were ready to storm, and ordered to kill the traitors Dumitru, Chiesar and son, under the charge of guile and treason.” (Bălcescu, 1998).

Turkish chronicles categorize one of the former Prince of Moldavia as “corrupt”, his actions being seen like corrupt by the fact that he rebelled against the power of the Ottoman empire and gathered about 10,000 Moldovans to take hold of Iasi city on December 25, 1683 (Mehmet, 1980).

A description of Romanian nobility comes from Nicolae Iorga “The boyars is portrayed unfavourably. Generally bad raised, namely that servility, the common people flowing through the daily humiliation of the situation scribes. Some Moldavian landowner killed a Jew to rob him... he contributes to corruption class, which still holds all the power, for being a landowner is to be human.” (Iorga, 1929).

He also speaks about the actions of Știrbei Vodă against corruption and bribery “It reveals the action of Știrbei Vodă for justice to be done without bribery.” (Iorga, 1929).

During the XVII and XVIII centuries from 1711 in Moldova and 1716 in Muntenia, extremely difficult times will begin for our countries, corruption reaching unimaginable proportions, becoming a plague in the true sense of the word, mostly because the corrupt Turkish and Phanariote regime. The need to extort money by any means resulted in the selling the right to rule in Iasi and Bucharest to exorbitant amount of money and gifts to

the officials who intermediated business. The rulers had an ingenious strategy to pay debts: they brought their creditors with them, making them landowners in our country to enrich themselves, and finally to “extinguish” the debt by this mean. Thus, the amounts paid were recovered shortly and at the same time they had a nice living where they could be removed from the throne or resume the fight to regain the throne (Djuvara, 2002).

The campaign journal of General Louis Alexandre Andrault, Count of Langeron, French immigrant entered in the service of the Tsar, brings clarification on Phanariotes: “... there is no nation on the face of the earth more villains and villainous than Phanariotes.” (Djuvara, 2013). Also, Langeron says about Ion Gheorghe Caragea “... we can imagine how great was the wish of the Greeks to take possession of the Principates, if we see that prince Caragea, the most greedy and shameless of all these bastards, being called prince of Wallachia, after the peace (peace of Bucharest, 1812) has squeezed in six years from this miserable province, 93 million piasters – according to the exchange rate at that time, more than 50 million roubles. He spent about 5 or 6 million, he took with him 18 million when he run way (also diamonds and jewels), and 70 million went to the sultan, to its ministers and phanariotes...” (Djuvara, 2013). Not all Phanariot rulers were as Langeron says, some of them leading the country well, for example Constantin Mavrocordat which abolished serfdom or Alexander Ypsilanti who began a judicial reform in 1775.

In “Hieroglyphic History” Dimitri Cantemir talks about the implications of corruption and bribery in Moldova's relations with the Ottoman Empire and the forms in which this was known. Money from extortion and bribery “disappeared” into the greedy hands of Ottoman dignitaries. Those wishing to enter the grace of the Ottoman Empire, were required to comply the practice of paying bribes and gifts, practices maintained by the vizier: practicing “greed” and only afterward to tell grievances Cantemir expose these practices that ensured the success and influence of the Ottoman court (Cantemir, 1983). He condemns those who buy their throne because they pay “sacrifice” (money obtained by extortion of peasants through their sacrifice) to ingratiate themselves with the Sultan and his people, money that are raised by people sweat and extortion (Cantemir, 1983).

One of the most famous corrupted business is “Strousberg business (1868)” (Kogălniceanu, 1972), connected with the process of modernizing the country by building a railway critically needed by the United Principates. Unfortunately, this business ended by damaging the Principates, only two railway track sections being partially completed with some huge costs and inadequate technical conditions. The project was entrusted without any auction to the German company, Strousberg although the auction was mandatory under the law. More than that, companies from Spain and Austria interested in this project were outclassed by a company from Prince Charles's country of origin which has been accused of having favoured it (Gusti, 1938), though prices offered by this company were several times higher compared with those offered by competitors bringing (almost 27.5 million Romanian gold “lei” greater – Stoenescu, 2010, pp. 348-351). This decision was highly criticized at the time, especially because the prince's father was one of the company's shareholders (Radum and Iuga, 2013). Even more frustrating was the attitude of Germany and the “Iron Chancellor” Otto von Bismarck, who is said that Romanians interested him as much as an empty glass of beer, which was concerned with obtaining Strousberg liquidation business (Constantiniu, 1997). At the

end of Russo-Turkish War (1877-1878), the Romanian government under the management of Bratianu managed to buy back Strousberg shares nationalizing the railways, whilst managing to obtain recognition of the country's independence from the only major country that had a hard word in Europe diplomatic relations – Germany (Stoenescu, 2010).

The Hallier business (1896), involved the modernisation of the Constanta port and the construction of Constanta - Canara (Ovidiu) railway. Unfortunately, this investment has been a total failure, more than half of the loan given to the French company Hallier being spent without any conclusive results. Only a small part of the project was completed. Even if the interbellum period is seen as the most prosperous period in the contemporary history of Romania it was characterized by corruption, scandals that resulted in great losses and had implications at the highest level.

To the cases described above we can also add and Skoda business (1930) with a contract of more than 6 billion RON and an agreement to supply ammunition and weapons, including heavy artillery. The State was prejudiced by approx. 1.7 billion RON, classified information came into possession of foreign country representative, Romania supplied guns were about 25% more expensive than those sold to Yugoslavia and Romanian defence industry interest were endangered. But what proved to be the “trigger” to the whole scandal was the discovery of a codified list containing the names of Romanian officials who were bribed by the representative of Czechoslovak company (a spy under the observation of Romanian intelligence services) with the amount of 19.219.335 Ron. None of them have been convicted, except to the Skoda representative who took 5 years in prison. Subsequent judicial inquiry found that business had been concluded with the National Peasant Party leaders since the year 1928 (Stoenescu, 2010).

Another corruption case in the interbellum period was “Pavement” business (1933), which targeted the reconstruction of Bucharest infrastructure. Public works were made by companies belonging to Rudenberg family, close friends to mayor Pache Protopopescu. These companies had no work experience in the field and the price of this work was raised to 40 times more than the actual value. Also in the interbellum period the bankruptcy of Marmorosch Blank & Co. Bank became in suspicious circumstances, the institution being the largest and strongest bank in interbellum Romania (Radu and Iuga, 2013).

After 1989, corruption has taken an unprecedented scale and became a widespread corruption of Romanian society. Privatization of large factories, Caritas, CEC, FNI – national investment fund, Rosia Montana business, Bechtel business (a “Strousberg” business with highways closed for 1.3 billion euro), Microsoft and EADS business are few business known by public opinion. Influence peddling, embezzlement, money laundering, tax evasion, criminal groups were the prime concerns of Romanian dignitaries after 1989.

In accordance with the statistics from Transparency International, Romania has achieved in 2016 a score of 48, ranking 57th position in the ranking of 176 countries. Compared to the euro area and Western Europe this score ranks us before Bulgaria, Greece, Italy, and other European countries, classifying these countries as the most corrupt countries of the region (see Appendix 1 for full rankings).

Romania has nothing left to do than to live a titanic struggle against corruption, which it began to run through the events after the presidential election in November 2014. The fight against corruption gains Romania that rank 57, meaning this fight is getting results.

3. Corruption in Romania (methodology)

The study began in April 2014 and tries to synthesize the views of young people against corruption, morality and the values of the Romanian people. The study was conducted during April 2014 - January 2017 worth a total of 1505 responses.

The items in this form, both open and closed questions, address current problems of corruption in Romania. Questions also focus on the degree in which young people are concerned about the financial crisis, unemployment, governance weaknesses, infrastructure development or crime. The questionnaire was distributed exclusively online, targeting students in most universities and faculties in the country, the youth people and Romanians working abroad.

A representative sample size was determined for a population of 19,561,485 inhabitants, a maximum permissible error of 5% and a level of confidence of 95%:

$$n = t^2 * p * (1-p) / e^2$$

where:

t = accepted probability - theoretical value (usually t = 1,962, 95% level of trust);

p = Sampling feature in the total population, 0.50;

e = error permissible limit for representativeness – values between 1% and maximum 5%.

$$n = 1.962^2 * 0.5 * (1-0.5) / 0.05^2 = 384.9444.$$

Depending on the size of the population sample, result will be corrected as follows:

$$n_1 = n / [1 + (n-1) / N]$$

n_1 = corrected sample value;

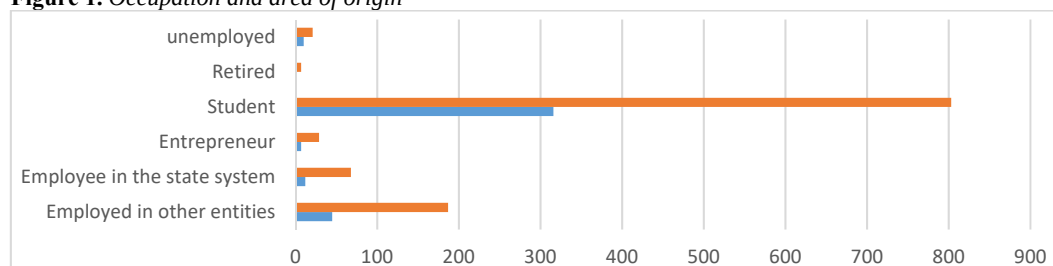
n = obtained sample value;

N = total population - 19.561.485 residents

$$n_1 = 384.9444 / [1 + (384.9444 - 1) / 19.561.485] = 384.93.$$

From the results above, we can see that for representation should we would need to survey 395 residents. As the research carried out targeted 1,500 questionnaires, the study falls into the category of representativeness.

Figure 1. Occupation and area of origin



Source: Author processing based on research conducted during April 2014 – January 2015.

Thus 1404 of the respondents are young people aged between 18 and 35, representing 93.3% of the total, mostly in urban areas.

Regarding the level of corruption in Romania, 922 respondents agreed that this is highly increased. 70.6% agreed that corruption began to rise after 1989 and consider that Romania's EU integration was a trigger for the growth of corruption.

Analysing views on corruption in public institutions, as seen in table and graph below, we found that respondents believe political parties and the government are the most corrupt in Romania, followed closely by the police, the media and the judiciary.

Table 1. Number of responses regarding the perception of corruption in state institutions

	Less Corrupt	Corrupt	High Corrupt	Share of Less Corrupt answers	Share of Corrupt answers	Share of High Corrupt answers	Total share
Politic parties	23	250	1232	0,6886%	4,3253%	20,7757%	25,7896%
Police	155	857	493	4,6407%	14,8270%	8,3137%	27,7814%
Army	970	433	102	29,0419%	7,4913%	1,7201%	38,2533%
Church	360	498	647	10,7784%	8,6159%	10,9106%	30,3050%
Government	26	351	1128	0,7784%	6,0727%	19,0219%	25,8730%
Mass-media	235	698	572	7,0359%	12,0761%	9,6459%	28,7579%
ONG-s	872	497	136	26,1078%	8,5986%	2,2934%	36,9998%
Judicial System	248	782	475	7,4251%	13,5294%	8,0101%	28,9647%
Educational System	311	768	426	9,3114%	13,2872%	7,1838%	29,7824%
HealthCare System	140	646	719	4,1916%	11,1765%	12,1248%	27,4929%
Total	3340	5780	5930				

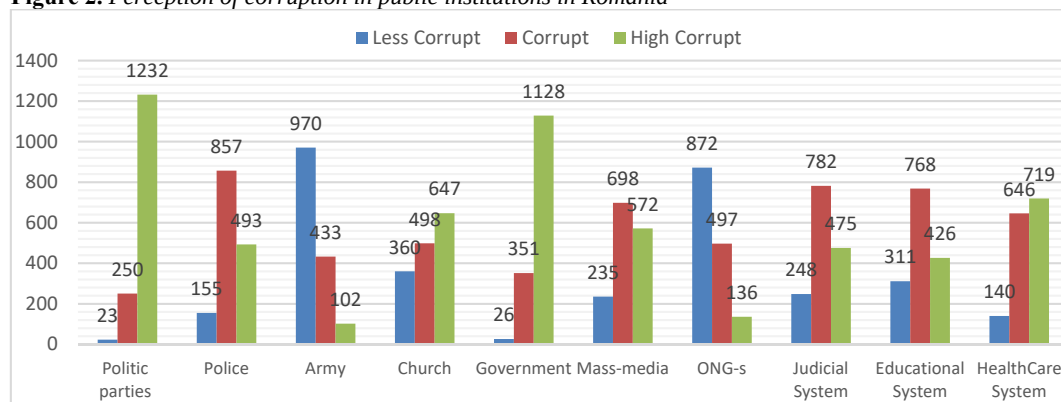
Source: Authors processing based on research conducted during April 2014 – January 2017.

The results are accurate if we take into consideration the corruption scandals involving government ministers, police, church officials and owners of media enterprises. From the responses, it appears that the army and ONGs are more the most trusted institutions, also categorized as the least corrupt.

4. Results and interpretations

Further, we will discuss the results and the interpretation of what our study acknowledged, introducing, first of all, perception of corruption in public institutions in Romania.

Figure 2. Perception of corruption in public institutions in Romania

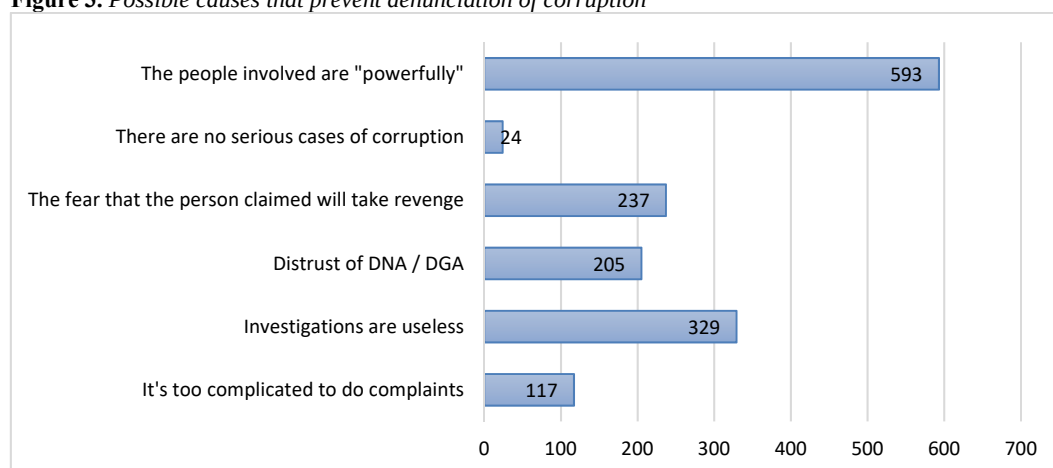


Source: Authors processing based on research conducted during April 2014 – January 2017.

Respondents admit that sometimes it is easier to circumvent official channels to solve some problems, and among the three systems, judiciary, health and education, the health takes top corruption. About 50% did not pay bribes, some of them acknowledge that they had paid a bribe to receive services to which they were entitled and the amount paid did not exceed 500 RON. When it comes to the reasons that give rise to corruption, most responses concluded that the main cause is carelessness and lack of involvement of state institutions, followed by low salaries, greed, the desire to win money easily and not least by “tradition” to offer bribe or “gifts”. An effective measure against corruption would be to penalize both those who receive bribes, and those who offer, strengthening this measure with the presentation of these cases in the media.

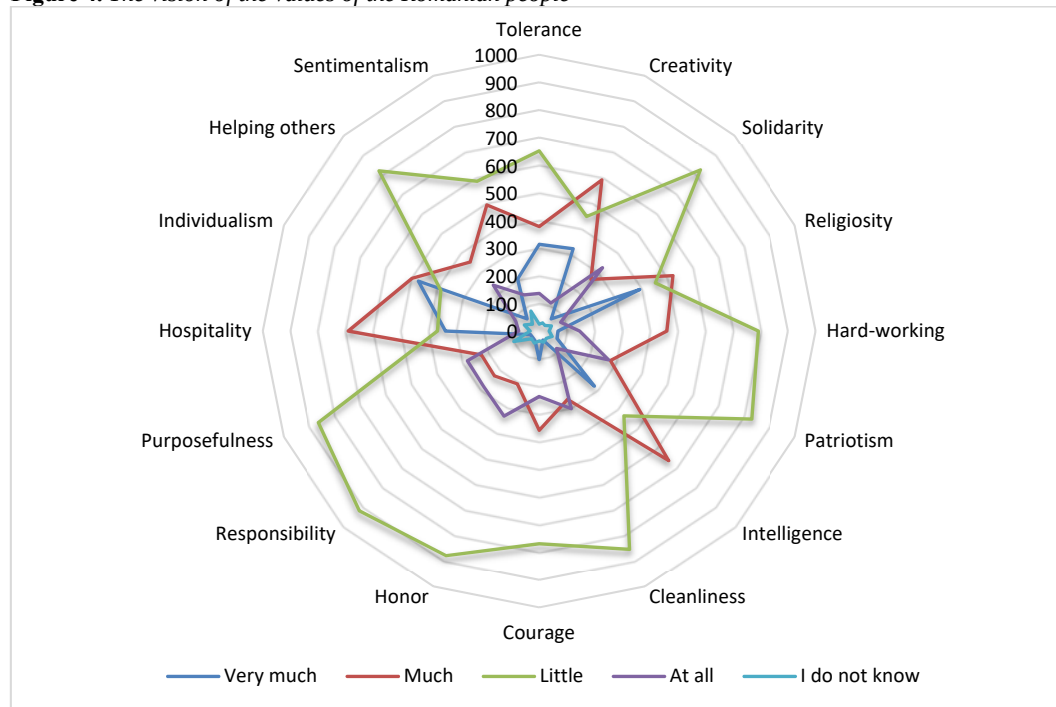
The actions of DNA prosecutors had a spectacular growth in past recent years. However, most of the respondents believe that the commitment in eliminating corruption was less effective, and this was due the lack of denouncing act of corruption (from causes we all know). Among the reasons that I have listed in the questionnaire, the most devote was the involvement of influential people, businessmen, senators, etc. The figure below shows most voted causes why acts of corruption were not denounced.

Figure 3. Possible causes that prevent denunciation of corruption



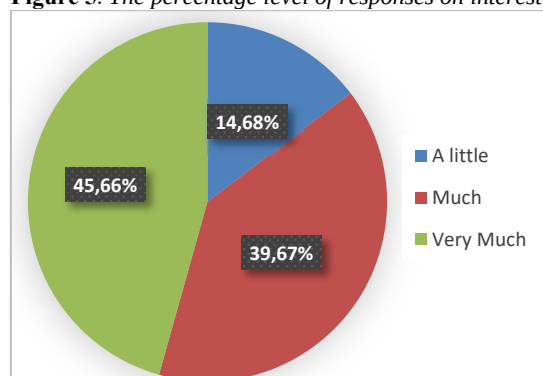
Source: Authors processing based on research conducted during April 2014 – January 2017.

Comparing the education system and the health, I noticed that health takes precedence in choosing the most corrupt of the two. To strengthen the study results we can look at the multitude of corruption acts and malpractice that occurred lately. The common practice of informal payments and doctors' negligence and incorrect treatments are generating tragedies. The analysis carried out showed that the phenomenon of corruption is highly accentuated in education, especially in higher education system.

Figure 4. *The vision of the values of the Romanian people*

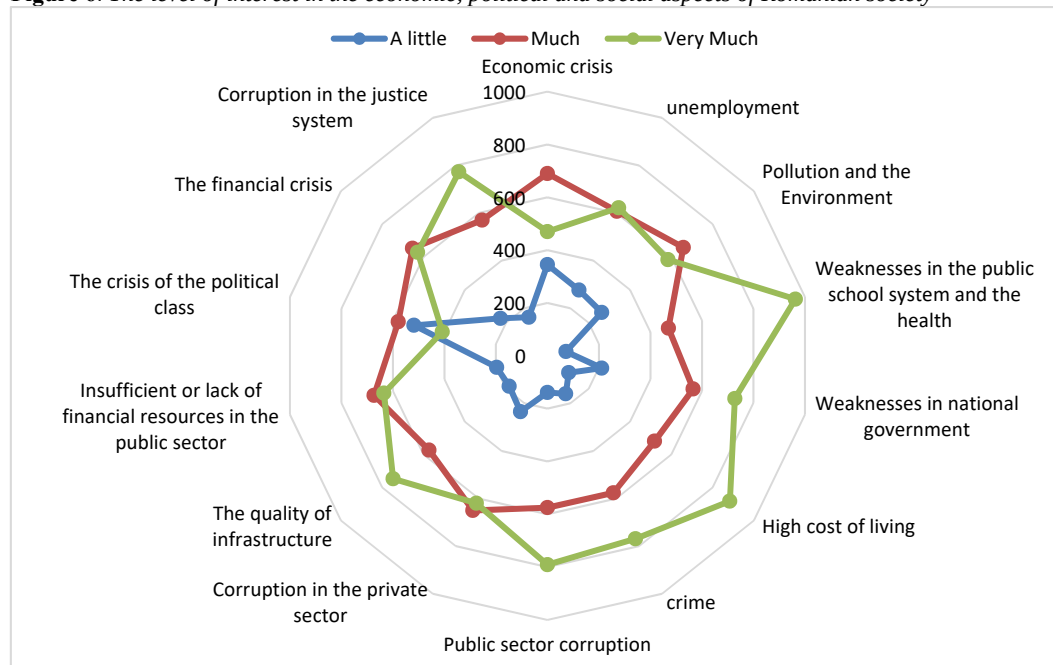
Source: Authors processing based on research conducted during April 2014 – January 2017.

According to the survey results, today's youth has little confidence in about the values of the Romanian people, although the history largely contradicts this. Of the 24080 respondents, 45.23% (10891) felt that these values can be found in Romanian, 26.94% were in favor of option “Long” and unfortunately only 11.76 of respondents believe yet these values. The remaining 16.6% is the computer “Not at all” and “do not know”.

Figure 5. *The percentage level of responses on interest in the problems of society*

Source: Authors processing based on research conducted during April 2014 – January 2017.

The last two diagrams are correlated, the above representing the percentage people who are worried about economic changes in the last period and the corruption in the public and private sectors, the second chart showing the responses for each option.

Figure 6. *The level of interest in the economic, political and social aspects of Romanian society*

Source: Own calculations using PRS Group database.

The fact is that 45.66% are very interested the country economic and financial problems, 39.67% opted for the middle option and 14.68% said that are interested in little aspects of the economic, political and social, fields largely because they think that they will emigrate from Romania in the future.

5. Conclusions

Corruption has existed and still exists, its total eradication being impossible mostly because its “tentacles” reached both political, social and economic fields. Over time consuls, dictators, kings, governors, popes, chancellors and presidents have led countries through corruption, the only ones who had to suffer from being the people who paid and worked hard for these leaders to be at the helm. The more corruption in the government the most inefficient this will be. Thus, corruption undermines the rational economic choices, lowers the confidence in market economy and banking system and increases the unemployment rate because the money necessary to pay wages are now going to the official’s pockets. Corruption also slows down the implementation of economic policies and interrupt the process of attraction of foreign investment. Corruption is a political phenomenon.

Subject to any form of corruption is a man of power, including government officials, companies and various institutions. Where is power there is corruption. The more power the most easier ways to carry out illegal activities. Corruption can influence effectiveness, justice and legitimacy of state activities. Corruption questions the future of youth around the world, the only hope is that the measures implemented at national and international level to bring the desired effect.

International organizations like Transparency International or the International Anti-Corruption Academy (IACA) pull the alarm signals each year by publishing studies conducted internationally. The United Nations has ratified the United Nations Convention against Corruption (UNAC), signing the agreement obliging signatory countries to respect the law and to fight corruption regulated. GRECO, has the same objective: identifying corruption and the fight against corruption. Organisation for Economic Co-operation and Development – OECD analyses existing corruption especially in countries seeking to entry into the organization (Romania has applied in 2014). The fight against corruption in Romania is very effective lately, more and more cases being discovered and presented in the media.

The study conducted revealed the mistrust that young people are having in state institutions and that they no longer believe in honesty, honour, kindness and heroism, values for which our ancestors fought for from ancient times up to the War of Independence, first world war and Second world war, in which they gave their lives to defend this “piece of land” which is called Romania.

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Exports in the European Union sub-models. Determinants and performances

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Abstract. *The aim of this paper is to identify the potential patterns within European Union sub-models, knowing the social and economic performances that characterizes them. Also, based on an econometric model with panel data, covering the period of 2000 to 2013, we want to highlight the relation between sub-models' exports competitiveness and their sensitivity to the fluctuations of several factors considered relevant in this study, such as: the share of tertiary education graduates, the unit labour cost and the investments.*

Keywords: sub-models, exports, social benefits, competitiveness, unemployment trap.

JEL Classification: C5, D63, F15, R23.

Introduction

In the last 50 years, the literature about the socio-economic patterns from the European Union highlights several sub-models having economic, social and institutional features relatively similar, as well as performances or effects which tends to be relatively homogenized.

This paper examines the socio-economic performances of the European Union' sub-models, their specific characteristics in the European economic landscape and how the sub-models features affect the external competitiveness of the countries that are part of them.

Thus, this paper was divided into three distinct sections presented in the following paragraphs. In the first part of the article we performed an analysis of the main characteristics that tend to homogenize European sub-models as it emerged as a result of the theoretical background. We also followed the key factors that influence the performance of socio-economic sub-models, being focused specifically on the most important researches in this field, starting with Richard Titmuss (1974) and continuing with Gøsta Esping-Andersen (1990) and Aiginger and Leoni (2009).

In the second part of our approach we presented the performances recorded by the European sub-models in terms of labor market, ability to generate social equity and external competitiveness of the countries that compose them. In this regard, we utilized indicators such as the employment rate and the unemployment rate, the unemployment trap, the magnitude of inequalities regarding the income, the trade union level, the social protection expenditure per capita, the level of protection for employees and the gap level of protection regarding employees with normal employment contracts (permanent contracts) and with atypical employment contracts (usually on temporary period) etc.

Finally, the third part of the paper is a quantitative section. Based on an econometric model using panel data, we analyze factors that may explain sub-models export competitiveness and their sensitivity to several explanatory variables fluctuations included in the model. For this, we used as independent variables indicators such as: the share of population with tertiary education, the value of foreign investments, R&D expenditure etc. Data series have covered the annual frequency and time horizon from 2000 to 2013.

1. Main characteristics that homogenize the EU sub-models

As a result of literature review regarding the European Social Model we may say that it is difficult to talk about a single European Social Model, in terms of homogeneity, unicity in the European Union, but there are some related trends that can be identified at a regional level. However, over the past decades there have been researchers such as: Esping-Andersen (1990), Aiginger and Leoni (2009), Leibfried (1992), Ferrera (1996) and others, that made several efforts in shaping a few various regional typologies in today's well-known (sub)models.

This analysis is more interesting as we focus on the European Union's slowness development in the recent years, especially since the enlargement process has brought its inevitable intra-European heterogeneity. In addition, internal and external risks such as

international competitiveness, aging population and the increase of migratory phenomenon are elements that put additional pressure on the ability of European countries to quickly adapt.

In this context, as Aiginger and Leoni (2009) suggested, the theoretical and practical attempts to group European states in socio-economic (sub)models more or less homogenous is a first way of homogenization and "exhaustion" of complex differences between countries, at least at the level of some aggregated indicators.

The differences between states are often highlighted by the challenges that the European welfare state have to face. The European welfare state's modern bases started in the early 1940's - under the significant influence of Beveridge's ideas (1942) and developed especially in the postwar period, when social protection assumed and taken by national governments (level of redistribution, intervention and financing schemes, regulations) expanded significantly (Ştefan, 2015).

Richard Titmuss began his research with the study of welfare state expansion and founded three types of social models, emphasizing that "the purpose of constructing models is not to admire the architecture of each of them, but to discover some order into the factors disorder" (Titmuss, 1974). In this way, the British researcher formulated few socio-economic models through three key pillars of individual welfare, namely: (i) market; (ii) family and (iii) State (social institutions), thus identifying three contrasting typologies:

- *The Residual Model*, based on the premise that there are two natural channels through which the individual's needs are appropriately aligned, namely: market and family, while social institutions will intervene only when this link will diminish.
- *The Industrial Model* argued that social needs stands on work performance and productivity. This is the result of many theories that support the strong connection between incentives, reward, effort and loyalty.
- *The Institutional/Redistributive Model* incorporate social welfare as an important institution in society, being sketched on fundamentals that support social equality. Social equality is achieved through government intervention and redistribution, which is considered necessary, given the multiple effects of the market and thus of social change.

According to Titmuss (1974), all three models listed above involved a careful approach of ethic work and family institution in modern society. Subsequently, complex work of Esping-Andersen, *The Three Worlds of Welfare Capitalism* (1990) highlighted the various agreements between the same factors approached by Titmuss, namely: state, market and family, identifying in turn three types of welfare states:

- *The liberal model* represented by countries such as: Canada, USA and Australia.
- *The corporatist model*, in which they were embedded countries features such as: Germany, France and Italy.
- *The social-democratic model* considered to be the least widespread, being representative at that moment only for Norway and Sweden.

In this regard, Esping-Andersen revealed that the liberal model is one in which universal transfers were modest, the progress of social reform being marked by the phrase according to which the welfare limits is represented by the desire of choosing social benefits beyond

work. The state encouraged the market passively by guaranteeing minimum benefits and actively by subsidizing private welfare schemes.

On the other hand, the corporatist model seemed to be one in which the obsession of market efficiency is not visible. Moreover, the corporatist regime stood the Church's influence, which is why preserving the traditional family was one of its commitments. The state made itself remarkable once the family wouldn't have the possibility to help their members.

Finally, the social-democratic model promoted a welfare state outlining equality to the highest standards. In this way, the working class benefited from the same social rights as the "white collars". Thus, "All benefit, all are dependent and all will presumably feel obliged to pay" (Esping-Andersen, 1990, p. 36).

Therefore, on the writings made by two authors mentioned above and those summarized in Table 1, in Europe can be distinguished three social-economic models: (i) the Anglo-Saxon model (liberal), (ii) the Scandinavian model (social-democrat) and (iii) the Continental model (corporatist) – shaped by Esping-Andersen (1990) and based on the pioneering work conducted by R. Titmuss (see also the work of J.G. Andersen, 2012), to which were added the Mediterranean model (southern) and the catching-up model constructed with Central and Eastern Europe countries (new member states).

Table 1. *Authors who have shaped the EU socio-economic models*

1974	R. Titmuss	The Residual Model The Industrial Model The Institutional Model
1990	G. Esping-Andersen	The Liberal Model The Corporatist Model The Social – Democratic
1992 1996	S. Leibfried M. Ferrera	The Southern Model
1999	B. Ebbinghaus	The Northern Model The Central Model The Southern Model The Anglo-Saxon Model
2004	Kohl-Platzer	The New Member States Model
2009	K. Aiginger T. Leoni	The Scandinavian Model The Continental Model The Liberal Model The Mediterranean Model The New Member States Model

Source: Based on Titmuss (1974), Esping-Andersen (1990), Leibfried (1992), M. Ferrera (1996), B. Ebbinghaus (1999), Kohl-Platzer (2004) K. Aiginger, T. Leoni (2009).

Starting the scientific approach with the works mentioned above it becomes necessary to achieve a recent perspective from a comparative presentation of the theoretical models, given the risks that the EU's economy is currently experiencing (higher unemployment rates, fiscal consolidation and high public debts, the increase of people at risk of poverty, the decrease of fertility rates, the aging of population etc.).

These being said, the Scandinavian sub-model, considered to be an example for other member states (sub-models) is a pattern that managed to combine both equity and efficiency (Sapir, 2005; Socol et al., 2009), stands on the foundation of a not so easy

evolution. The countries from this sub-model (see Table 2) have passed through critical and important reforms at the end of the twentieth century, implementing some measures to make a more flexible labor market, reforms in social protection and fiscal adjustments, but they showed strong generosity of social security systems. Dealing with the spread of globalization, the situation of competitiveness in the countries was often questioned, but it seems that they proved to manage in a suitable way their advantages and disadvantages (see Ludo Van der Heyden's presentation at the conference Beyond the European Social Model: Refresh or Reform, 2006).

According to the study conducted by Aiginger and Leoni (2009), among the factors that favored the outstanding performances of the northern sub-model are included the high rates of employment and, in particular, the support of women's participation on labor market. Also, many public institutions which aimed the inclusion had supported the innovation, the quality of education, hence the allocation of significant public expenditure for research and development, education and IT&C. Thereby for better adaptation to new global requirements – note the two authors – the good cooperation between key institutional actors in society had an important role: the government, experts/specialists in economics, employers and trade unions.

On the other hand, *the liberal sub-model* highlights the individuals' responsibility towards themselves, social transfers are considerably lower than in other sub-models, and there is also a low labor market regulation. The state has a minimal role, while markets designed the redistribution of wealth.

At the crossroads made by the characteristics of the two sub-models mentioned above is *the continental sub-model*, which focuses on employment as the basis of transfers. In these countries (Table 2) benefits are moderate, tightly related with the revenues. Here, as in the northern sub-model we can see wage bargaining systems, trade unions, revealing finally a regulated labor market.

The Mediterranean sub-model shows a relatively low level of social transfers to support individuals, but that is balanced by the family support. In the countries belonging to this model (Spain, Italy, Portugal, Cyprus, Malta and Greece) can be notice the low rates of female participation in labor market, with them having as priority most of the housework, rather than being employed.

Both southern and continental sub-model are characterized by high expenditures for the elderly (pensions and health care), which indicates their poor participation in the workforce and a predisposition for early retirement. Another difference refers to the weak involvement of the State (social transfers) for families with children and also for young people.

The New Member States are highlighted primarily by different historical trajectory that followed after the Second World War. The fact is that after the fall of the Iron Curtain and the collapse of the communist system, replacing one social system with one that revolves around the market was not easy, Central and Eastern European countries facing deep crisis in that period. So, the catching-up process began only in the mid of 1990s.

Trying to assign them to one of the four sub-models, noticed in the developed countries of the European Union, it was concluded that none of them can be applied to the Central and Eastern European countries (Kohl-Platzer, 2004). The mix of policies and institutions for which they had applied after the 1989's events offer unique features to the New Member States sub-model.

Ultimately, it is characterized by heterogeneous social models that incorporate specific elements of the socialist system under which they previously served. In the context of the trinom market - state - family, the catching-up sub-model shows a behavior devoted to the market in terms of social perspective. Also, the state involvement in the common medium, public medium (parks, infrastructure, the educational system etc.) and family participation in supporting the individual are quite visible. Regarding the labour market, we can notice a low participation both from women and elderly population; also, long-life trainings programs are not part of the national priorities.

Table 2. *Characteristics of the EU social-economic sub-models*

Sub-models	Countries from the sub-models	Characteristics
The Scandinavian Sub-model (Northern)	Sweden Finland, Denmark	<ul style="list-style-type: none"> ▪ High degree of redistribution ▪ Flexicurity on the labor market ▪ High cooperation between social partners, trade unions and Government ▪ Pronounced fiscal requirements (progressive type) ▪ Includes some of the most competitive European economies ▪ High awareness for the importance of environment
The Anglo-Saxon Sub-model (Liberal)	UK, Ireland	<ul style="list-style-type: none"> ▪ Presents a more liberal approach, very closed to the US one ▪ Social assistance is limited ▪ The labor market is not regulated, job search lies to the individual ▪ Relatively low fiscal requirements ▪ High income inequality
The Continental Sub-model (Corporatist)	France, Germany, Luxemburg, Belgium, Austria, The Netherlands	<ul style="list-style-type: none"> ▪ Large level of redistribution, but less pronounced than in the northern sub-model ▪ Occupation is the basis of social transfers. ▪ The labor market is regulated. ▪ Relatively high fiscal requirements, which contribute to inhibiting the private sector in terms of job creation ▪ Large social benefits for the unemployed, causing inactivity traps and high unemployment
The Mediterranean Sub-model (Southern)	Spain, Portugal, Italy, Greece, Malta, Cyprus	<ul style="list-style-type: none"> ▪ Large social expenses with the elderly population, particularly with pensions and health care ▪ The labor market is segmented, dual and regulated ▪ An abundance of family businesses and family enterprises ▪ The individual gets a high support from the family ▪ Reduced flexibility of the labor force, which contributes to high rates of long-term unemployment
The New Member States Sub-model	Poland, Czech Republic, Slovakia, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania, Hungary, Slovenia	<ul style="list-style-type: none"> ▪ Mix of policies and institutions ▪ Significant differences between the national systems of the countries that are part of the sub-model ▪ The labor market is regulated ▪ Low level of social security ▪ Differentiated fiscal requirements

Source: Based on Esping-Andersen (1990), Aiginger and Leoni (2009).

2. Social-economic performances and competitiveness in the European sub-models. Empirical evidences

In the tables below (Table 3 and Table 4) we grouped the EU countries in those five sub-models (clusters) that are promoted in the literature and we highlighted the value of various economic, social and institutional indicators, comparing the levels from 2008 to those from 2014 or the most recent year for which data were available. Each sub-model average was calculated using the weighted average formula, indicators being multiplied by the share of each country in total population of the sub-model in which was included until the 1st of January 2015:

$$\text{Submodel's average } j = \sum \frac{\text{Country population } i}{\text{Total submodel population } j} * \text{Indicator } X i,$$

where:

i – the member country of the sub-model;

j – European sub-model;

X – the indicator.

As it can be seen, the largest sub-model in terms of population is the continental sub-model, followed by the Mediterranean one, the NMS sub-model, the Anglo-Saxon sub-model and the northern sub-model. From the perspective of indicators covering the labor market, like: the employment rate for the active population (15-64 years) and the unemployment rate (15-64 years). We can observe that the best performance was reflected both in the pre-crisis and post-crisis period in the northern and the Anglo-Saxon sub-models, the existing institutional arrangements and the business development favoring relatively high employment rates above 70%. In a similar way, in 2014, continental sub-model recorded similar levels as in the pre-crisis period, in terms of employment rate.

On the other hand, the southern sub-model is the one that faced the highest increase in unemployment in 2014, of around 9.6 percentage points, from 8.5% in 2008 to 18.1% at the end of 2014, an increase which reflects both the negative output gap existing - partially supported by the tight credit and the fiscal consolidation measures implemented by national governments - and also the institutional problems that generate a pronounced character of stiffness for labor markets in this sub-model's economies.

Among the new member states from Central and Eastern Europe there has been a recovery in terms of employment rate, but unemployment is present at a high level, still 2.4 percentage points above that recorded in 2008.

Table 3. Social-economic indicators from the European sub-models

	% EU Pop.	Employment rate (15-64)		Unemployment rate (15-64)		Gini index after transfers	
		2008	2014	2008	2014	2008	2014
Northern sub-model	4.1%	74.4	72.7	5.5	7.8	24.9	26.0
Anglo-Saxon sub-model	13.7%	71.2	71.2	5.7	6.4	33.6	30.2
Continental sub-model	36.4%	68.4	69.4	6.9	7.4	29.5	29.3
Southern sub-model	25.5%	61.2	55.3	8.5	18.1	31.6	33.4
NSM sub-model	20.3%	60.8	62.3	6.6	9.0	31.0	30.9

Source: Eurostat, October 2015.

In Table 4, presented below, we examined three indicators tracking the institutions governing labor relations. The first two indicators, the protection of individual employees with an employment contract for an indefinite period (normal EPL) and the indicator on the protection of individual employees with contracts for a fixed/temporary period (temporary EPL) were provided by the database of the Organisation for Cooperation and Development (OECD), and union density rate was provided by the database of the International Labour Organisation (ILO). As in the case of the indicators calculated on Table 3, figures represent weighted averages of indicators.

Generally, there is a decrease of all three indicators analyzed between 2008 and 2013, less in terms of union density rate from the Mediterranean sub-model, which increased by one percentage point. In this case employees opted for this solution (trade unions) so that their rights could be better represented and they could obtain an additional protection. However, expanding temporarily horizons until the early 2000's it can be observed that there was a deregulation in the area of labor relations, in some states indicators had significantly decreased, especially in terms of union density rate.

This trend was guided and promoted by the Lisbon Strategy - which debuted in 2000 - under the so-called concept of "flexicurity", so governments had implemented national legislation labor codes to support labor market flexibility and the companies' ability to adjust the number of employees or the hours worked by the employees to the economy's demand.

According to the ILO data, there were very large percentage decreases especially in the countries of Central and Eastern Europe (CEE). Between 2000 and 2013 the biggest reductions in union density rate in CEE were held in Slovakia (58.8%), Estonia (58.4%), followed by Lithuania (52.2%), Hungary (52, 1%), Czech Republic (51.9%), Slovenia (49%) and Latvia (48%). In Bulgaria, the decrease rate was 30% between 2000 and 2012 and for Romania the data covering 2002-2012 show a decrease of 44.9%.

Table 4. *Institutional Indicators of the EU sub-models*

	% EU population	Normal EPL		Temporary EPL		Union density rate	
		2008	2013	2008	2013	2008	2013
Northern sub-model	4.1%	2.4	2.4	1.3	1.5	68.1	67.8
Anglo-Saxon sub-model	13.7%	1.3	1.1	0.4	0.6	27.4	25.7
Continental sub-model	36.4%	2.6	2.5	2.4	2.5	17.6	16.9
Southern sub-model	25.5%	2.7	2.4	2.9	2.8	25.5	26.5
NSM sub-model	20.3%	1.5	1.4	1.4	1.5	20.2	14.7

Source: Eurostat, OECD, International Labour Organization, October 2015.

On the other hand, in terms of legislation regarding the protection of workers, the member states for which data was available had tried to support increased flexibility on the labor market by reducing the degree of protection for employees, but also by reducing asymmetry between the protection offered to employees on determinated contracts and those with temporary contracts.

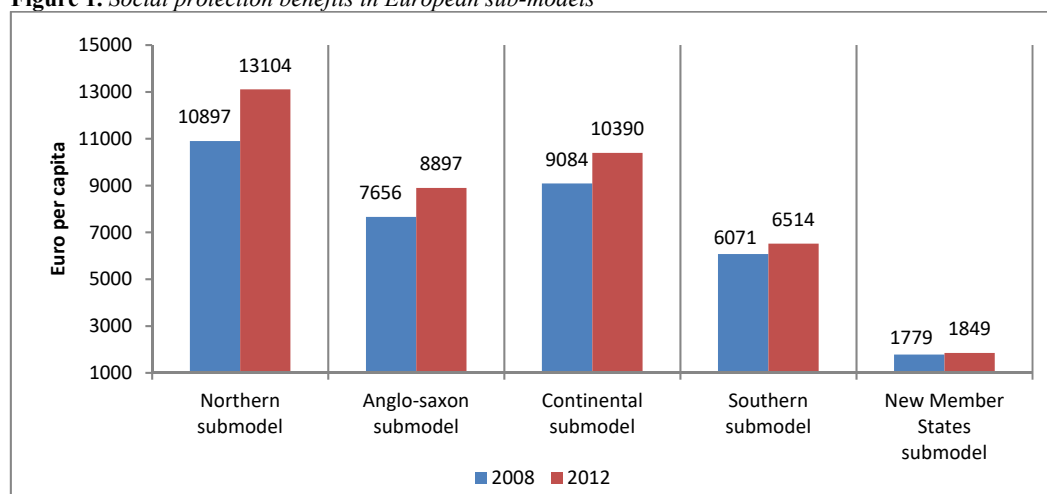
The effects of this problem regarding asymmetry were observed in the post-crisis period in states from the southern sub-model, where the duality of labor markets and high unemployment among young people have raised important problems to the governments.

Therefore, structural reform programmes targeted the labor market, especially in Portugal, Greece and Spain, where the protection index of the employees with indefinite period contracts has decreased considerably.

One of the most important features of the social and economic European models aims welfare systems by which governments intervene to improve the condition of individuals. Thus, in terms of generosity of social protection systems, measured through social protection expenditure per capita allocated, the northern sub-model is the one that has the highest rates, as shown in Figure 1.

In the northern sub-model, social protection expenditure per capita made by governments were in 2012 over EUR 13,100, followed by the continental sub-model, with EUR 10,390 per capita, and by the Anglo-Saxon sub-model, with almost EUR 8,900 per capita.

Figure 1. *Social protection benefits in European sub-models*



Source: Eurostat.

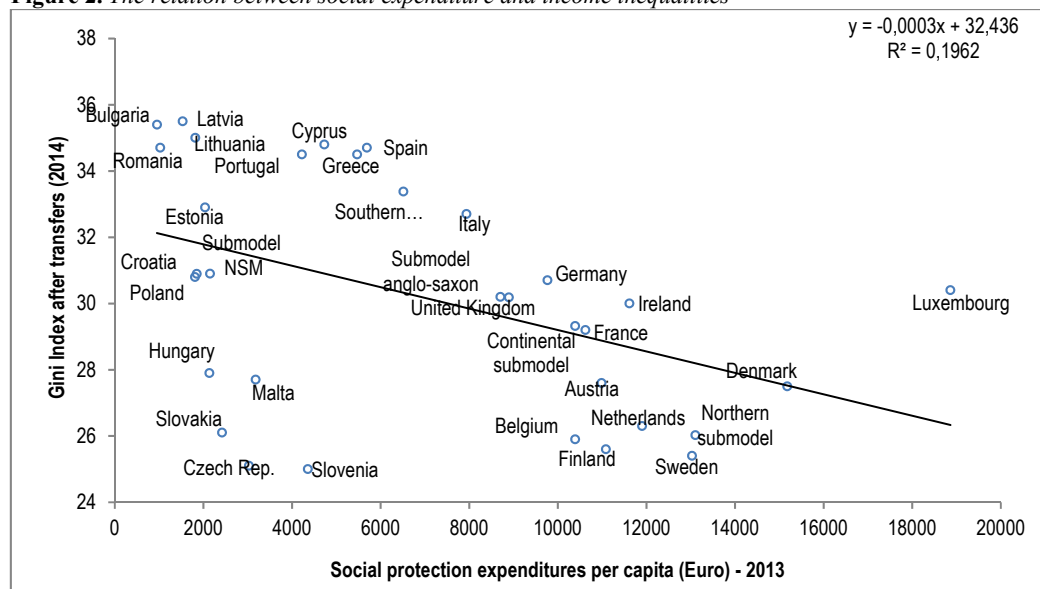
The results, in terms of poverty rate and inequality of income are significantly better in the northern sub-model compared to other European sub-models, because of the relatively high social spending (as social benefits allocated per capita and as share of GDP) and as a result to the large number of employees who are covered by trade unions.

Thus, income inequalities after transfers tend to be smaller in northern and continental sub-models, while in countries from sub-models that redistributes less, such as the southern and the New Member States sub-models, inequalities in income are significantly higher (see Figure 2 below). Additionally, we should take into account that the northern and continental sub-models have progressive systems of income taxation on individuals (personal income tax).

On the other hand, the rate of poverty reduction is heterogeneous. As shown by Ştefan (2015) poverty rate is reduced by less than 25% in countries such as Latvia, Poland, Italy, Bulgaria, Greece and Romania; while poverty rates are reduced by 50% in the Netherlands, Finland, Denmark and Ireland, these countries being known for having some of the largest social protection expenditure per capita. As a whole, there is negative correlation between

allocations store achieved through social protection systems and the degree of reduction poverty (poverty threshold is set at a level of 60% of median income).

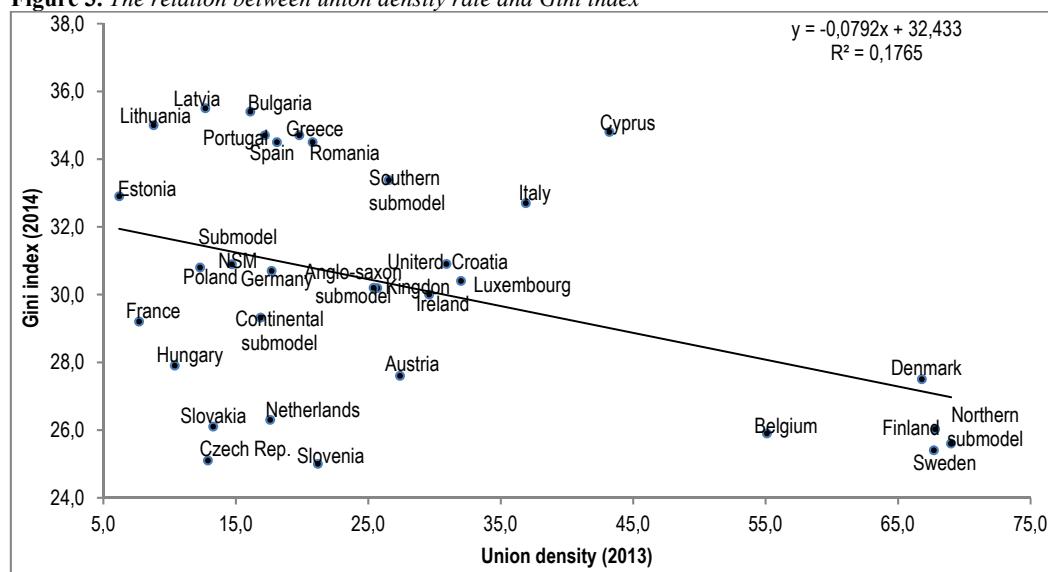
Figure 2. *The relation between social expenditure and income inequalities*



Source: Eurostat.

As it is shown in Figure 3, there is a negative relation between rate of union density and Gini index, EU Member States showing a heterogeneous picture, with countries such as Slovenia, Czech Republic and the Netherlands, which, had although recorded a high rate of union density, they failed to provide a better distribution of income among individuals.

Figure 3. *The relation between union density rate and Gini index*



Source: Eurostat, International Labour Organization (October 2015).

There are also countries such as Finland, Sweden and Belgium, where there is a high percentage of employees enrolled in trade unions (over 55% of all employees) and a lower Gini index. In addition, it can be seen that some countries in the Mediterranean sub-model (Greece, Portugal, Spain) and in the NSM sub-model (Lithuania, Latvia, Bulgaria, Romania) recorded the highest levels of Gini index and at the same time some of the lowest rates of union density.

Another angle of approach outlined in the literature that analyzes the socio-economic models relates to so-called "traps" that taxation and allocation systems of social benefits may create among individuals. There are three kind of traps: the inactivity trap, the unemployment trap and low wage trap (or poverty trap) (see for more details Carone et al., 2004).

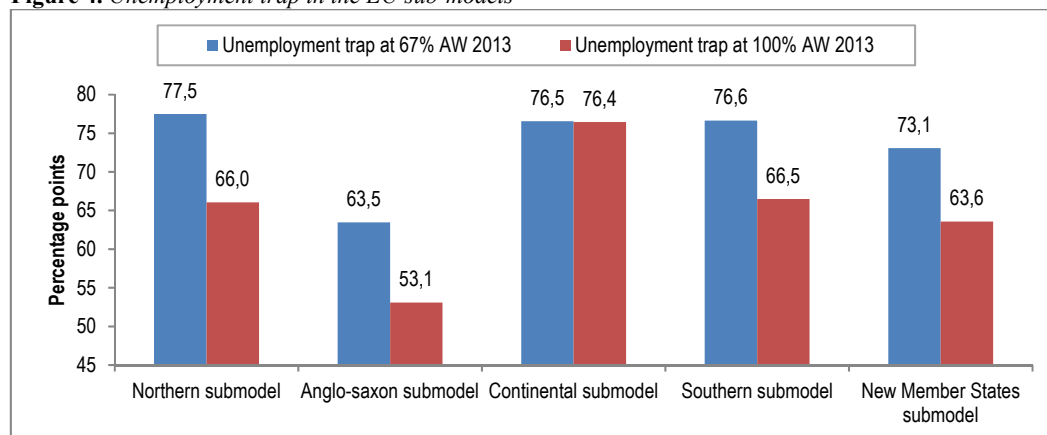
In this case, we can discuss about two perspectives regarding the impact of tax systems and social intervention schemes. There is, on one hand, the view on which the allocation of generous social benefits and, respectively, traps high (unemployment / inactivity / poverty) annihilates individual initiative (beneficiary persons) to occupy a job or to add effort (increase in working hours) in obtaining a higher salary.

On the other hand, one can consider that when accidentally or based on effects of cyclical issues (deficient on aggregate demand), individuals remain without a job, but if they receive support through social protection systems they can take more risks knowing that there is a "social safety net" to support them whether risks materialize or not.

Figure 4 reveals calculations which were based on the methodology developed by the OECD and the European Commission, using the values from 2013 for the unemployment traps in the five sub-models defined in the previous section (Northern, Anglo-Saxon, Continental, Mediterranean and New Member States). There were taken as reference two categories of individuals:

- An individual unmarried and unemployed, who previously won 67% of the average country level and who could be employed on a similar salary
- An individual unmarried and unemployed, who previously won 100% of the average country level and who could be employed on a similar salary

Figure 4. *Unemployment trap in the EU sub-models*



Source: The European Commission, Tax and benefits database (October 2015).

The figure shows that, in the first category of individuals the unemployment trap is higher by approximately 10 pp in four of the five sub-models, excepting the continental sub-model, where interventions through social protection and taxation systems are mainly proportional to the salary received by the individual analyzed, while in the other sub-models there is a tendency towards increasing the aid share as the salary is lower.

In the same time, according to Figure 4, the highest values of the unemployment trap were in 2013 in the northern sub-model (77.5%) - making an individual who is unemployed and then become employed at a salary of 67% of the average wage to obtain additional marginal gain of only 22.5 pp regarding the whole sub-model as an example (even only 10.1 pp in Denmark, which has an unemployment trap for this category of individuals of 89.9%).

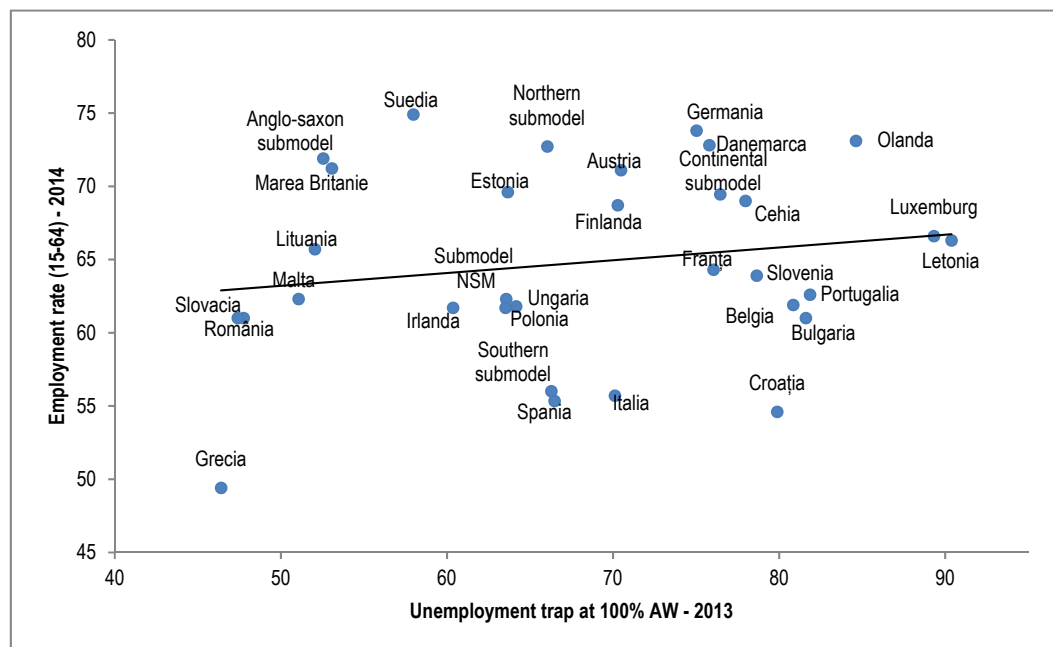
This sub-model is followed by the continental and the Mediterranean ones. We can add that in 2013 the New Member States and the Anglo-Saxon sub-models recorded the lowest values of unemployment trap, especially with regard to unemployed individuals who then became employed with a salary equal to the average salary at country level.

The level of unemployment trap presented above can bring arguments regarding the adoption of a national preference on the impact of social benefits visions: one that annihilates personal initiative or another one that promotes risk taking and individual's proactivity.

However, as it is shown in Figure 5, empirical evidence provides a diffuse picture among the member states and the socio-economic European sub-models from the perspective of the relation between unemployment trap (single individual, unmarried, unemployed and who can be employed with a salary equivalent to 100% of the average) and employment rate, even if it is often important to see a more detailed analysis of the quality of employment:

- There are countries that have relatively low unemployment traps and good performance in terms of employment rate (UK and Sweden);
- There are countries that have higher traps and good employment performance, which thrive by the implemented policies to stimulate individuals to take risks and to boost them for the purposes of employment (Netherlands, Denmark, Germany etc.);
- There are countries with small traps and poor performance (Greece, Romania Slovakia, Spain etc.)
- There are countries with large traps and poor performance of the labor market (Portugal, Croatia, Italy, Bulgaria, Belgium etc.)

In general, in countries with poor performance regarding the labor market, in terms of employment and unemployment persist both cyclical issues created by the deficit of aggregate demand - caused because of fiscal consolidation measures, difficult access to credit or other financing instruments for companies etc. and by the structural issues/institutional labor market (performance of the educational systems, the structure of employment in terms of training, labor relations legislation etc.).

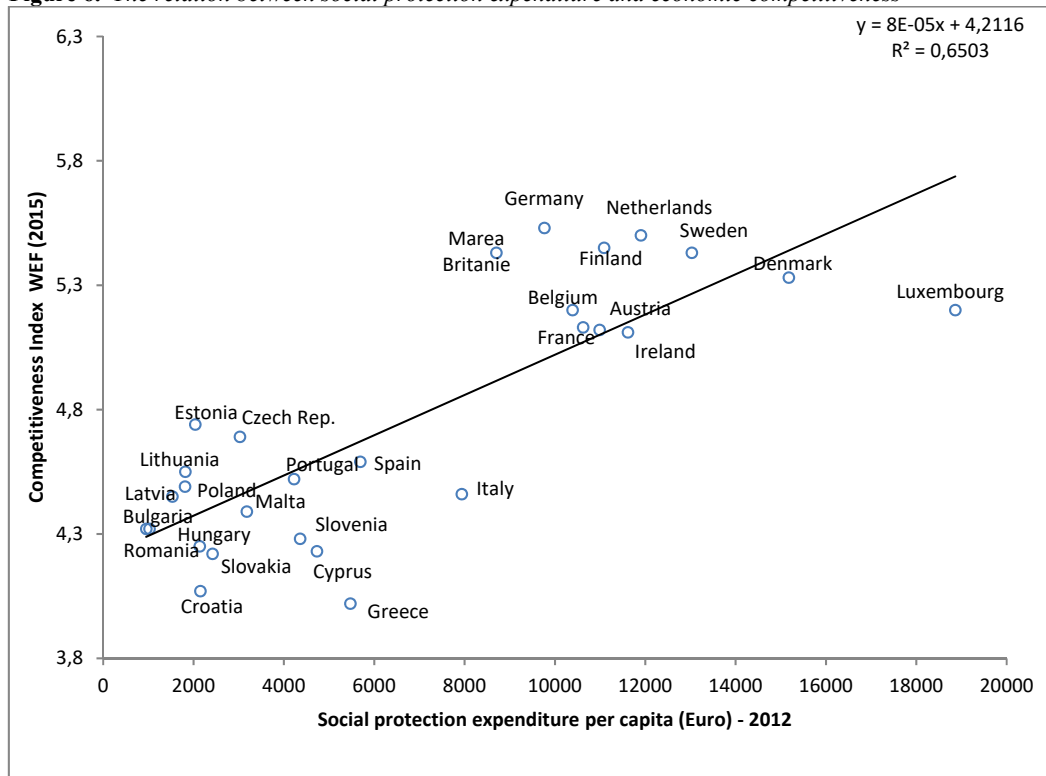
Figure 5. *The relation between unemployment trap and employment rate in the EU*

Source: Eurostat and The European Commission, Tax and benefits database (October 2015).

3. Econometric analysis – The influence of EU competitiveness on the sub-models' exports performances

In this section, we intend to evaluate from an empirically point of view the exports performances of the European sub-models' countries based on several economic, social and institutional variables considered relevant in connecting them with the competitiveness of the countries selected.

Figure 6 reveals that there is a direct correlation between the social protection allocations and the competitiveness of a national economy, as it is measured by the World Economic Forum, showing that 'embracing' risk may be driven despite a system of generous social protection. More precisely it shows that the fiscal pressure borne by economic agents (individuals or companies) is not necessarily an obstacle for competitiveness, exiting also structural and institutional components so that, even there is a loss of competitiveness in costs - aimed to a high rate of taxation, this may be offset by factors which supports non-cost competitiveness. In this case we can enumerate the various policies implemented on the labor market (active labor market policies, assistant policies in searching for a job, flexibility and deregulation on labor market), the quality of business environment and the incentives measures for entrepreneurship, the ease of opening a company, the limitation of the fiscal taxes numbers and the encouragement in lifelong learning, the high percentage of people with university or the facilitation of the transition from education to labor market etc.

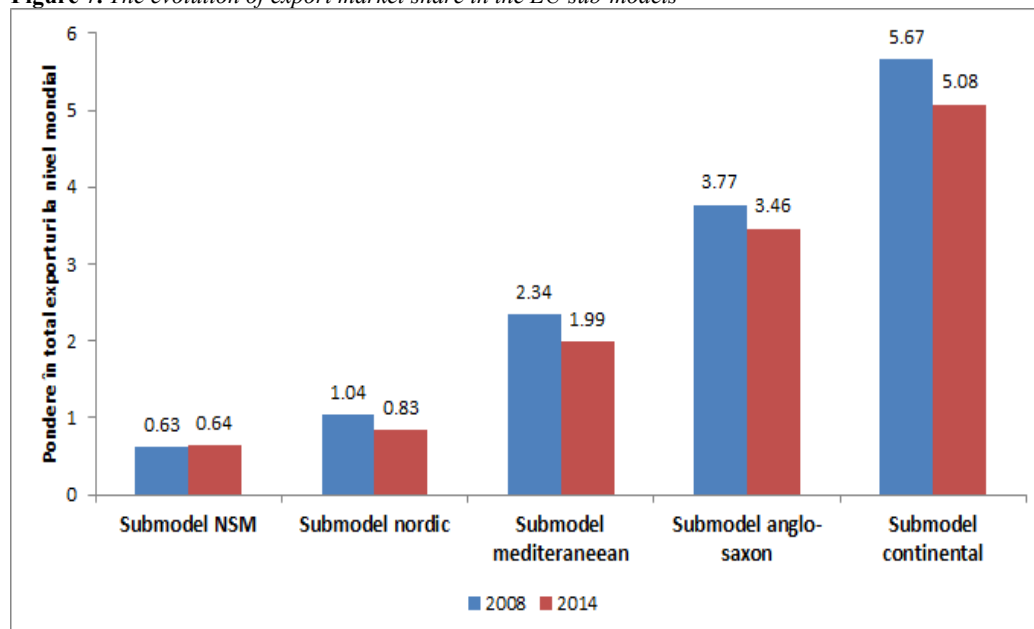
Figure 6. *The relation between social protection expenditure and economic competitiveness*

Source: World Economic Forum, Eurostat, October 2015.

The evolution of exports market share from the European Union's member states was unfavorable in the period analyzed (2008-2014) in four of the five European sub-models followed, excepting the New Member States sub-model (Figure 7). However, they still hold significant shares in total exports – globally.

Although they were descending compared to 2008, in the continental sub-model, at the end of 2014 stood out countries such as: Germany (7.54%), France (3.67%) and the Netherlands (3.11%). The three countries, along with Great Britain from the Anglo-Saxon sub-model - which represents around 3.6% of total exports worldwide had the highest shares on exports from the EU28.

Returning to the NMS sub-model, the increasing of exports share in its countries is based on many details. On one hand, many of these countries (Romania and Poland) had the exchange rate tool, which could be use in terms of allowing a depreciation of national currencies for competitiveness gains. Another explanation aims the improvement of the exports structure that countries have achieved, increasing exports on products with higher added value and winning a majority position in high-tech and medium high-tech goods exports. Finally, we can notice that in terms of destinations and exported goods there was a change in diversifying the exports to other regions outside the EU, because of the recession in the Eurozone and the economic expansion of the emerging countries.

Figure 7. *The evolution of export market share in the EU sub-models*

Source: Eurostat, October 2015.

In the following paragraphs, we made a quantitative analysis based on a panel econometric model with fixed effects so that we can find out how different variables manage to explain the export performance of the European sub-model's states. Thus, as explanatory variables we used the share of population with tertiary education in total population, the value of exports rate, the expenses made by each Member State for research and development and the foreign investments. The explanatory variable was the level of exports. Data are yearly basis and cover the period 2000-2013.

The econometric model contains the following variables:

$$\text{EXP SHARE}_i = c + \beta_1 \cdot \text{EXPORTS}_i (-1) + \beta_2 \cdot \text{ISD}_i + \beta_3 \cdot \text{POPTERTIARY}_i + \beta_4 \cdot \text{RESEARCH}_i + \gamma$$

where:

c = constant;

$\beta_1, \beta_2, \beta_3, \beta_4$, = explanatory variable coefficients;

ISD = foreign direct investment;

EXPORTS = value of exports denominated in euro;

POPTERTIARY = share of population with tertiary education;

RESEARCH = worth of spending on research and development;

γ = residual error.

The results of the processing data, made in Eviews 5, are shown in the table below:

Dependent Variable: D(EXPSHARE?)				
Method: Pooled Least Squares				
Date: 11/16/15 Time: 18:34				
Sample (adjusted): 2002 2013				
Included observations: 12 after adjustments				
Cross-sections included: 28				
Total pool (unbalanced) observations: 285				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013682	0.006786	-2.016085	0.0448
D(ISD?)	7.31E-07	8.59E-08	8.508548	0.0000
D(EXPORTS?(-1))	1.04E-06	2.14E-07	4.865230	0.0000
D(POPTERTIARY?(-1))	-0.000216	4.11E-05	-5.260773	0.0000
D(RESEARCH?)	-2.49E-05	7.35E-06	-3.381786	0.0008
Fixed Effects (Cross)				
BELGIUM--C	-0.039160			
BULGARIA--C	0.015179			
CZECHREP--C	0.037150			
DENMARK--C	-0.003188			
GERMANY--C	-0.018031			
ESTONIA--C	0.017212			
IRELAND--C	-0.020879			
GREECE--C	0.013528			
SPAIN--C	0.022027			
FRANCE--C	-0.053705			
CROATIA--C	0.010195			
ITALY--C	-0.056785			
CYPRUS--C	0.006479			
LATVIA--C	0.018405			
LITHUANIA--C	0.023687			
LUXEMBOURG--C	0.014269			
HUNGARY--C	0.021131			
MALTA--C	0.002039			
NETHERLANDS--C	-0.063436			
AUSTRIA--C	-0.010986			
POLAND--C	0.087001			
PORTUGAL--C	0.017738			
ROMANIA--C	0.037645			
SLOVENIA--C	0.016700			
SLOVAKIA--C	0.020958			
FINLAND--C	-0.002581			
SWEDEN--C	-0.013228			
UK--C	-0.087522			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.484008	Mean dependent var	-0.024351	
Adjusted R-squared	0.420783	S.D. dependent var	0.100197	
S.E. of regression	0.076256	Akaike info criterion	-2.203973	
Sum squared resid	1.471200	Schwarz criterion	-1.793869	
Log likelihood	346.0661	F-statistic	7.655403	
Durbin-Watson stat	1.936033	Prob(F-statistic)	0.000000	

Source: Own computations in Eviews 5 program.

As shown by the results obtained from the econometric analysis we can say that in 2000-2013 period (2002-2013 after adjustments) foreign investments and exports reputation (the latter was surprised by exports in period $t-1$) have a positive influence over the exports share on global market.

At the same time, according to our results, expenditure on research and development and the number of persons with tertiary education had a negative impact on exports. The value of these coefficients is not very big, even if they are statistically representative for EU member states. Even if the sign is important, the endogenous variable sensitivity to fluctuations of explanatory variables is very low according to coefficients obtained in the analysis of panel data and further research is needed.

Conclusions

This paper was a trial to identify the potential patterns within European Union sub-models, according to their social and economic performances. Indicators such as: the unemployment, the Gini index, the social benefits, the union density rate etc. and the relation between them reflected the sub-model's performances both in pre-crises and post-crises period.

These being said, our mains findings can be summarized as follow.

Firstly, in the northern and the Anglo-Saxon sub-models, the institutional arrangements and the business development favoured relatively high employment rates, above 70%. On the other hand, the southern sub-model is the one that faced the highest increase in unemployment during the covering period (2008 to 2014) and the employees opted for trade union, so that their rights could be better represented and they could obtain an additional protection.

In terms of poverty rate and inequality of income, it seems like there are significantly better results in the northern sub-model compared to other European sub-models, due to the relatively high social spending and also as a result to the large number of employees who are covered by trade unions. Thus, income inequalities after transfers tend to be smaller in northern and continental sub-models, while in countries from sub-models that redistributes less, such as the southern and the New Member States sub-models, inequalities in income are significantly higher. It is also important to mention the fact that the sub-models such as the northern and the continental have progressive systems of income taxation on individuals.

Secondly, regarding the sub-models performances in term of exports competitiveness, the evolution of exports market share from the European Union's member states was unfavourable in the period analysed (2008-2014) in four of the five European sub-models, excepting the New Member States one. In the catching-up sub-model some countries' exchange rate tools and the improvement of the exports structure contributed to the mentioned increase. However, the European Union sub-models still hold globally a significant shares in total exports.

Last, but not least, the econometric model with panel data, covering the period of 2000 to 2013, was use to highlight the relation between exports competitiveness and their sensitivity to the fluctuations of several factors considered relevant in this study. The model suggests that foreign investments and exports reputation have a positive influence over the EU's countries exports share on global market, while, the expenditure on research and development and the number of persons with tertiary education had a negative impact on exports.

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Growth and distribution of microfinance in India: A panel data analysis

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Abstract. *This paper analyses large panel of Self-Help Group (SHG) financing across 30 Indian states over the period 2007 to 2015. Classifying the panel across four different bank based on financing, we find a significant and positive association of both outstanding loan and savings of SHGs to that of bank financing across the states. Applying panel regression frameworks of both time varying and state specific fixed effects, we have obtained positive association between outstanding loans, savings rate of SHGs to that of bank loans. Our panel model has further confirmed that increases in the number of SHGs have positively influenced the bank loans particularly from public and private sectors over the years. The results thus suggest that financial inclusion drive in India has made financial institutions across the sectors to extend loan for small sector initiatives.*

Keywords: Micro-Finance Institutions, SHG, Outreach, Financial Inclusion, NPA.

JEL Classification: G21, H62.

1. Introduction

Financial Markets and Institutions, in the developing countries, have failed miserably to address the credit requirements of the poor households in rural areas. The main reason for the failure is the lack of any sort of recognized employment source and collateral with the poor (European Commission, 2007a). The high risk and the high transaction costs of banks associated with the small loans and savings deposits are the other factors which have made them unbankable. The lack of loans from the formal institutions has left the poor with no other option but to borrow money from the local money-lenders at huge rate of interests. The high interest rate fixer dominates the rural credit market because they are able to monitor borrowers credit needs closely and offer credit to a group of known or trustworthy clients where social ties and social sanction induce investment (Ghate et al., 1992; Udry, 1990). However, the policy makers of various countries including India have taken efforts to offer formal financial services to the rural borrowers by setting up special agricultural banks/rural banks or directing commercial banks. Nonetheless, these programmes were in vain owing to various reasons. The common reasons marked by many were the political difficulty for governments to enforce the loan repayment and most importantly the borrowers were relatively wealthy and influential people rather than the poor (Adams et al., 1984; Adams and Vogel, 1986; World Bank, 1989).

The formal financial institutions do not serve to the segment of rural poor, as they perceived it as too risky (Armendariz and Morduch, 2000; Yunus, 1998; Hermes and Lensik, 2007). Thus, the inability of the formal credit institutions to deal with the credit requirements of the poor effectively has led to the emergence of microfinance to alleviate poverty and as an alternative credit system for the poor (Battilana and Dorado, 2010; Morduch, 2000; Coleman, 2005).

Microfinance scheme emerged as panacea for the poor households who are not able to access financial services from the formal financial institutions which require collateral (Ledgerwood, 1998; Littlefield, Morduch and Hashemi, 2003; Robinson, 2001). It helps them build up assets, survive crises and to establish small business to come out of poverty. Besides, by extending small loans (microcredit), the microfinance program provides various other financial and non-financial services such as savings, insurance, guidance, skill development training, capacity building and motivation to start income generating activities. This innovative programme is reaching the poor people especially women and has a greater impact on their socio-economic development as well as their empowerment. The successfulness of the program had impacted the developed countries to emulate the program to alleviate poverty (Jajo et al., 2010).

Literature reveals different ideas of impacts of microfinance. Some studies shows positive impact of microfinance in terms of poverty, health, nutrition, education, and women empowerment (Armendariz de Aghion and Morduch, 2000; Armendariz and Morduch, 2005, 2010; Hashemi, Schuler and Riley, 1996; Littlefield et al. 2003; Roodman and Morduch, 2009). These positive impacts have been questioned and proved that microfinance do not make any changes in the lives of the poor (Angelucci et al., 2013; Ganlea et al., 2015; Banerjee et al., 2009, Rooyen et al., 2012).

The main objective of the paper is to empirically analyze the outreach of bank financial lending programmes for the small credit mainly to MFI or SHG financing. Drawing evidences from previous literatures has helped us to establish the real issue behind the MFI lending methodology. Till date, Banks across the sectors have not had the well established financial connectivity for small lending institutions. Though volume of financial assistance from banks go on increasing, still the problems like non-performing assets, rising debt ratio, failure of many loans and lack of recovery of loans have even decimated the bank lending in this regard across the states. Lack of regulation and absence of strong credit bureau have led to the profound increase in debt ratio of MFIs in Lebanon⁽¹⁾. Another biggest problem is the presence of indebtedness over a longer time period has cut short the refinancing facilities of bank for further MFI loan. In one report “Microfinance Banana Skins 2011” for the analysis of 500 MFIs of 86 economies, it has been documented that credit risk is the number one risk for all MFIs across the economies worldwide. Against this background, we have empirically analysed our paper by using time varying fixed effect and state specific fixed effect frameworks to see, how far the coefficients of bank loans get influenced by the rising default rates, NPAs, outstanding loan volumes and number of SHGs per year.

The remainder of the paper is structured as follows. Section 2 discusses the Growth and outreach of MFIs in India. In Section 3 we discussed the microfinance lending methodologies in India and financial outreach for MFI lending across Indian states. Section 4 continues with data description, estimation strategy along with results and discussion. Section 5 underscores certain potential challenges and issues faced by the MFIs in India. In section 6 we summarize the main findings and provide conclusion, we derive from the analysis.

2. Growth and outreach of microfinance in India

In India, MFIs currently operate in 28 States, 5 Union Territories and 561 districts. At present, 155 MFIs with a branch network of 11,687 have reached out to an all-time high of 33 million clients with an outstanding loan portfolio of Rs.33,517 crore. This includes a managed portfolio of Rs.4,075 crore. The average loan outstanding per borrower stood at Rs.10,079 and 80% of loans were used for income generation purposes. Outreach grew by 20% and loan outstanding grew by 30% over the previous year. The Southern region continues to have the highest share of both outreach and loans outstanding, followed by East. However, growth rates are higher in the Western and Eastern regions. Outreach proportion of urban clientele is increasing year on year (44% for 2013-14) as against the rural population. Women borrowers constitute 97% of the total clientele of MFIs; SC/ST borrowers constitute 19% and other minorities 14%. Of the total, NBFC-MFIs contribute to 82% of both clients outreach and outstanding portfolio, while NGO MFIs contribute to the remaining. MFIs with portfolio size of more than Rs.500 crore contribute significantly to the total outreach (74%) and loan outstanding (76%) of the sector.

Table 1. Year-wise Outstanding Loan, Loan Disbursed and Client Outreach of Overall Banks

Year	Outstanding loan (in crore)	Loan Disbursed (in crore)	Client outreach (in lakhs)
2009-10	22544	29330	267
2010-11	24332	35176	317
2011-12	24607	22635	275
2012-13	25699	25635	275
2013-14	33517	24017	330
2014-15	48882	30334	371
2015-16	63853	37286	399

Source: Compiled from various reports of Bharat Microfinance Reports, Sa-Dhan.

The data for the year 2015-16 indicates to an outstanding loan portfolio of Rs.63,853 crores as on 31 March 2016. Of this amount, the 8 SFB licensees account for a portfolio of Rs.23,553 crore. This implies that on a standstill basis the MFI sector portfolio would reduce to Rs.44,943 crore once all these eight institutions become SFBs, indicating a contraction of nearly 35 %. The provisional estimate of clients served by MFIs for the year ending March 2016 was 476 lakhs, out of which nearly 135 lakhs are being served by would-be SFBs.

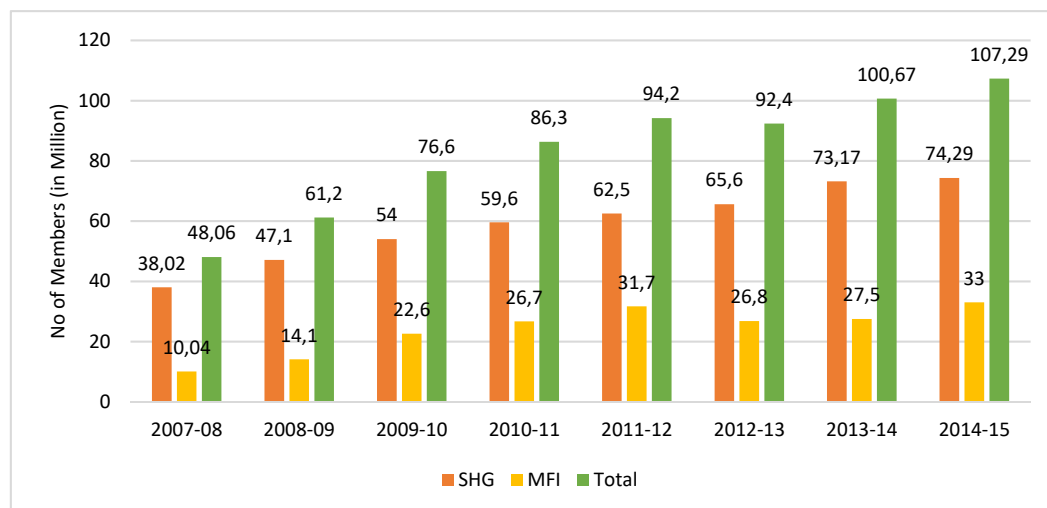
While the lending philosophy and methodology of each of the SFBs would be for them to decide upon, few of them would be able to continue with the present systems of unsecured group lending. Opportunity also opens up for not-for profit MFIs, i.e. NGO-MFIs, Mutual/Cooperatives and Section 8 Companies. The trajectory of growth of MFI sector since 2010 is an indication of the absorption capacity and potential for such type of lending. This potential opportunity calls for a vigorous role to be played by the development finance institutions. It may be recalled that in the initial years of setting up of MFIs in their NGO-MFI form it was NABARD which assisted them with grant support and Revolving Fund Assistance (RFA). Later NABARD helped a number of MFIs with quasi-equity and subordinated debt instruments from Micro Finance Development and Equity Fund (MFDEF).

Similarly, SIDBI supported the growth story of MFIs through its SIDBI Foundation for Micro Credit (SFMC). The India Microfinance Equity Fund (IMEF) later supported MFIs, especially the medium and smaller ones with equity and quasi-equity. Such pioneering roles may be required to be played again in nurturing a newer set of institutions to take their places in the space vacated by the SFBs. Of course MUDRA with its total focus on microenterprise has to hand-hold and facilitate the development process of smaller MFIs and not-for profit MFIs as they are the ones who operate in remoter locations and with the more underserved populations. The establishment of Small Finance Banks also opens up another window of opportunity for reinvigorating the SHG-Bank Linkage Programme. We are aware that there is greater enthusiasm for SBLP from smaller institutions like RRBs, DCCBs and smaller banks than from bigger banks. This phenomenon would apply to SFBs also. Moreover, as eight of them (nine, if you include Capital) are from the microfinance stable, they would be more positively inclined for SHG linkage. While all of them operated on the JLG methodology, some of them worked on the SHG model also. Strategic partnerships with them for SHG-Bank Linkage Programmes have the potential to take SBLP to greater heights in the next couple of years. The setting up of Payment Banks would also give a further fillip to the microfinance sector. Partnerships between

MFIs and Payment Banks can ensure that MFIs' clients can avail of financial products other than credit from the latter. Additionally, the cash and remittance management services of FIs can be taken care of by the Payments Banks. RBI's discussion paper on Peer to Peer (P2P) lending also opens up a window for some MFIs with technology wherewithal to transform themselves into P2P players for the microfinance segment. Institutions like Kiva and Rang-De are already working in this area, but there is a scope for a number of other institutions to enter this niche.

The transition of microfinance industry into a mature industry could strengthen the financial inclusion pattern in a much better fashion. Structured financing and SHG linked bank financing can make MFIs more appealing to the achieving of financial stability (Karmakar, 2009). As per Status in Microfinance Report, 2013, big NBFC MFIs have gained lot of momentum in terms of opening more accounts and disbursing loans to the poor. Big NBFC MFIs have regained market confidence and picked momentum in client outreach and loans outstanding. Bank credit eased for MFIs and SHGs as well. However, rising NPAs pose as the serious challenges for the bigger MFIs. The gross loan portfolio of microfinance institutions (MFIs), registered with the Reserve Bank of India as non-banking financial companies (NBFCs), can cross Rs 1 lakh crore by March 31, 2018⁽²⁾. Medium MFIs are, however, facing with the rising challenges in some key states such as U.P and Bihar, where people especially women take loan for consumption purposes rather than the income generation activities. Increasing suicide rates among poor people and inadequate regulation have also added woes to the financial capability of MFIs⁽³⁾. Differences in terms of taking loans and using for other purposes often have marred the basic aim of the MFIs.

Figure 1. Growth of SHG and MFI



The chart describes that approximately 107.29 million people were provided with microfinance under SHG- BLM and 33 million under the MFI model up to March 2015. The perusal portrays the focus of the programme mainly concentrating in the southern region. Approximately 48 percent and 55 percent of the people who were provided with

microfinance under these two models belonged to the Southern Region of India (NABARD, 2015). However the spread of the programme is limited in the North and North-Eastern Region. Over all, the microfinance outreach in India is approximately five percent and three percent and these clients belonged to the north and north-eastern regions respectively.

3. Microfinance lending methodologies in India: Bank Linkage Model

In India, the microfinance penetrates in different ways and the most popular channels are: MFI-Bank Linkage Program (MFIBL) and SHG-Bank Linkage Program (SHGBL). The SHG-BL program is spearhead program in rural financial service launched by NABARD in the year 1992, is most popular and spread across six different regions of India, i.e. Northern, North-Eastern, Eastern, Central, Western and Southern Regions. The Northern region comprises of the states of Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir and Rajasthan. The North-Eastern region encompasses Assam, Sikkim, Tripura, Meghalaya, Arunachal Pradesh, Mizoram and Nagaland states. The Eastern region takes in Bihar, West Bengal, Jharkhand, Orissa, and Andaman and Nicobar Islands. The Central region includes Madhya Pradesh, Chhattisgarh, Uttaranchal and Uttar Pradesh. Western region includes Goa, Gujarat and Maharashtra states. The Southern region incorporates Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and U.T. of Pondicherry.

Initially, till 1999, there was a slow progress in the programme as only 32,995 groups were credit linked. Later on, the programme began to grow rapidly. Table 2 exposes the total figure of SHGs credit linked with banks and the bank loan disbursed to these groups between the periods 1992-93 and 2007-08. It, furthermore, shows that 255 SHGs were given Rs.2.9 million of bank loans during the period 1992-93. In 1999-2000 the number increased to Rs.1, 14,775 with bank loans of Rs.1,929.8 million. This cumulative number of credit linked SHGs has increased to about Rs.34.78 lakh and the amount of bank loan given to these groups increased to Rs.2, 22,680 million up to March 2008. The microfinance through SHGs has reached such a position in India that it is acknowledged as the biggest microfinance programme in the world. The data reveals that though the cumulative number of SHGs provided with the bank loans increases, the rate of intensification is relatively slow as compared to the previous years. The table also shows that the rate of expansion of SHGs and the bank loans disbursed to them is unenthusiastic during the year 2007-08. One of the reasons for the rapid escalation of the programme in the southern states of India might be because it has reached a saturation point in some other parts of these states. The provisional data available from NABARD for the year 2010-11 shows that the banks has disbursed loan amounting to Rs.14.7 billion to 1.2 billion groups during the year. The average loan disbursed per group is amounted to Rs.122,700 which are higher than the comparable levels of last year. Compared to the last year's growth rate, the SBLP has underperformed during the year.

Table 2. Progress of SHG-Bank linkage in India (in Billion)

Year	SHGs financed by banks			Bank loans		
	Number	Growth	Cumulative	Number	Growth	Cumulative
1993-1994	610	-	-	0.01	-	-
1994-1995	1502	146.23	2122	0.02	100.00	0.02
1995-1996	2635	75.43	4757	0.04	100.00	0.06
1996-1997	3841	45.77	8598	0.06	50.00	0.12
1997-1998	5719	48.89	14317	0.12	100.00	0.24
1998-1999	18678	226.60	32995	0.33	175.00	0.57
1999-2000	81780	337.84	114775	1.36	312.12	1.93
2000-2001	149050	82.26	263825	2.88	111.76	4.81
2001-2002	197653	32.61	461478	5.45	89.24	10.26
2002-2003	255882	29.46	717360	10.22	87.52	20.49
2003-2004	361731	41.37	1079091	18.56	81.60	39.04
2004-2005	539365	49.11	1618456	29.94	61.31	68.98
2005-2006	620109	14.97	2238565	44.99	50.27	113.97
2006-2007	1105749	78.32	3344314	65.7	46.03	179.67
2007-2008	1227770	11.04	4572084	88.49	34.69	268.16
2008-2009	1609586	31.10	6181670	122.54	38.48	390.70
2009-2010	1586822	-1.41	7768492	144.53	17.95	535.23
2010-2011	1196134	-24.62	8964626	145.48	0.66	680.71
2011-2012	1147878	-4.03	10112504	165.35	13.66	846.06
2012-2013	1219821	6.27	11332325	205.85	24.49	1051.91
2013-2014	1366421	12.02	12698746	240.17	16.67	1292.08
2014-2015	1626238	19.01	14324984	275.82	14.84	1567.9
2015-2016	1832323	12.67	16157307	372.87	35.19	1940.77

Source: Compiled from various issues of Status of Microfinance in India, NABARD.

The NABARD's Status of Microfinance in India reports clearly states that Southern region's principal focus was on SHGs. It was on account of the prevalence of the voluntary organizations being in the wide spread for the linkage banking program. The largest MFIs of India, such as SHARE, Spandana, CDF, MYRADA, SKS and PREM have also given attention to the Southern regions. The spread of microfinance programme was almost negligible in the North-Eastern States. The share of Southern States in the number of groups linked to the banks was declining, while the share of the other regions was improving (NABARD, 2016).

4. Data, estimation strategy and results

The dataset for the study has been collected from Status of Microfinance in India reports for the years 2007-08 to 2015-16 (9 years) annually published by NABARD. MFIs data have been gathered from Microfinance in India report published by Sa-Dhan.

Description of Variable

Bank Loan: Here the bank loan is in volume term, meant for the MFI finance exclusively. This constitutes an important segment of our empirical analysis. Being the dependent variable, it will help explain the magnitude of change w.r.t other variables. Being the part of financial inclusion programme, the banks irrespective of their classifications have extended loans for the small scale credit.

Savings: Here, the variable saving has implied the SHG saving rate. It is included as one of the explanatory variables in our model in terms of volume.

Outstanding Loan: it is kept as the one of the explanatory variables in the model. Outstanding loan refers to the failure in terms of repayment intensity of the banks. It is the best indicator of growing NPAs of the banks. It can be otherwise known as bad loan.

No of SHG: it is in terms of numbers. Being one of the explanatory variables, it indicates how the number of SHGs has increased over the years. It is in annualized formats. It indicates the outreach of SHGs across India over the years.

All these data are covered for 30 states over the time period 2007 to 2015. In order to avoid inconsistency and spurious regression problem, we have converted all the variables into the natural logarithm.

The empirical model in this context is

$$\begin{aligned} \text{bank loan}_{i,t} = & \alpha_1 \text{bank loan}(-1)_{i,t} + \alpha_2 \text{savings}_{i,t} + \alpha_3 \text{out.loan}_{i,t} + \\ & + \alpha_4 \text{SHG}_{i,t} + \delta_t + \sigma_t + \epsilon_{i,t} \end{aligned} \quad (1)$$

Here, we have taken bank loan as the dependent variable. The other sets of explanatory variables are savings of SHGs, outstanding loans of SHGs and the number of SHGs. δ_t takes care of the panel specific time effect. σ_t takes into account the state specific effect or region specific effect. $\epsilon_{i,t}$ is the error term in the equation across the region I and time t. In order to get rid of spurious regression issue, we have converted all the variables into the natural logarithmic values. The region I takes care of 30 Indian states and the time t covers the period from 2007 to 2015.

This above equation has been applied across the bank classified in terms of their ownership. Using the set of variables just described above, we have estimated the following equations by applying Ordinary Least Squares and Fixed Effect methods.

$$\begin{aligned} \text{bank loan}_{it}^{pb} = & \alpha_1 \text{bank loan}(-1)_{it}^{pb} + \alpha_2 \text{savings}_{it}^{pb} + \\ & + \alpha_3 \text{out.loan}_{it}^{pb} + \alpha_4 \text{SHG}_{it}^{pb} + \delta_t + \sigma_i + \epsilon_{it} \end{aligned} \quad (2)$$

$$\begin{aligned} \text{bank loan}_{it}^{pvb} = & \alpha_1 \text{bank loan}(-1)_{it}^{pvb} + \alpha_2 \text{savings}_{it}^{pvb} + \\ & + \alpha_3 \text{out.loan}_{it}^{pvb} + \alpha_4 \text{SHG}_{it}^{pvb} + \delta_t + \sigma_i + \epsilon_{it} \end{aligned} \quad (3)$$

$$\begin{aligned} \text{bank loan}_{it}^{rrb} = & \alpha_1 \text{bank loan}(-1)_{it}^{rrb} + \alpha_2 \text{savings}_{it}^{rrb} + \\ & + \alpha_3 \text{out.loan}_{it}^{rrb} + \alpha_4 \text{SHG}_{it}^{rrb} + \delta_t + \sigma_i + \epsilon_{it} \end{aligned} \quad (4)$$

$$\begin{aligned} \text{bank loan}_{it}^{cb} = & \alpha_1 \text{bank loan}(-1)_{it}^{cb} + \alpha_2 \text{savings}_{it}^{cb} + \\ & + \alpha_3 \text{out.loan}_{it}^{cb} + \alpha_4 \text{SHG}_{it}^{cb} + \delta_t + \sigma_i + \epsilon_{it} \end{aligned} \quad (5)$$

All these above equations represent the empirical results w.r.t different types of banks classified on the basis of their loans provided to the MFIs and other types of small credits over the period 2007 to 2015. The equations (2) to (5) represent the cases of bank loans as

the functions of the lagged bank loan value, savings, outstanding loan volume and no of SHGs for public sector, private sector, regional rural banks and co-operative banks respectively.

Table 3. *Fixed Effect Estimation bank loan with the explained variable*

Bank Loan	Model I	Model II	Model III	Model IV
Bank Loan (-1)		-0.057 (-1.46)		
Savings	0.279* (5.52)	0.344* (6.02)	0.271* (4.77)	0.285* (5.02)
Outstanding Loan	0.705* (14.94)	0.683* (13.18)	0.720* (14.07)	0.671* (12.67)
No of SHGs	0.042 (1.24)	0.056 (1.46)	0.134* (2.82)	0.103** (2.62)
Constant	-0.031 (-0.70)	-0.033 (-0.65)	-0.210* (-0.82)	-0.006 (-0.60)
State F.E			Yes	No
Year F.E			No	Yes
R squared	0.921	0.919	0.919	0.928
No of Obs	240	210	240	240

Note: 't' statistics are in parentheses; *, ** and *** are 1%, 5% and 10% levels of significances respectively.

Source: Computed.

The above table represents the empirical estimation result of the public sector bank loan towards the SHG institutions. Here, the bank loan is taken as the explained variable across the models. Our outcome variables are savings rate by SHGs, outstanding loans possessed by the public sector banks arising out of MFI loans and the number of SHGs created over the period 2007 to 2014. From empirical standpoint, we have applied four models based on OLS, OLS with lagged dependent variable, panel fixed effect models with time effect and state effect. In the first model, the coefficient of savings estimates is 0.279 implying that every 1% increase in SHG saving rate has induced nearly 0.28% increase in public sector bank loans. Bank loan transaction with respect to MFI expansion is somewhat continuing. However, if we look at the bank loan relation to that of outstanding loan amount, it is really staggering. For every 1% increase in bank loan, there is the probability that only 30% of SHG institution is successful in retuning the loan amount. In Model II, we have introduced the lagged explained variable to detect the problem of endogeneity. In this case, we have hardly got any significant association between lagged value of bank loan to that of bank loan and the number of SHGs to that of bank loan. Nevertheless, compared to savings rate of SHGs, the outstanding loans of PSBs have become doubled due to the rising bank loan. Further, our structural specification goes towards the fixed effect estimation model by controlling the time specific and state specific effects. In both these cases, we have found that the effects of outstanding loans have been pronounced more in the midst of rising bank loan towards this sector. The correlation between rest of these variables and bank loans appear to be positive and significant over the period. From the above result, it is evident that the public sector bank loan has not reduced despite the range of outstanding loan increasing day by day.

Table 4. Fixed Effect Estimation Private Bank loan with the explained variable

Bank Loan	Model I	Model II	Model III	Model IV
Bank Loan (-1)	-	-0.057 (-1.46)	-	-
Savings	0.279* (5.52)	0.344* (6.02)	0.271* (4.77)	0.285* (5.02)
Outstanding Loan	0.705* (14.94)	0.683* (13.18)	0.720* (14.07)	0.671* (12.67)
No of SHGs	0.042 (1.24)	0.056 (1.46)	0.134* (2.82)	0.103** (2.62)
Constant	-0.031 (-0.70)	-0.033 (-0.65)	-0.210* (-0.82)	-0.006 (-0.60)
State F.E			Yes	No
Year F.E			No	Yes
R squared	0.921	0.919	0.919	0.928
No of Obs	240	210	240	240

Note: 't' statistics are in parentheses; *, ** and *** are 1%, 5% and 10% levels of significances respectively.

Source: Computed.

The above table represents the empirical result of private bank loan towards the SHG financing across the states. Like public sector banks, private banks in recent years have started financing for various MFI and SHG initiatives. Like before, here we have focused on four empirical models: panel OLS, OLS with dependent lagged variable, and panel fixed effect models with both time specific and state specific effect. From our Model I estimation, we have obtained positive and significant association between savings of MFI and private sector bank loans. Every 1% increase in saving leads to 0.27% increase in private bank loan. However, it does not have any significant association with the number of SHG institutions. Outstanding loan tends to increase with the increase in bank loan over the years but the worrying trend is that the intensity of outstanding loan is almost twice of savings made by SHG institutions. While considering state specific effect, we have obtained positive and significant association of all variables to that of bank loan amount disbursed by the private banks. States specific effect further specifies the worrying trend of excessive outstanding loan amount incurred from the bank loans. It suitably implies that the loan repayment rate across states is significantly lesser. The time specific or year specific effect clearly shows even the substantial increase in the outstanding loan. Every 1% increases in outstanding loan shows a 0.67% increase in bank loan in the subsequent years. The number of SHGs and savings are found to be positive and significantly associated with the bank loan. Thus, the overall picture suggests that even though private sector banks abide by the financial inclusion initiatives of the government of India, the repayment rate is far from the satisfactory.

Table 5. Fixed Effect Estimation Co-operative bank loan with the explained variable

Bank Loan	Model I	Model II	Model III	Model IV
Bank Loan (-1)	-	0.124* (3.62)	-	-
Savings	0.568* (10.93)	0.729* (13.71)	0.582* (11.66)	0.597* (11.94)
Outstanding Loan	0.445* (10.03)	0.239* (4.91)	0.960* (8.04)	0.355* (7.84)
No of SHGs	-0.002 (-0.08)	-0.039 (-1.12)	0.039 (0.79)	0.019 (0.39)
Constant	-0.079 (-1.19)	-0.066 (-1.03)	-0.025 (-0.15)	-0.0001 (-0.00)

Bank Loan	Model I	Model II	Model III	Model IV
State F.E	-	-	Yes	No
Year F.E	-	-	No	Yes
R squared	0.929	0.942	0.928	-
No of Obs	240	210	240	240

Note: 't' statistics are in parentheses; *, ** and *** are 1%, 5% and 10% levels of significances respectively.

Source: Computed.

The above table represents the case of co-operative bank loan initiative towards SHG financing. By applying the four models, we have shown that savings and outstanding loans have been positively and significantly associated with that of bank loan. The value of coefficient of saving varies from 0.568 to 0.597. The values of coefficient of outstanding loan vary from 0.455 to 0.355 throughout the models. Bank loan and the number of SHGs have not been significantly associated. The same is true in case of RRB loan disbursement towards SHGs as evident from the table below. With the increase of SHG savings level, the bank loan amount starts increasing. Therefore, the worrying trend is the increasing level of outstanding loans, implying the NPA cases.

Table 6. Fixed Effect Estimation RRB Bank loan with the explained variable

Bank Loan	Model I	Model II	Model III	Model IV
Bank Loan (-1)	-	0.050 (1.19)	-	-
Savings	9.367* (5.63)	0.342* (4.60)	0.278* (3.58)	0.269* (3.42)
Outstanding Loan	0.619* (10.91)	0.595* (9.04)	0.582* (8.70)	0.571* (8.68)
No of SHGs	-0.0374 (-1.02)	-0.035 (-0.85)	-0.010 (-0.22)	-0.17 (-0.36)
Constant	0.084 (1.05)	0.075 (0.83)	0.250 (1.50)	0.309** (1.72)
State F.E	-	-	Yes	No
Year F.E	-	-	No	Yes
R squared	0.886	0.876	0.885	0.893
No of Obs.	240	210	240	240

Note: 't' statistics are in parentheses; *, ** and *** are 1%, 5% and 10% levels of significances respectively.

Source: Computed.

5. Potential challenges faced by MFIs in India

Indian MFIs are not free from the impeding dangers in terms of default and other associated risks. There are four types of risks typically prevailing in the MFI market and they are credit risk, market risk, operation risk and strategic risk. Credit risk and market risk are more financial in character. Lack of proper regulation, small investment, no proper legal backup and other associated factors could potentially lead to more risk in terms of disbursing and handling of MFI loans. However, the overall advantage lies in the sustainability of MFI existence, rather than vying for huge profit at the initial stages. Smaller size of loans and short tenure in terms of repayment often have led to the failure of MFI loan schemes in most of the cases⁽⁴⁾. Kappel et al. (2010) have aimed for constructing an index of early warning in case of MFI, because many MFIs are increasingly facing the problem of over indebtedness across various economies. Mosley (2010) has established the link between MFI and poverty in Bolivia and found that MFI

unlike other financial institution is successful in controlling poverty. However, the growing problems in MFI institutions have been the rising share of default rates of the poor customers and rising indebtedness. Due to the dramatic decline in the repayment facilities, 50 branches of two major MFIs were closed by authorities in Krishna district of Andhra Pradesh in 2006 and in 2009 repayments almost came to a grinding halt in Karnataka's Kolar district⁽⁵⁾. Microfinance institutions typically face various forms of risks during the onset of different financial crises. Yet, the very crises also stem from the internal management, capital adequacy ratio, effective loan management and exposure to the forms of households being the clients. The concept of risk in MFI lies in the heart of financial intermediation. Lack of clarity in regulatory framework, political interference, inability in recovering the loans and lack of monitoring in terms of loan utilization have led to the failure of many small MFIs in India. In case of Joint Liability Group model, the potential failure of one group in terms of providing capital, deterioration in credit quality and mismatch in setting goals have often plagued the financial viability of the MFIs in long run. Increase in cost of funds and interest rate fluctuation, particularly short run interest volatility have triggered the collapse of such financial condition of MFI in the long run⁽⁶⁾. After Malegam committee, the Andhra Pradesh government has started initiative of shutting down the private MFIs in order to protect the government backed SHG financing models. This step has rather triggered severe loss in financing provisions to the poor. Citing private MFIs for exorbitant profit and operating under a competitive strategy, the Andhra government has restricted the movement of private players in MFI sectors⁽⁷⁾.

Other issues with present MFI in India

Mobilization of Savings

The rationale behind the establishment of SHG is to nurture saving habits among the poor women. Savings is mandatory in SHG; every member has to save a minimum amount of `25 per week and the maximum amount is discretion to the members. In this context, the savings of the members are maintained by a bank in which the SHG linked for bank credit. Table shows the growth of SHG savings with Commercial Banks, Cooperative Banks and Regional Rural Banks.

Table 7. *Savings of SHGs with Banks in India (Rs.in lakhs)*

Year	Commercial Banks	Coop-Banks	Regional Rural Banks	Total
2007	189241.44	46199.96	115829.39	351270.79
2008	207773.45 (9.79)	54116.67 (17.14)	116648.83 (0.71)	378538.95 (7.76)
2009	277298.84 (33.46)	78287.80 (44.66)	198975.08 (70.58)	554561.72 (46.50)
2010	367389.24 (32.49)	122544.16 (56.53)	129937.49 (-34.70)	619870.89 (11.78)
2011	423006.42 (15.14)	135084.19 (10.23)	143539.67 (10.47)	701630.28 (13.19)
2012	415298.04 (-1.82)	109829.49 (-18.70)	130013.93 (-9.42)	655141.46 (-6.63)
2013	553257.05 (33.22)	115758.22 (5.40)	152710.20 (17.46)	821725.47 (25.43)

Year	Commercial Banks	Coop-Banks	Regional Rural Banks	Total
2014	663145.63 (19.86)	130610.18 (12.83)	195985.73 (28.34)	989741.54 (20.45)
2015	663067.47 (-0.01)	208259.23 (59.45)	234657.37 (19.73)	1105984.07 (11.74)
2016	903388.77 (36.24)	217322.11 (4.35)	248428.13 (5.87)	1369139.01 (23.79)
Mean	466286.64	121801.2	166672.6	754760.42
SD	228437.08	56983.25	49125.04	322470.93
CV	48.990698	46.78382	29.47398	42.724939
CAGR	24.49	24.82	50.32	29.39
t' value	11.57**	6.32**	3.40**	10.67**

Note: Values in () shows growth rate, ** denotes significant at 0.05 level.

Source: Compiled and Computed from various issues of Status of Microfinance in India, NABARD.

The above table shows the savings of SHGs with Banks in terms of the Indian rupees. The trend above reflects that although the volume of savings of SHGs has been increasing due to the bank loan, still the growth rate of savings has remained volatile across the banks. In 2012, the savings rate has become negative for SHGs across banks. Across all types of banks, RRBs have faced severe default of loans from SHGs during this period. Due to the rising number of non-performing assets in banks, these institutions have faced notable challenges in forms of lack of further refinancing facilities. In case of commercial bank financing, savings of SHGs have become negative for the year 2012 and 2015. The loan flow from co-operative banks has been reduced in recent years due to the failure of repayment by SHGs, leading to the declining savings of SHGs. The total savings of SHGs across bank financing has been seen with wide fluctuation during this time period 2007 to 2016.

Loan Disbursement to SHGs

Various public and private sector banks such as commercial banks, RRBs and cooperative banks involved in providing microfinance to the SHGs. Table 7 exhibits the shares of these agencies in the total credit linked SHGs and in the total loans disbursed.

Table 8. *Loan Disbursement to SHGs as per various types of banks*

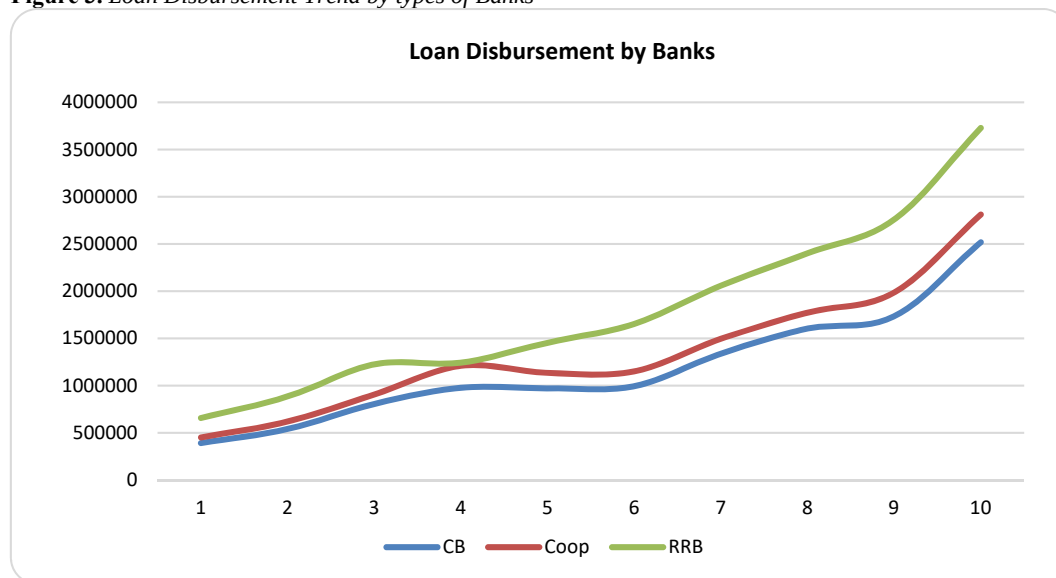
Year	CB	Coop	RRB	Total
2007	391894.32	59871.43	205273.10	657038.85
2008	540390.35	79351.75	265184.14	884926.24
2009	806053.10	99949.28	319349.01	1225351.39
2010	977521.00	232504.00	33320.06	1243345.06
2011	972455.27	162556.33	319761.59	1454773.19
2012	994204.49	156667.23	502605.15	1653476.87
2013	1338500.70	157383.52	562652.22	2058536.44
2014	1603749.35	169173.14	628813.35	2401735.84
2015	1733412.66	252296.21	772522.19	2758231.06
2016	2518497.23	293699.98	916492.88	3728690.09
Mean	1187667.8	166345.3	452597.4	1806610.5
SD	631627.38	75640.28	272988.2	942278.49
CV	53.182157	45.47185	60.3159	52.157258
CAGR	18.74238	23.89924	26.01253	20.961931
t' value	8.3	4.24	5.58	9.66

Note: Values in () shows growth rate, ** denotes significant at 0.05 level.

Source: Compiled and Computed from various issues of Status of Microfinance in India, NABARD.

The table explains that as on March 2007, 55 per cent of the total credit linked SHGs received the loans from the commercial banks, 31 per cent from RRBs and the remaining 14 per cent from the co-operative banks. The Commercial banks contributed 63 per cent of the total amount of the loans disbursed to the SHGs, while RRBs and co-operative banks shared approximately 28 per cent and 9 per cent of the total loan amount. The SHG bank linkage became a part of business for all the 27 public sector and 20 private sector commercial banks. NABARD data of SHG-BLP up to March 2006 reveals that the State Bank of India credit linked the highest number of SHGs (3,92,494), followed by the Andhra Bank (1,13,466) and the Indian Bank (96,460). The regional rural banks also financed SHGs in significantly

Figure 3. *Loan Disbursement Trend by types of Banks*



All the 159 RRBs in the country have been participating in the SHG-BLP. The Maximum number of SHGs has been linked to Pandiyan Grameen Banks in Tamil Nadu and Pondicherry (45,672) followed by Srivishakha Grameen Bank (35,875) and Nagarjuna Grameen Bank (27,879) in Andhra Pradesh. Up to March 2006, as many as 337 central co-operative banks were involved in SHG-BLP. The Maximum number of SHGs has been linked to Hooghly Cooperative Bank (18,015) in West Bengal followed by South Canara Co-operative Bank (10,851) and Hassan Co-operative Bank (10,389) in Karnataka.

Non-Performing Assets

Rising NPAs are the serious problems posing towards MFI refinancing. Over the years, refinancing facilities have taken a backstage due to the increasing reluctance of banks in financing the MFIs. NABARD Report (2012) has noticed a 4% decline in refinancing facilities across all categories of banks owing to the 4.72% rise in NPAs during this period. However, fresh loan issued by banks towards MFIs have been increasing sharply in order to drive up the financial inclusion and small entrepreneurship movements.

The probability of repayment has not been so encouraging due to the mismanagement and lack of effective monitoring of utilization of loans and grants⁽⁸⁾. Korankye (2014) has studied such a trend of defaulting of MFI loans and increasing NPA problems in Ghana. His study has pointed out that factors like poor appraisal, poor management, improper client selection and inadequate loan size have resulted in terms of failure of loan repayment and rising NPAs of banks. If we look at the table below, we can find the detailed trend of non-performing assets of three bank categories. Among these three banks, RRBs have the highest concentration of NPAs coming out of the MFI and SHG loan financing. However, the co-operative banks have been to certain extent been able to control the bad loan aspects of MFIs through various innovative financial schemes and less stringent repayment norms.

Table 9. NPAs across banks arising from SHG financing

Year	CB	Coop	RRB	Total
2008	21370.74	3594.89	17326.65	42292.28
2009	38710.10	6097.48	17779.20	62586.78
2010	53746.41	6703.99	21853.74	82304.14
2011	106698.90	27281.73	27281.73	161262.36
2012	165541.60	13097.44	42634.18	221273.22
2013	217598.70	18006.00	43088.27	278692.97
2014	202492.00	21585.20	69189.23	293266.43
2015	246686.47	28230.20	106553.96	381470.63
2016	232139.69	30053.72	106429.49	368622.90
Mean	142776.07	17183.41	50237.383	210196.86
SD	88926.05	10269.88	35823.254	129846.2
CV	62.283582	59.76629	71.307961	61.773617
CAGR	11.999785	15.14452	19.918048	14.593482
't' value	9.39	4.39	6.92	14.96

Note: Values in () shows growth rate, ** denotes significant at 0.05 level.

Source: Compiled and Computed from various issues of Status of Microfinance in India, NABARD.

Rising NPAs have already posed as the serious challenges for the Indian banking system. Rising non-performing assets from the sides, SHG loans are being piled up day by day leading to the bankruptcy conditions of the public sector banks. In 2012 Status of Microfinance in India report, NABARD has raised serious concerns regarding the growing NPAs particularly from the public sector banks. As per NABARD report, the non-performing assets from SHG loans have been increased by 1.3% within 2011-12 periods. Fresh lending approach and effectiveness in handling the loan disbursement channels have become the failure in case of self help groups leading to which, the loan to SHGs has not been recovered fully by bank. Except some handful states of Karnataka, H.P and Pondicherry, all of the states have been facing severe challenges in forms of recovering SHG based loan given by PSBs⁽⁹⁾. Das (2013) has found the successful adoption of SHG linked lending approach across the country notably in southern states. However, his study has found greater disparity in terms of SHG based financing to the women household in North-East Indian states. In order to contain with the problem of NPA problems of MFIs, the government of India, in 2015-16 budget, has offered tax break for MFIs to deal with the situation. Furthermore, the budget 2016-17 had proposed that non-banking finance companies (NBFCs) will be allowed to claim tax deductions on the provisions for NPAs up to 5 per cent of total income⁽¹⁰⁾.

Regional variations in Microfinance outreach

Region-wise allocation of MFIs has not been uniformly distributed throughout the country. Regions more concentrated with poverty and deprivations, have seen more rise in the number of MFIs. In India, especially in South India the number of MFIs has increased exponentially. However, in the last two years, all regions have experienced increase in MFIs and SHG linked loan financing. MFI currently works in 28 states and 561 districts. Nearly 50% of total MFIs in India are concentrated in only one state, 30% in 2 to 5 states. Rest of India has very few shares of MFIs and small loan financing facilities. As of 2013-14, 11687 MFI branches have been there across India with more than 1200 branches in Andhra Pradesh alone. As of March 2016, the total savings across all SHGs have reached 13691 crores, with a 21% increase in overall savings rate from 2015⁽¹¹⁾. Nagaland, Tripura, Jharkhand, Maharashtra and Assam have seen all time high in the branches of MFIs. The Southern Region has maintained its prominence in upkeep of savings linked SHGs and savings balances with 44.9% of SHGs and 63.3% of total savings outstanding⁽¹²⁾. Some of the worrying figure has been detected in forms of losing client outreach in terms of negative growth for MFIs during 2015-16. States like Tripura, Delhi, Punjab, Haryana and Punjab have seen the biggest decline in client outreach for the small scale financing. In South, Pondicherry has registered 69% loss in the client outreach of MFIs. However, states like Bihar, Andhra, Odisha, West Bengal and Jharkhand have registered outstanding growth in MFI outreach in 2015.

6. Concluding remarks

This paper formally represents the evolution, structure and other financing patterns of MFIs, in India, post 2000. Indirect SHG and direct MFI models have helped to facilitate the process of financial inclusion process in the long run. Right from the establishment of small finance banks, the evolution of MFIs has been started in varied forms. After the successful initiation of Grameen bank model, MFI initiatives have been started with full swing in India. Amount of bank loans towards SHG financing, the number of SHGs, savings by SHGs and outstanding loan database of banks have been collected to figure out the empirical relation in terms of efficiency of bank loans in terms of MFI startups across the Indian states. The sample is constituted of the individualized cross-section data collected from the NABARD reports of each year. In order to encounter the difficulties in the estimation process, we have undertaken four alternative approaches to take care of sampling error, omitted variable bias and year and state specific effects.

Our first specification has tested the efficiency of various types of bank loans with respect to MFI expansion across the models. In case of public sector bank financing, savings and outstanding loans even perpetuate more bank loans over the years. Similar logic stands true for the cases of private sector bank, RRB and co-operative banks as well. Further, the results specify that the number of SHGs have no significant association with that of bank loan. In our second model specification, we have taken care of endogeneity problem with the introduction of lagged explained variable. Results specify that savings and outstanding loans across the banking sectors have led to the more financing of MFI loans.

These solely identify that small scale credit finances still play a major role in the disbursement of banking loans for meeting the financial inclusion criteria.

Coming to the private sector bank lending, we have found positive association between savings of SHGs and bank loans during this period. Despite the increasing outstanding loan, the volume of bank loans towards the SHG financing remains positive. The sheer numbers of rising SHGs never have influenced the bank loans over the years significantly. However, if we examine from the panel fixed effect with respect to time and state specifics, then we have got positive and significant association of all the concerned explanatory variables to that of bank loan. Moreover, private sector bank lending has greatly influenced with the rising number of SHGs during this period. Similarly, in case of both co-operatives and RRB, we have obtained positive and significant association between bank loans to those of savings and outstanding loans. Overall, the empirical results indicate that financial inclusion is the need of the hour and still, the rate of repayment out of such loan has not progressed well since the starting year. Banks across the sizes, specifications and ownership have extended overall financial loan towards the small sector finances. Across the banks, the volume of outstanding loans has been quite high in case of both public and private sector banks. Except private sector banks, there is no other bank having a positive relation between the number of SHGs and bank loans. In case of co-operative bank loans, the volume of savings from SHGs has been the highest compared to those of other bank loan segments.

In order to make an effective microfinance system, it is better to read the local credit needs and conditions first. One size fits all propositions have never been universally applicable in the line of Grameen bank model. The appeal of importance of microfinance is entirely local specific. In most of the cases, it has been found that the percentage rate of repayment is quite lessened or not up to the minimum expectation level. Though it is being dubbed as the forefront of micro-credit towards the poor, still it remains a confused buzzwords for the banking institution due to the increasing share of outstanding loan and low repayment rate. Even studies have confirmed that microfinance institutions are not the sole ways of escaping poverty. Banerjee et al (2015) from six different randomized experiments have confirmed that MFIs alone cannot solve the problem of poverty. As far as the women empowerment is concerned, the studies by Banerjee et al has concluded that women were neither more empowered nor was more money spent on things like child education in families that received loans⁽¹³⁾.

Now the question, how we could address this issue despite knowing that the loan repayment rate is not up to the satisfactory level, arises. It could be addressed in numerous ways. MFIs must disburse loan in a phased manner, rather than to give straightaway to the poor and needy people. Low interest rate with phase wise manner may encourage more returns in the long run, which will directly lead to the increased productivity of the poor people.

Notes

- (1) See <http://business.time.com/2012/03/14/what-went-wrong-with-microfinancing/> (Retrieved on 29th Nov, 2016).
- (2) http://www.telegraphindia.com/1150413/jsp/business/story_14232.jsp#.V_6F1_197IU
- (3) Please see <http://thewire.in/18937/why-microfinance-is-becoming-a-bad-word-all-over-again/>
- (4) Please refer to <https://firstforsustainability.org/risk-management/understanding-environmental-and-social-risk/environmental-and-social-risk-for-financial-institutions/risk-in-microfinance/>.
- (5) Please see <http://www.ifmr.co.in/blog/2011/02/18/managing-risks-in-microfinance/>
- (6) <http://www.thehindubusinessline.com/opinion/managing-risks-in-microfinance/article1458600.ece>
- (7) For detailed discussion, please refer to <http://www.legatum.org/attachments/MicrofinanceCrisis.pdf>
- (8) Retrieved on 1st Dec 2016, see http://www.business-standard.com/article/finance/nabard-raises-concern-over-rising-npas-in-shg-lending-112112700679_1.html
- (9) Please refer to http://www.business-standard.com/article/economy-policy/nabard-raises-concern-over-rising-npa-in-shg-lending-112112603006_1.html
- (10) Please refer to <http://www.thehindubusinessline.com/money-and-banking/tax-breaks-for-npa-provisioning-will-help-mfis-save-150-crore/article8327972.ece>
- (11) For more details, see Status of Micro-finance Report, 2015 by NABARD
- (12) For more details, see Bharat Micro-finance Report, 2014.
- (13) Please refer to <http://www.humanosphere.org/social-business/2015/01/microfinance-not-quickly-lift-people-poverty-studies/>.

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Appendix

Definition of Variables and Descriptive Statistics

Variables	Definition	No of Obs.	Mean	Std.Dev	Min.	Max.
Bank Loan	the Loan disbursed for SHG Startup	240	3.252	1.122	0.100	5.902
Savings	total savings by SHGs	240	3.094	1.106	-0.091	5.443
Outstanding Loan recovered	Amounts of loan not recovered	240	3.808	1.068	0.000	6.325
No of SHGs total SHG startup in the state annually		240	4.427	0.915	2.255	6.021
Private Bank		No of Obs.	Mean	Std.Dev	Min.	Max.
Bank Loan		240	1.161	1.617	-1.698	5.144
Savings		240	0.791	1.354	-2	4.134
Outstanding loan		240	1.295	1.615	-0.585	5.241
No of SHGs		240	1.812	1.704	0	5.229
Co-operative Bank		No of Obs.	Mean	Std.Dev	Min.	Max.
Bank Loan		240	2.537	1.691	-0.431	5.614
Savings		240	2.416	1.536	0	4.961
Outstanding loan		240	2.813	1.741	0	5.781
No of SHGs		240	3.668	1.807	0	5.645
RRB		No of Obs.	Mean	Std.Dev	Min	Max
Bank Loan		240	2.044	1.565	-0.795	4.695
Savings		240	1.963	1.487	-0.456	4.536
Outstanding loan		240	2.200	1.619	0	4.869
No. of SHGs		240	3.364	1.661	0	5.517

Note: Author's own compilation. All variables are logarithmically transformed.

Human capital and collegiality in academic beehives: Theory and analysis of European Economics faculties

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Abstract. *This study investigates the importance of the quality of human capital investment and collegiality (i.e., good colleagues) in achieving the type of acclaim in economics captured by receipt of the Yrjö Jahnsson Award, arguably the second-most prestigious award that a European economist can receive as recognition of the importance of his or her research endeavors. We provide an economic model as a foundation for both qualitative and quantitative analyses. Our results indicate that four institutions, namely the Toulouse School of Economics, University College London, University of Oxford and the London School of Economics generally rank highest in supporting a position of acclaim among academic economics faculties in Europe.*

Keywords: economics research; human capital formation; collegiality; scientometrics; Yrjö Jahnsson Award.

JEL Classification: A10; A14.

1. Introduction and background

In moving from one institution to another, the late Nobel Laureate George Stigler's (1911-1991) experiences taught him that the types of academic institutions where "seniority [is] not considered an adequate substitute for interesting research" are surely unusual, if not anomalous. To Stigler, these were the types of academic institutions where the faculty engage in "that kind and intensity of scholarship" that leads to truly pioneering work, thus earning them reputations as academic "beehives" (Stigler, 1988: 46)⁽¹⁾ In their role as scholars, professional academics are not typically funded by the piece for their scholarly output, but are instead compensated in equivalent ways. For example, the higher the quality of their scholarship, the more prestigious the journal in which it will be published (Stigler, 1988: 84). The successful researcher is then hired by a more prestigious university, promoted at a rapid rate, more highly-favored by funding institutions such as the National Science Foundation, given a lighter teaching load and elected to the more learned societies (Stigler, 1988: 84-85).

The root of the type of success described above begins with formal human capital accumulation by the young scholar, primarily during his or her graduate school years. In an examination of the average quality of the PhDs trained during the 1960s by the top 36 U.S. *graduate* programs in *economics*, Hogan (1981) finds that student quality and faculty research activity contributes positively to the quality of *graduate* training in economics.⁽²⁾ More recently, Hilmer and Hilmer (2009) examine the role played by a PhD recipient's dissertation advisor and graduate economics program in his or her early career publishing success. Controlling for the quality of both the *student's graduate* program and dissertation advisor, they find that *students* working with prominent advisors are significantly more likely to publish in the early portion of their careers than *students* working with less prominent advisors – a result that is more remarkable when considering publications in only the top economics journals. Additional results in Hilmer and Hilmer (2009) suggest that even *students* attending lower ranked programs, but working with "superstar faculty," publish both more articles, and more articles in the top economics journals, than *their counterparts* attending top-ranked programs, but who are working with less prominent advisors.

Over time, doctoral students in economics ultimately graduate, and many find employment among the economics faculties of academic institutions. When they function at a high level, academic departments consist of faculty members committed to interacting in a collegial manner, as one's association with good colleagues provides frequent opportunities for exchanges with strong minds and powerful scientific imaginations "that have a deep understanding of the problems one is struggling with [and] are invaluable in discovering errors and eliminating strange perspectives that creep into one's work (Stigler, 1988: 36)."⁽³⁾ Such a commitment to collegiality, and to excellence in research, becomes self-reinforcing, as scholars who are themselves committed to the endeavor are the ones who accept invitations to join the group (Stigler, 1988: 46).⁽⁴⁾

As in the case of human capital accumulation discussed above, academic research suggests that economics faculty benefit from collegiality. Laband and Tollison (2000), for

example, investigate the impact of the provision by scholars of helpful assistance (e.g., commentary, constructive criticism) on the current research of other academicians by collecting the number of individuals acknowledged in the authors' footnotes for all articles published in the *Review of Economics and Statistics* over the period 1976-1980.⁽⁵⁾ Their analysis indicates that the scholarly impact of published research, as measured by citations to it, is a positive function of the number of helpful comments provided by others to that published research (Laband and Tollison, 2000). In a later extension, Laband and Tollison (2003) examine the authors' acknowledgements for all articles published in the three leading economics journals – *American Economic Review* (AER), *Journal of Political Economy* (JPE) and *Quarterly Journal of Economics* (QJE) – over the period 1960-1999, finding (1) that the number of commenters per paper has been generally rising over time, from a low of 124 aggregate “thanks” in 1960 to a high of 1,005 aggregate “thanks” in 1998, and (2) that the major economists over the last 20 years show up as helpful colleagues as well (Laband and Tollison, 2003).⁽⁶⁾ Thus, this work by Laband and Tollison (2000 and 2003) is also consistent with that of Oettl (2012), which explores the idea that innovation is often the result of a communal process, wherein scientists influence the productivity of their peers, thus creating an a social dimension to innovation referred to as “helpfulness to others.”⁽⁷⁾

Following the research outlined above, the present study extends recent work by Faria, Mixon and Upadhyaya (2016) investigating the importance of the quality of human capital investment and collegiality (i.e., good colleagues) in producing acclaimed scholars in the field of economics. In doing so, this study focuses on European economics faculties through an analysis of the probability of receiving of the Yrjö Jahnsson Award, arguably the second-most prestigious award that a European economist can receive as recognition of the importance of his or her research endeavors. Unlike Faria et al. (2016), we develop a formal approach to the subject, which is presented in the next section of this study. The formal model is followed by an exploratory analysis of the credentials of past winners of the Yrjö Jahnsson Award, particularly as they relate to the theoretical framework regarding human capital investment and collegiality presented in this study.

2. Human capital and collegiality in Economics: An economic model

To introduce our economic model, we assume that high-quality publications, P , serve as proxies for the quality of a scholar's research portfolio. Publications are an increasing function of the human capital of the author, E , given by his education and training (proxied by the PhD-granting institution), as in Hogan (1981) and Stigler (1988), and his or her professional network, N , which captures his or her area of research. Publications also increase with his or her departmental affiliation, D , because of in-house or affiliated journals (i.e., journals published by his own department or association), co-authors, students and the overall departmental environment or, as in Laband and Tollison (2000 and 2003) and Oettl (2012), collegiality,

$$P_t = F(E_t, N_t, D_t) = (E_t N_t)^\beta D_t^\gamma. \quad (1)$$

Taking the logarithm of (1) yields,

$$\ln P_t = \beta(\ln E_t + \ln N_t) + \gamma \ln D_t. \quad (2)$$

Human capital grows through education at the rate ε ,

$$E_t = He^{\varepsilon t} \Rightarrow \ln E_t = \ln H + \varepsilon t. \quad (3)$$

Professional (academic) networks grow by a constant accumulation of knowledge, nt , and random shocks that impact research and research communities, u_t ,

$$N_t = Ne^{nt+u_t} \Rightarrow \ln N_t = \ln N + nt + u_t. \quad (4)$$

The department benefits from the reputation acquired through publication of its faculty,

$$D_t = gP_{t-1} \Rightarrow \ln D_t = \ln P_{t-1} + \ln g. \quad (5)$$

Inserting (3) through (5) into (2) yields,

$$\ln P_t = \Omega + \beta(l\varepsilon + n)t + \gamma \ln P_{t-1} + \beta u_t, \quad (6)$$

where $\Omega = \beta(\ln N + \ln H) + \ln g$. Assuming that $\beta + \gamma = 1$, we have,

$$\ln P_t = \Omega + (1 - \gamma)(\varepsilon + n)t + \gamma \ln P_{t-1} + (1 - \gamma)u_t. \quad (7)$$

Defining,

$$y_t = \ln P_t - (\varepsilon + n)t, \quad (8)$$

yields,

$$y_t = \Omega + \gamma y_{t-1} + (1 - \gamma)u_t. \quad (9)$$

Equation (9) is a first-order linear difference nonhomogeneous stochastic equation which has as a solution (Dadkhah, 2007: 510),

$$y_t = \left(y_0 - \frac{\Omega}{1 - \gamma} \right) \gamma^t + \frac{\Omega}{1 - \gamma} + (1 - \gamma) \sum_{j=1}^{t-1} \gamma^j u_{t-j}. \quad (10)$$

As $0 < \gamma < 1$, the model is stable and fluctuations around the long-run trend, $\frac{\Omega}{1 - \gamma}$, are

caused by random shocks affecting academic networks. To summarize, this model explains the scholarly impact of researchers (economics faculties) as a function of PhD training, departmental affiliation (including collegiality), professional networks, growth rates of knowledge and education and random shocks affecting scientific networks and research.

In the empirical analyses that are presented in the next section of this study, Egghe's g-Index serves as proxy for the high-impact publications, P , that represent the impact of a scholar's research portfolio in (1) above (Egghe, 2006). Following Faria et al. (2016),

Of course, the production of impactful publications reflected in a high g-score ultimately leads to greater acclaim for economics faculties. With the exception of the Nobel Prize in Economic Sciences, the Yrjö Jahnsson Award is the most prestigious award that a European economist can receive. The Yrjö Jahnsson Award (hereafter YJA), is sponsored by the Yrjö Jahnsson Foundation, which is a private trust founded to promote Finnish research in economics (particularly health economics) and medicine and to support educational and research facilities.⁽⁹⁾ The Yrjö Jahnsson Foundation was established in 1954 by Hilma Jahnsson (1882-1975), who provided the original capital by donating funds acquired with her husband Yrjö Jahnsson (1877-1936), a professor of economics.⁽¹⁰⁾ The YJA began in 1993 as a biennial award “for a European economist no older than 45 years old who has made a contribution in theoretical and applied research that is significant to economics in Europe.”⁽¹¹⁾ The European Economic Association (EEA) cooperates with the Yrjö Jahnsson Foundation in the selection of YJA winners, who each receive €20,000 from the Yrjö Jahnsson Foundation.⁽¹²⁾ The link between human capital and collegiality and the production of impactful research, as well as that between impactful research production and acclaim, are the focus of the next section of the study. The analysis begins with a review of all YJA winners.

All YJA winners through 2015 are listed, along with their time-of-award university affiliations and doctoral degree affiliations, in Table 1.⁽¹³⁾ The first winners of the YJA are Jean-Jacques Laffont and Jean Tirole, both of whom were affiliated with the Toulouse School of Economics, which is part of the University of Toulouse Capitole (France).⁽¹⁴⁾ Laffont was trained in economics at Harvard University, while Tirole received his economics training at the Massachusetts Institute of Technology (MIT).⁽¹⁵⁾ The most recent winner of the YJA, Central European University's Botond Köszegi, acquired, like Tirole, his economics training at MIT.⁽¹⁶⁾ The first and only female to win the award to date is Hélène Rey, who, at the time of her recognition in 2013, was affiliated with London Business School (LBS).⁽¹⁷⁾ Rey received her training in economics from the London School of Economics (LSE).⁽¹⁸⁾

Table 1. *Yrjö Jahnsson Award Winners, 1993-2015*

Name	Jahnsson Award	University Affiliation	Doctoral Affiliation
Laffont, Jean-Jacques	1993	Toulouse	Harvard
Tirole, Jean		Toulouse	MIT
Blundell, Richard	1995	UC London	—
Persson, Torsten	1997	Stockholm	Stockholm
Kiyotaki, Nobuhiro	1999	LSE	Harvard
Moore, John		LSE	LSE
Aghion, Philippe	2001	UC London	Harvard
Tabellini, Guido		Bocconi	UCLA
Dewatripont, Mathias	2003	Free U Brussels	Harvard
Besley, Timothy	2005	LSE	Oxford
Gali, Jordi		Pompeu Fabra	MIT
Saint-Paul, Gilles	2007	Toulouse	MIT
van Reenan, John	2009	LSE	UC London
Zilibotti, Fabrizio		Zurich	LSE
Falk, Armin	2011	Bonn	Zurich
Piketty, Thomas	2013	Paris School	EHESS & LSE
Rey, Hélène		LBS	LSE
Kőszegi, Botond	2015	CEU	MIT

Notes: LSE = London School of Economics; LBS = London Business School; CEU = Central European University

The first step in analyzing the Table 1 data in a way that is consistent with the conceptual framework developed above in this study, and with the empirical approaches in Neckermann (2008), Mixon and Upadhyaya (2008) and Faria et al. (2016), is to rank the European universities included in Table 1 on the basis of YJA medals won by these universities' economics faculties. Studies by Frey and Neckermann (2008), Mixon and Upadhyaya (2012) and Faria et al. (2016) have created a branch in the economics literature that include studies that rank economics departments on the basis of prestigious prizes and awards held by their current faculty. Specifically, Frey and Neckermann (2008) employ economists' self-reported data on a wide variety of awards contained in Blaug and Vane (2003) to construct worldwide rankings of economics departments and economists. Most recently, Faria et al. (2016) rank U.S. economics departments on the basis of John Bates Clark Medals won by economists affiliated with various university faculties.⁽¹⁹⁾ This study follows the approach taken in the Faria et al. (2016).

The first of our rankings is consistent with the notion of ranking institutions on the basis of their success in training high-quality economics faculty, as evidenced again by YJA awards. A ranking using this approach, which we refer to as the human capital-based approach is also presented in Table 2. According to this approach, LSE retains the top-ranked European economics faculty based on the fact that it is responsible for the academic training of four YJA winners. The first of these is Moore (1999), while the most recent winner in this group is Rey (2013). The others in this group are Fabrizio Zilibotti (2009) and Thomas Piketty (2013). Rounding out the top five European universities is a four-way tie for second that includes the University of Stockholm, Zürich, Oxford and UCL. Each of these trained one of the 18 YJA winners listed in Table 1. Lastly, an alternative presentation of the human capital-based approach using simple YJA counts is a ranking based on the highest g-score of the time-of-award research portfolios of each European institution's YJA winners. That presentation is

included in the second part of Table 2, with Oxford ranking as the top European economics faculty with a g-score of 162.⁽²⁰⁾ Oxford is followed by UCL (141) in second, Zürich (126), which ranks third, and LSE (116) and Stockholm (116), which are in a two-way tie for fourth. Here, the Spearman rank correlation between the two human capital-based ranking series in Table 2 is -0.354 , although it is not statistically significant at usual levels.⁽²¹⁾

Table 2. *Ranking Economics Faculties Using Jahnssen Awards, 1993-2015*

Human Capital-Based Approach						Collegiality-Based Approach					
Award Count			Highest g-score			Award Count			Highest g-score		
Rank	Institution	Score	Rank	Institution	Score	Rank	Institution	Score	Rank	Institution	Score
1	<i>MIT</i>	4	1	<i>MIT</i>	211	1	LSE	4	1	Toulouse	211
	<i>Harvard</i>	4	2	<i>Harvard</i>	201	2	Toulouse	3	2	UCL	201
	LSE	4	3	Oxford	162†	3	UCL	2	3	Pompeu Fabra	174†
4	Stockholm	1	4	<i>UCLA</i>	150†	4	Bocconi	1	4	LSE	162
	Zürich	1	5	UCL	141†		Free U Brussels	1	5	Bocconi	150†
	Oxford	1	6	Zürich	127†		Pompeu Fabra	1	6	Bonn	127†
	UCL	1	7	LSE	116		Zürich	1	7	Paris School	116†
	<i>UCLA</i>	1		Stockholm	116†		Bonn	1		Stockholm	116†
							Paris School	1	9	Free U Brussels	105†
							LBS	1	10	LBS	94†
							Stockholm	1			

Notes: The universities listed in *italics* are American universities. † denotes institutions with a single YJA winner over the period 1993-2015.

A contrasting approach is, according to the conceptual framework discussed earlier in this study, one that compares European universities on the basis of having the type culture or collegiality necessary for supporting the development of highly-accomplished economists from among the economics faculties affiliated with these institutions. As such, this approach to ordering European universities is referred to here as the collegiality-based approach. As pointed out in the third ranking in Table 2, LSE is the leader in producing YJA winners over the 1993-2015 period, having produced four winners, beginning with Nobuhiro Kiyotaki and John Moore in 1999, and ending with John van Reenan in 2009. In between these two award years is Timothy Besley's YJA in 2005.⁽²²⁾ Following top-ranked LSE in second place is Toulouse, with three YJA winners. In addition to Laffont and Tirole, this list includes Gilles Saint-Paul, who won the award in 2007.⁽²³⁾ In third place is University College London (UCL), with two YJA winners. The UCL are Richard Blundell (1995) and Phillipe Aghion (2001). Interestingly, Blundell did not complete formal doctoral-level training in economics, while Aghion received a PhD in economics from Harvard, as did the aforementioned Laffont and Kiyotaki. Finally, rounding out the top 10 European universities is an eight-way tie or fourth with one YJA winner in each case.

An alternative presentation of the collegiality-based approach using simple YJA counts is a ranking based on the highest g-score of the time-of-award research portfolios of each European institution's YJA winners. That presentation is included in the last portion of Table 2, with Toulouse ranking as the top European economics faculty with a highest g-score of 211. Rounding out the top five are UCL (201), Pompeu Fabra University (174), LSE (162) and Italy's Bocconi University (75).⁽²⁴⁾ The order of the remaining institutions in the top 10 is the University of Bonn (127), Paris School of Economics

(116), Free University of Brussels (105), LBS (94) and the University of Zürich (28).⁽²⁵⁾ Interestingly, the Spearman rank correlation between the two collegiality-based ranking series in Table 2 is +0.678, which is statistically significant at $p = 0.022$. Lastly, each of the sets of rankings in Table 2 are summarized, using average rankings, in Table 3. The summary evidence in Table 3 support for the case that Oxford, UCL and LSE again stand out among Europe's top institutions in terms of offering the quality of human capital that is conducive to producing future YJA winners, while Toulouse, LSE and UCL appear to provide the most amenable collegiality to achieving acclaim in the form of the YJA.

Table 3. *Average of Rankings of European Economics Faculties*

Human Capital-Based Approach			Collegiality-Based Approach		
Rank	Institution	Avg Rank	Rank	Institution	Avg Rank
1	Oxford	1.5	1	Toulouse	1.5
2	UCL	2	2	LSE	2.5
3	LSE	2.5		UCL	2.5
	Zürich	2.5	4	Pompeu Fabra	3.5
5	Stockholm	3.5	5	Bocconi	4.5
			6	Bonn	5
			7	Paris	5.5
				Stockholm	5.5
			9	FUB	6.5
			10	LBS	7

A more formal exploration of the data described above in Tables 2 and 3 is undertaken next. That exploration begins with a description of the empirical methodology. Here, the tendency of the Yrjö Jahnsson Foundation, with the assistance of the European Economic Association, to support (or not support) a given YJA candidate, i , is a function of the impact of i 's research portfolio at the time of the selection, where research portfolio impact is captured by the current g-score associated with i 's research portfolio. This latter variable is endogenous, given that it is determined by the quality of i 's human capital, as proxied by the quality of his or her doctoral training, and the level of collegiality associated with the economics faculty to which i is affiliated. In order to deal with this aspect of the analysis, we first develop the following two-equation systems (models), which treat the human capital and collegiality effects separately:

$$g\text{-SCORE}_i = \alpha + \delta_1 \text{LSE-HC}_i + \delta_2 \text{OXFORD-HC}_i + \delta_3 \text{UCL-HC}_i + \varepsilon_{i1} \quad (1a)$$

$$\text{YJA}_i = \alpha + \delta_1 g\text{-SCORE}_i + \varepsilon_{i2}. \quad (1b)$$

and,

$$g\text{-SCORE}_i = \alpha + \beta_1 \text{LSE-C}_i + \beta_2 \text{UCL-C}_i + \beta_3 \text{TOULOUSE-C}_i + \varepsilon_{i1} \quad (2a)$$

$$\text{YJA}_i = \alpha + \beta_1 g\text{-SCORE}_i + \varepsilon_{i2}, \quad (2b)$$

Above, each economist i 's g-score is an endogenous variable, while all other variables are assumed to be exogenous. The variables above are defined in Table 4.

Table 4. *Variable Definitions*

Variable	Definition
$g\text{-SCORE}_i$	Current g-score of the time-of-award research portfolios of each YJA candidate, i , in our sample.
LSE-HC_i	Dummy variable equal to 1 for each economist, i , in our sample who is completed doctoral training at LSE, and 0 otherwise.
OXFORD-HC_i	Dummy variable equal to 1 for each economist, i , in our sample who is completed doctoral training at Oxford, and 0 otherwise.
UCL-HC_i	Dummy variable equal to 1 for each economist, i , in our sample who is completed doctoral training at UCL, and 0 otherwise.
YJA_i	Dummy variable equal to 1 for each economist, i , in our sample who won the YJA, and 0 otherwise.
LSE-C_i	Dummy variable equal to 1 for each economist, i , in our sample who is affiliated with LSE at the time of the relevant YJA selection, and 0 otherwise.
UCL-C_i	Dummy variable equal to 1 for each economist, i , in our sample who is affiliated with UCL at the time of the relevant YJA selection, and 0 otherwise.
TOULOUSE-C_i	Dummy variable equal to 1 for each economist, i , in our sample who is affiliated with Toulouse at the time of the relevant YJA selection, and 0 otherwise.

Sources: Harzing (2007) and Authors.

4.1. Specification of the variables in (1a) through (2b)

In the first model (i.e., the human capital model), $g\text{-SCORE}_i$ is defined as the current g-score of the time-of-award research portfolios of each YJA candidate, i , in our sample, and it is considered to be a function of the quality of one's formal human capital attainment, which is captured by having been trained in economics at one of the top three European institutions listed in Table 3. Thus, given qualitative analysis in Tables 2 and 3, it is expected that the human capital variables in the first equation of the second system – LSE-TR, OXFORD-TR and UCL-TR, which are defined in Table 4, along with the other variables – will each exhibit a positive relationship to $g\text{-SCORE}$. In the second model (i.e., the collegiality model), $g\text{-SCORE}$ is considered a function of departmental affiliation (and/or professional networks) and random shocks affecting scientific networks and research (see (2a) above). The variables LSE-C, UCL-C and TOULOUSE-C, each of which is a dummy variable equal to 1 if economist i was affiliated with the respective university at the time of his or her YJA (for recipients) or YJA candidacy (for non-recipients), and 0 otherwise, capture the culture or collegiality represented within the economics faculties of these three institutions vis-à-vis their counterparts in our sample. Given the rankings analysis presented in Tables 2 and 3 above regarding the impact of economists who are affiliated with these institutions, each of these variables is expected to be positively related to $g\text{-SCORE}$. Lastly, the dependent variable in the second equation of each model, YJA_i , is expressed as a function of $g\text{-SCORE}$, which is the endogenous variable in the first equation of each system. It is expected that in each case a higher g-score will result in a greater likelihood that an economist, i , is awarded the YJA.

4.2. Data

Following the foundation laid in a study of John Bates Clark Medal winners by Chan, Frey, Gallus and Torgler (2014), and used recently in empirical research by Faria et al. (2016), our models are applied to data on both YJA winners and other economists who are considered to be their competitors for the YJA.⁽²⁶⁾ Given that the present study examines collegiality and human capital pertaining to various European universities whose economics either won or were eligible for past YJAs, use of the control group provided by Chan et al. (2014), and employed in Faria et al. (2016), is not feasible.

Instead, we generated an alternative control group by culling through the rolls of age-eligible editors and associate editors of two prominent European economics journals that each has a current or past relationship to the European Economics Association – *European Economic Review* (EER) and the *Journal of the European Economic Association* (JEEA). The former was established in 1969 by Elsevier, and, as a result of an agreement between Elsevier and the EEA Council, it became the official journal of the EEA in 1986, a position it would hold through 2002.⁽²⁷⁾ The EER, which continues to be published by Elsevier, is currently ranked sixteenth among all economics journals (Kalaitzidakis, Mamuneas and Stengos, 2011). The latter journal was established in 2003 as the official journal of the EEA, and it is currently ranked nineteenth among all economics journals (Kalaitzidakis et al., 2011).

In culling through the rolls of editors and associate editors of the *EEA* and *JEEA*, we sought to identify economists who had not reached the age of 45 before the first YJA was awarded in 1993, and who did not have more than a few years remaining, by 2015, before reaching the age of 45. This process resulted in providing a control group of 19 economists, which, when matched with the YJA-winning economists, creates the overall group of economists appearing in Table 5.⁽²⁸⁾

Table 5. *YJA Winners and Potential YJA Competitors*

Aghion, Phillipe	Garcia-Peñalusa, Cecilia	Mira, Pedro	Rey, Hélène
Bandiera, Oriana	Heidhues, Paul	Monacelli, Tommaso	Saint-Paul, Gilles
Besley, Timothy	Huck, Steffen	Nöldeke, Georg	Schmutzler, Armin
Blundell, Richard	Janeba, Eckhard	Oechssler, Jörg	Sutter, Matthias
Botticini, Maristella	Kiyotaki, Nobuhiro	Persson, Torsten	Tabellini, Guido
Claudio, Michelacci	Kőszegi, Botond	Pesendorfer, Martin	Tirole, Jean
Dewatripont, Mathias	Laffont, Jean-Jacques	Piketty, Thomas	Välimäki, Juuso
Falk, Armin	Leith, Campbell	Raimondos, Pascalis	Zenou, Yves
Gali, Jordi	Manzini, Paola	van Reenen, John	Zilibotti, Fabrizio

Notes: The names in bold font are YJA winners, while those in traditional font are members of a control group of potential YJA competitors culled from the lists of editors and associate editors of *European Economic Review* and *Journal of the European Economic Association*.

The “academic demographics” frequencies for the 36 economists included in our sample are provided in Table 6. As indicated there, affiliations with both LSE and UCL exist across both the YJA recipients and members of the control group (i.e., the YJA candidates), while one member of the control group received economics training from LSE. While a number of YJA winners received economics training from either Harvard or MIT, economists in the control group were trained at either Columbia University or the University of Minnesota, which are responsible for the training of three previous John Bates Clark Medal winners. Lastly, a few different European universities, such as the aforementioned Bocconi, Bonn, Stockholm and Zürich, are associated, either through affiliation, training or both, with economists on both sides of the sample listed in Table 5.

Table 6. *Academic Demographics Frequencies*

Institution	YJA Winners		YJA Competitors	
	Training	Affiliation	Training	Affiliation
LSE	3	3	1	2
Toulouse	0	3	0	0
UCL	1	2	0	1
Oxford	1	0	0	0
Aalto	0	0	0	1
Basel	0	0	0	1
Bocconi	0	1	0	2
Bonn	0	1	2	1
Boston College	0	0	1	0
CEMFI	0	0	0	2
CNRS	0	0	0	1
Cologne	0	0	0	1
Columbia	0	0	1	0
Copenhagen	0	0	0	1
ESMT	0	0	0	1
Essex	0	0	1	0
Exeter	0	0	1	0
Free U Brussels	0	1	0	0
Glasgow	0	0	0	1
Harvard	4	0	0	0
Heidelberg	0	0	1	1
Humbolt	0	0	1	0
Innsbruck	0	0	1	1
LBS	0	1	0	0
Mannheim	0	0	0	1
Minnesota	0	0	1	0
MIT	4	0	0	0
New York	0	0	1	0
Northwestern	0	0	2	0
Pantheon-Assas	0	0	1	1
Paris School	0	1	0	0
Pennsylvania	0	0	1	0
Pompeu Fabra	0	1	0	0
Rice	0	0	1	0
Southampton	0	0	0	1
St. Andrews	0	0	0	1
Stockholm	1	1	0	0
UCLA	1	0	0	0
U of London	0	0	1	0
Zürich	1	1	0	1

4.3. Estimation technique and empirical results

Treating g-scores as endogenous means that the second equation in each system, (1b) and (2b), contains an endogenous variable on the right-hand side. Thus, the use of traditional econometric methods would yield biased and inconsistent estimates (Johnston, 1962). As such, we use a two-stage estimation procedure to jointly estimate each system. There is also the consideration that although the latent dependent variable in (1b) and (2b) is a continuous variable, YJA^* , measuring the Yrjö Jahnsson Foundation's propensity (tendency), with the assistance of the European Economic Association, to select a given YJA candidate, this variable cannot be observed. What is observed, however, is an indicator of YJA^* , or the variable YJA , which is equal to 1 for each economist, i , in our sample who won the Yrjö Jahnsson Award, and 0 otherwise. Therefore, the latter portion

of the model should be estimated by maximum likelihood. Maddala (1983: 242-245) describes a two-stage technique for estimating a similar model that can be applied to our empirical analysis. The first step in the empirical process is to estimate (1a) and (2a) using OLS. From this procedure, we obtain predicted values of *g-SCORE*, which are used as regressors in (1b) and (2b), respectively.

The results from empirical tests of (1a) and (1b) above are presented in columns two and three of Table 7. As indicated there, the human capital effects included in our model explain about eight percent of the variation in the *g-scores* of the economists included in our sample. In this system, the positive sign (i.e., 59.90) and significance (at the 0.000 level) of UCL-HC suggests that economists who were trained at University College London during this period produced research portfolios that were on average about 60 points (on the *g-Index*) more impactful than those of their counterparts in the omitted category (i.e., those trained at Heidelberg, Stockholm, etc.). Although the associated parameter estimate for OXFORD-HC is relatively large (i.e., 41.90), it falls marginally outside of traditional levels of statistical significance. Lastly, the results of probit estimation of (2b) shown in Table 7 are not encouraging, indicating that the predicted value of *g-SCORE* in this system is, although positive, not significantly related to the probability that an economist in our sample wins the YJA. This parsimonious equation explains about four percent of the variation in the probability of winning the YJA among the economists in our sample.

Table 7. Simultaneous Probit Results for Individual and Encompassing Models

Variable	Human Capital Model		Collegiality Model		Encompassing Model	
	<i>g-SCORE</i>	YJA	<i>g-SCORE</i>	YJA	<i>g-SCORE</i>	YJA
constant	81.10 [0.000]	-2.140 [0.163]	75.25 [0.000]	-2.198 [0.043]	81.10 [0.000]	-2.108 [0.007]
<i>pred g-SCORE</i>	—	0.024 [0.176]	—	0.025 [0.052]	—	0.024 [0.008]
LSE-HC	14.90 [0.254]	—	—	—	26.53 [0.046]	—
OXFORD-HC	41.90 [0.159]	—	—	—	59.07 [0.077]	—
UCL-HC	59.90 [0.000]	—	—	—	82.61 [0.000]	—
LSE-C	—	—	6.750 [0.760]	—	-11.09 [0.404]	—
UCL-C	—	—	45.42 [0.193]	—	51.19 [0.148]	—
TOULOUSE-C	—	—	74.08 [0.015]	—	79.86 [0.010]	—
<i>nobs</i>	36	36	36	36	36	36
<i>R</i> ²	0.079	—	0.216	—	0.353	—
pseudo <i>R</i> ²	—	0.042	—	0.104	—	0.173

Note: The numbers in brackets below the parameter estimates are two-tailed *p*-values.

Next, the results from empirical tests of (2a) and (2b) above are presented in columns four and five of Table 7. As indicated there, the collegiality effects included in our model explain about 22 percent of the variation in the *g-scores* of the European economists included in our sample. The positive sign (i.e., 74.08) and significance (at the 0.015 level) of TOULOUSE-C suggests that economists who were affiliated with Toulouse School of Economics during this period produced research portfolios that were on average almost 75 points (on the *g-Index*) more impactful than those of their counterparts in the omitted

category (i.e., those affiliated with Bocconi, Bonn, etc.). As such, this finding supports the idea that the typical Toulouse economist's colleagues offered superior assistance in allowing him or her to compete for the YJA. Next, although positively signed, neither the coefficient attached to LSE-C nor that associated with UCL-C reach traditional levels of significance in the collegiality model.⁽²⁹⁾ As such, the quality of the collegiality exhibited among the economics faculties at these two universities is similar to that supporting the economics faculties affiliated with the institutions in the omitted category (i.e., those affiliated with Bocconi, Bonn, etc.). Lastly, and encouragingly, the results of probit estimation of (1b) shown in Table 7 indicate that the predicted value of *g-SCORE* is positively and significantly (at the 0.052 level) related to the probability that an economist in our sample wins the YJA. This parsimonious equation in the collegiality system explains more than 10 percent of the variation in the probability of winning the YJA among the economists in our sample.

The possibility that the lack of significance of the individual regressors in (1a)-(1b) and in (2a)-(2b) may be due to omitted variables, the human capital and collegiality approaches to explaining YJA success are combined into a single system with six individual regressors in the first equation. The results of simultaneous probit estimation of this broader system or encompassing model are reported in columns six and seven of Table 7. As indicated there, the six regressors in the combined model work to explain more than 35 percent of the variation in *g-SCORE* across the 36 European economists studied here. Also, five of the six regressors are positively related to *g-SCORE*, as expected, with four of these reaching statistical significance (at the 0.08 level or better). Each of the human capital variables – LSE-HC, OXFORD-HC and UCL-HC – retains a coefficient estimate larger than 25 and that is significant at the 0.077 level or better. These results suggest that economics training at either of these three institutions supports a significantly more impactful research portfolio than that supported by training at one of the institutions in the omitted category. At the same time, the other results indicate that Toulouse collegiality remains an important pillar in terms of supporting a YJA-worthy research portfolio.⁽³⁰⁾

In terms of the individual effects, the simultaneous probit results suggest that University College London doctoral training has, by a small margin, the largest effect on the impact of one's research portfolio (through age 45), followed by Toulouse collegiality. Trailing Toulouse collegiality are Oxford doctoral training and LSE doctoral training. Finally, and again encouragingly, the results of probit estimation of (1b) for the encompassing model that are shown in the final column of Table 7 indicate that the predicted value of *g-SCORE* is positively and significantly (at the 0.007 level) related to the probability that an economist in our sample wins the YJA. This parsimonious equation in the collegiality system explains more than 17 percent of the variation in the probability of winning the YJA among the economists in our sample, further attesting to the efficacy of the encompassing approach.

5. Concluding remarks

This study investigates the role of human capital formation and collegiality in achieving acclaim in the field of economics. The hypotheses developed from a formal model are tested both qualitatively and quantitatively. Our results indicate that for European

economics faculties both the quality of one's human capital formation (i.e., doctoral training) and access to good colleagues (i.e., collegiality) are integral to achieving the type of acclaim in economics captured by receipt of the Yrjö Jahnsson Award, arguably the second-most prestigious award that a European economist can receive as recognition of the importance of his or her research endeavors. The empirical analysis also suggests that three institutions, namely University College London, Oxford and London School of Economics, generally rank highest in fostering development of acclaimed European economists, and that, more specifically, the collegiality that has existed within the Toulouse School of Economics ranks highest in providing the quality of support helpful in earning Europe's top economics award.

It is worth noting, in closing, that the results of this study, which are summarized just above, appear to suggest that in Europe human capital quality holds greater importance than collegiality in the determination of acclaim in economics. The recent study of the John Bates Clark Medal by Faria et al. (2016), on the other hand, suggests that in America either collegiality holds slightly greater importance than human capital quality, or that the two serve as equal paths to acclaim in economics. To the extent that such a difference exists, it could be due to a number of factors, such as faculty size, heterogeneity in graduate training and network effects. The mere possibility of such a difference, with any number of potential determinants, is easily a subject worthy of future research.

Notes

- (1) The London School of Economics was, according to Stigler (1988: 46), such a place during the 1930s.
- (2) Hogan (1981) explores the importance of program size, the quality of entrants and of the faculty, as measured by the faculty's published research output, in reaching conclusions about the importance of faculty research in the provision of a high-quality graduate program in economics. Stigler (1988: 35) adds that in the leading graduate economics programs, students learn primarily from one another, namely by learning to impose higher standards upon themselves in both the choice of problems to analyze and in the quality of their solutions to these problems.
- (3) As Stigler (1988: 36) indicates, the collaboration among scholars that these interactions foster has been invaluable to the advancement of science.
- (4) In his description of academic life at the University of Chicago, Stigler (1988: 46) notes that there was a warm camaraderie and willingness by colleagues to share one's problems even if they were not of close relevance to their own work, and that drafts of papers were read carefully and constructively, and one was expected to return the compliment (and the sharp criticisms).
- (5) Authors' acknowledgements are generally contained in a footnote on the first page of a published article. Therein the author or authors recognize the names of individuals who have provided comments and criticisms of the particular study. Berg and Faria (2008) show that this practice serves as a signaling device that increases the probability of acceptance for some authors, a potential explored in Laband, Tollison and Karahan (2002) and Mixon and Sawyer (2005). Laband and Tollison (2003) also admit to the possibility of rent seeking through inclusion of journal editors in lists of thanked scholars, although their results hold after adjusting authors' acknowledgements for journal editors.
- (6) It is worth noting here that, as Hollingsworth (2012) points out, what is defined as creativity in one field (e.g., the arts) may not be so in another (e.g., the sciences), with similar differences

occurring across societies at any point in time, as well as over time within a given society. Adding to the complexity is the idea that individual creativity is both influenced by personality traits and facilitated, or hindered, by the social environment (Hollingsworth, 2012).

- (7) Oettl (2012) shows that the quality of research output of scientists who experience the loss (through death) of a coauthor decreases, with the magnitude of decrease depending on whether the coauthor was helpful through the provision of conceptual feedback (i.e., critique and advice) or through the provision of materials (access), scientific tools or technical work.
- (8) For example, a scholar has an h-index of 31 if 31 of his n papers, for $n \geq 31$, have at least 31 citations each and the other $n - 31$ papers each have fewer than 31 citations (Editors, 2007).
- (9) See www.yjs.fi/en/
- (10) See www.yjs.fi/en/yrjo-jahnsson-foundation/ and www.yjs.fi/en/yrjo-jahnsson-foundation/hilma-ja-yrjo-jahnsson/
- (11) The first YJA was presented at the 1993 Helsinki Congress. See www.eeassoc.org/index.php?page=25
- (12) See www.eeassoc.org/index.php?page=25
- (13) See <http://www.yjs.fi/en/seminars-and-international-contacts/yrjo-jahnsson-award-in-economics/>
- (14) See <http://ecole.tse-fr.eu/en/history>
- (15) The use of the phrase “economics training”, or similar phrases, throughout this study is synonymous with earning a doctorate degree in economics.
- (16) Central European University (CEU), located in Budapest, is an international graduate-level university that was founded in 1991. For more on the history of CEU, see <https://www.ceu.edu/about>.
- (17) The London Business School (LBS) is an international business school founded in 1964. For more on the history of LBS, see www.london.edu/about/facts/history#.Vumke2NcN8E.
- (18) The London School of Economics (LSE), known more formally as the London School of Economics and Political Science, is a social science university that was founded in 1895.
- (19) In the interim, Mixon and Upadhyaya (2012) rank U.S. economics departments on the basis of a few major awards held by current faculty. The awards examined include (1) the *Nobel Prize in Economic Sciences*, (2) the *John Bates Clark Medal*, (3) the American Economic Association’s *Distinguished Fellows Award*, and (4) the AEA’s *Richard T. Ely Lecturers* series.
- (20) Oxford University is the oldest university in the English-speaking world, with evidence of teaching there dating back to 1098. For more on Oxford, see <https://www.ox.ac.uk/about/organisation/history?wssl=1>. University College London (UCL) is a multi-disciplinary university that was founded in 1826. For more on UCL, see <http://www.ucl.ac.uk/about-ucl>
- (21) This particular test suffers from a small sample size coupled with little variation in the award count ranking.
- (22) Like Laffont, the 1993 YJA winner, Kiyotaki was trained at Harvard University, while Moore received his economics training at LSE. Besley received his economics training at the University of Oxford, and the most recent YJA winner, van Reenan, was trained at University College London (UCL).
- (23) Saint-Paul earned his PhD in economics from MIT.
- (24) Pompeu Fabra University, located in Spain, was founded in 1990.
- (25) Zurich ranks eleventh using the g-score approach.
- (26) In their study, Chan et al. (2014) examine the effect of becoming a John Bates Clark Medal recipient or an Econometric Society Fellow on subsequent performance. In doing so, they compare the career productivity of the first 27 Clark Medal winners to that of each member of a “synthetic control group” of non-recipient scholars. Their results suggest that there is a statistically significant publications and citations boost after receipt of the Clark Medal. Faria et al. (2016) employ the synthetic control group in Chan et al. (2014) to examine differences in

collegiality and human capital effects on the probability of winning the Clark Medal of various prestigious universities in the U.S.

⁽²⁷⁾ See <https://www.eeassoc.org/index.php?site=JEEA&page=187>

⁽²⁸⁾ Moore, a 1999 winner of the YJA, is omitted from the empirical analysis given, as a result of his common surname, the difficulty of obtaining an accurate g-score in his case.

⁽²⁹⁾ The estimate for UCL (i.e., 45.42) falls just inside the 0.200 level of significance.

⁽³⁰⁾ Although the parameter estimate for UCL climbs to 51.19 in moving from the collegiality model to the encompassing model, it reaches only the 0.15 level of significance.

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An empirical assessment of fiscal sustainability for selected South Asian economies

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Abstract. *The paper examines sustainability of public finances for five major South Asian economies namely, India, Pakistan, Bangladesh, Sri Lanka and Nepal for period 1985-2014. The results of Gregory–Hansen (1996) and Carrion-i-Silvestre and Sanso (2006) tests confirm presence of long-run relationship between government revenue and expenditure for all the countries. The ARDL estimates of fiscal reaction function indicate positive long-run response of primary balance to rising public debt ratio in case of India, Bangladesh, Pakistan and Sri Lanka. The empirical results thus demonstrate coherence with intertemporal budget constraint for the countries. However, except for Bangladesh, sustainability exists only in weak form underscoring the need to reinforce commitments to long-term fiscal discipline.*

Keywords: Fiscal Sustainability, Cointegration, Structural Break, Fiscal Reaction Function, ARDL model.

JEL Classification: H2, H5, H6, C5.

1. Introduction

In the aftermath of the 2008-2009 global financial crisis (GFC) chronic fiscal imbalances have emerged as one of the major risks facing the global economy. As financial and capital markets have become more focused on fiscal risks, fiscal sustainability in countries at all income levels has become a major concern for policymakers.

Managing fiscal deficits and sustainability prospects is among the key macroeconomic management issues in South Asia as well. Notwithstanding a high economic growth in the recent past, the fiscal situation in the region exhibits signs of distress. The reform process initiated in late 1980s and early 1990s in the region involved measures aiming at simplification of tax systems, introduction of value added tax and streamlining of expenditure. Consequent upon the reforms, South Asia's fiscal deficits are decreasing gradually but remain consistently high relative to other developing regions (see Table 1).

Table 1. Fiscal balance (% of GDP) in South Asia vis a vis developing country groupings

Country Groups	2000-10	2011	2012	2013	2014	2016 ^f
East Asia and Pacific	-1.6	.2	-.3	-2.3	-2.1	-2.1
Europe and Central Asia	-4.4	.7	-.6	-1.3	-1.5	-1.5
Latin America and the Caribbean	-2.6	-3.1	-3.6	-4	-5.2	-4.1
Middle East and North Africa	.1	-4	-3.8	-6	-7.1	-5.3
South Asia	-7.4	-7.6	-7.2	-6.9	-6.7	-6.1
Sub Saharan Africa	-.6	-1.1	-1.7	-2.9	-2.5	-2.2

Note: f denotes forecast.

Source: Global Economic Prospects, January 2015.

The persistence of the deficits may be attributed to the region's limited success in widening tax base due to structural factors such as large share of agriculture, low literacy, large informal sectors etc. coupled with hard to resist populist spending raising prospects of unsustainable fiscal policy. Against this backdrop, the purpose of this paper is to examine the sustainability of public finances for five major economies in South Asia namely, India, Pakistan, Bangladesh, Sri Lanka and Nepal for the period 1985-2014.

The contribution of the paper to the existing literature concerning the selected countries is threefold. First, the paper draws inferences regarding fiscal sustainability from two alternative approaches. First, we use co-integration techniques to assess whether there is a long-run relationship between the government revenues and expenditures. Second, we investigate if the fiscal rule that relates the primary surplus and debt holds for the countries.

A further contribution is an evaluation of the degree of fiscal sustainability. This issue is usually disregarded in the existing literature pertaining to the selected countries, either because the analysis of sustainability is based on an eclectic approach (e.g., Waheed, 2008; Ejaz and Javid, 2011; Mahmood et al., 2014) or on stochastic properties of public debt (e.g., Buiters and Patel, 2006; Deyshappriya, 2012), or because the estimates of the cointegrating vector between expenditure and revenue are not discussed (e.g., Jha and Sharma, 2004; Kaur and Mukherjee, 2012; Munawar Shah et al., 2014).

Thirdly, a common argument in the empirical literature is that the standard cointegration tests tend to have limited power when variables are exposed to structural breaks (Gregory

and Hansen, 1996; Johansen, Mosconi and Nielsen, 2000). Accordingly, the paper analyses fiscal sustainability by accounting for endogenous shifts that might affect the budgetary process, an issue that has largely been overlooked in studies related to the selected countries.

The rest of the paper is organized as follows: Section 2 provides a brief resume of literature. Section 3 discusses data and methodology. Section 4 deals with the empirical assessment of fiscal sustainability and finally, Section 5 offers concluding remarks.

2. Review of literature

The concept of fiscal sustainability implies the fulfillment of the so-called inter-temporal budget constraint (IBC), which states that the current level of debt in an economy should equal the present value of future fiscal surpluses. If this condition is to be met, economies cannot indefinitely issue debt to cover fiscal deficits as the markets will observe a risk of bankruptcy (Carrion-i-Silvestre, 2015).

The empirical studies assessing the compliance to IBC can broadly be classified into two strands. The earlier studies following a univariate approach analyse the mean-reverting behavior of deficit and debt-GDP ratio series (e.g., Hamilton and Flavin, 1986; Wilcox, 1989). Second, the multivariate approach involves examining the long-run relationship between the flows of revenues and expenditures (e.g., Trehan and Walsh, 1988; Hakkio and Rush, 1991; Haug, 1991; Quintos, 1995).

The subsequent studies refined the analysis by incorporating the possibility of structural changes that are associated with different degrees of sustainability (e.g., Quintos, 1995; Martin, 2000; Afonso, 2005) and have also generalized the definition of sustainability to distinguish between strict and weak sustainability (see the discussion below). With advancements in cointegration techniques, the long-run relationship between revenue and expenditure has been widely examined for assessing fiscal sustainability (e.g., Payne, 1997; Olekalns and Cashins, 1997; Hatemi-J, 2002; Afonso and Jalles, 2012; Dalgiç, İyidoğan and Balıkçioğlu, 2014).

Bohn (1998, 2007) in his seminal work, however, challenges the time series literature on fiscal policy suggesting that stationarity-based sustainability tests are invalid because in an infinite sample, any order of integration of debt is consistent with the transversality condition, which implies that the intertemporal budget constraint may be satisfied even if these particular time series tests are not. Moreover, the time series tests of sustainability do not explicitly identify the fiscal policy reactions underlying the data. As a result, they do not shed much light on the kind of policies that might deliver sustainability. (Adams et al., 2010)

Bohn (1998, 2007), therefore, suggested an alternative model-based approach to fiscal sustainability. In case fiscal authorities take corrective measures in response to deterioration in debt position, rising debt ratios lead to higher primary surpluses relative to GDP indicating a tendency towards mean reversion. Accordingly, a stable and strictly positive feedback from debt stock to primary surplus is a sufficient condition for fiscal

sustainability. The model-based approach to fiscal sustainability has also been widely employed in the empirical literature (e.g., Prohl and Schneider, 2006; Ghatak and Sánchez-Fung, 2007; Afonso and Jalles, 2012; Carrion-i-Silvestre, 2015; Mackiewicz-Lyziak, 2015).

3. Data and methodology

The empirical strategy of the paper relies on two alternative approaches proposed by Hakkio and Rush (1991) and Bohn (1998) discussed above. The theoretical framework underlying the first approach relies on the government's dynamic budget constraint and on the assumption that the interest rate follows a stationary stochastic process. Fiscal sustainability can then be tested through the following cointegrating regression ⁽¹⁾:

$$R_t = a + bG_t + u_t \quad (1)$$

Where R_t and G_t are government revenue and expenditures inclusive of interest payments on debt; u_t is a stationary random variable and a and b are cointegrating parameters. Following Quintos (1995), the fiscal sustainability exists in "strong" form if R_t and G_t are cointegrated and $b = 1$. The fiscal stance is instead only "weakly" sustainable if $0 < b < 1$. Under this milder sustainability condition, government expenditures grow, on average, at a rate higher than receipts. Finally, if the null hypothesis $b = 0$ cannot be rejected, the fiscal stance is unsustainable.

The alternative strategy proposed by Bohn (1998) involves checking whether there is a corrective response by the government to increases in the public debt. The model suggested by Bohn takes the following form:

$$PS_t = \rho B_t + \alpha Z_t + \varepsilon_t \quad (2)$$

Where PS_t is the primary balance, B_t is the level of debt in the economy at the beginning of period t (which can be approximated by the level of debt in the period $t - 1$) and Z_t is a vector of explanatory variables that capture the economic cycle. The sufficient condition for sustainability requires $\rho > 0$ so that the government would be taking corrective actions – reducing the level of expenditure (excluding interest on debt) and/or increasing tax revenues – to offset the changes in the level of debt.

The empirical estimates in the paper are based on annual data on general government fiscal variables spanning from 1985-2014. The choice of the period as well as the selection of the five countries out of the eight in the South Asian region is based on the availability of consistent data. All the variables are measured in relation to GDP to obtain a more natural definition of sustainability that keeps pace with economic growth (Afonso, 2005) and to achieve similarly scaled series that offer easily interpretable information. The data are assembled from Key Indicators for Asia and the Pacific, Asian Development Bank and various International Monetary Fund (IMF) country publications and reports, such as IMF Article IV documents and Statistical Appendixes.

At the outset, the series are tested for presence of unit root using the conventional Augmented Dickey- Fuller (ADF) and Phillips-Perron (PP) tests. As noted by Perron

(1989) the conventional unit root tests are biased towards a false unit root null when the data are trend stationary with a break. This observation led to the development of breakpoint unit root tests based on modified ADF tests that allow for levels and trends to differ across a break date. Following Perron (1989), Perron and Vogelsang (1992) and Vogelsang and Perron (1998), four models of breakpoint unit root tests are developed. Model 1 supposes a non-trending series with a break in the intercept; Model 2 supposes a trending series with a break in the intercept; Model 3 supposes a trending series with a break in the intercept and trend and Model 4 supposes a trending series with a break in trend. The null hypothesis is that the data follow a unit root process, possibly with a break, against a trend stationary with break alternative.

The long-run relationship between the variables of interest is tested using Gregory Hansen (1996) test and Carrion-i-Silvestre and Sanso (2006) test. The Gregory- Hansen test is a residual-based approach to test the null hypothesis of absence of cointegration against the alternative of cointegration in the presence of a structural break at an unknown point in time. The approach considers three possible changes in the cointegrating equation corresponding respectively to a level shift (C), a level shift in the presence of a time trend (C/T), and a shift both in the intercept and in the slope of the equilibrium relationship (C/S) and relies on modified versions of the ADF test and of the test statistics developed in Phillips (1987) ($Z\alpha$, Zt) for the computation of the unit root tests on residuals across all possible break points in the sample. The test statistics used to assess the existence of cointegration are the smallest values (i.e., the largest negative values) of ADF , $Z\alpha$, and Zt obtained across each possible break point in the data sample.

The advantage of Carrion-i-Silvestre and Sanso (2006) cointegration test over Gregory Hansen Test (1996) is that it has null hypothesis of the presence of a cointegration relationship against the alternative of no cointegration and both the null and alternative hypothesis allow for the presence of structural break. Allowance of structural shift in the cointegration test introduces spurious unit root behavior that makes it difficult to reject the hypothesis of no cointegration. Therefore, alternative cointegration tests with null hypothesis of no cointegration have a higher possibility of failing to find cointegration, which leads to spurious results (Gregory and Hansen, 1996). Carrion-i-Silvestre and Sanso (2006) test is a Lagrange-multiplier type cointegration test based on the multivariate extension of the Kwiatkowski, et al. (1992) test. When the date of the shift is not known a priori, the test estimates the break date by minimizing the sequence of the sum of squared residuals. The test specifies six different models for estimations: model *An* allows for a break in the level, model *A* has a trend and allows for a break in the level, model *B* accounts only for a change in the slope of the time trend, and model *C* allows for a break in both the level and slope of the time trend. Model *D* allows a break in the deterministic components and the cointegrating vector, and model *E* contains a trend and allows for a shift in both the deterministic component and the cointegrating vector.

The coefficients of long-run relationship are obtained using Dynamic Ordinary Least Squares (DOLS) estimator by Stock and Watson (1993). The DOLS allow proper statistical inference in cointegrated system with structural changes and corrects for regressor endogeneity by including leads and lags of first difference of the regressors.

In the presence of a mix of stationary and non stationary series the fiscal reaction function may be estimated through the Autoregressive Distributed Lag (ARDL) approach (e.g., Asiama et al., 2014; Akosah, 2015; Waheed, 2016 etc.).

The unrestricted error correction model (UECM) of ARDL model used to examine the long- run and short- run relationship takes the following form:

$$\Delta PS_t = \mu_0 + \delta_1 B_{t-1} + \delta_2 Z_{t-1} + \sum_{i=1}^q \alpha_i \Delta PS_{t-i} + \sum_{i=1}^q \beta_i \Delta B_{t-i} + \sum_{i=1}^q \gamma_i \Delta Z_{t-i} \varepsilon_t \quad (3)$$

where the series are as defined earlier. Following the basic specification of Bohn (1998), Z includes temporary factors impacting the primary balance including output gap (Ygap) and government expenditure gap (Ggap). The former captures the cyclical conditions and the latter accounts for unexpected expenditures, unrelated to the economic cycle, such as military expenditures. The output (expenditure) gap is measured as a ratio to potential output (expenditure) i.e. actual output (expenditure) less potential output (expenditure) divided by potential output (expenditure) where the potential output is proxied by the trend obtained with the Hodrick- Prescott filter. The possible non-linearities in the relationship are investigated by adding the quadratic term $(B_{t-1})^2$ as explanatory variable. δ_1, δ_2 in equation (iii) refer to the long-run coefficients and α, β and γ refer to the short-run coefficients. The null hypothesis is of no co-integration ($H_0: \delta_1 = \delta_2 = 0$) and the alternative hypothesis $H_1: \delta_1 \neq \delta_2 \neq 0$ implies co-integration among the series.

Given a relatively small sample size in the study of 30 observations, the critical values used are as reported by Narayan (2005). The null hypothesis of no long-run relationship is rejected if the computed F -statistic is greater than the upper critical bound as tabulated by Narayan (2005). However, if the computed F -statistic is less than the lower critical bound, then, the test fails to reject the null, suggesting no cointegration. If there is evidence of cointegration among the variables, the following long-run model is estimated:

$$\Delta PS_t = \mu_1 + \delta_1 B_{t-1} + \delta_2 Z_{t-1} + v_t \quad (4)$$

The ARDL specification of the short-run dynamics can be derived by constructing an ECM of the following form:

$$\Delta PS_t = \mu_2 + \sum_{i=1}^q \alpha_i \Delta PS_{t-i} + \sum_{i=1}^q \beta_i \Delta B_{t-i} + \sum_{i=1}^q \gamma_i \Delta Z_{t-i} + \psi ECM_{t-1} + \xi_t \quad (5)$$

where ECM is the error correction term and ψ represents the speed of adjustment.

4. Analysis of fiscal sustainability

4.1. Fiscal profile and implications for fiscal sustainability

Before a formal econometric analysis, a brief discussion on the fiscal profile of the selected countries and its implications for fiscal sustainability may be appropriate. Figure 1 captures the trends in revenue/GDP and expenditure/GDP for the countries. It may be observed that among all economies, only Nepal has experienced a notable rise in its revenue/GDP ratio during 1985-2014. The ratio has indeed declined for Pakistan and Sri Lanka and oscillated in a narrow range for India and Bangladesh. A preliminary

inspection of the graphs indicates a synchronized behavior of revenue and expenditure for all countries hinting at the possible long-run relationship. However, expenditure as a share of GDP on average exceeds revenue for all the countries which seemingly supports weak sustainability hypothesis.

Figure1. Revenue and expenditure to GDP Series: 1985-2014

Figure 1(a): India

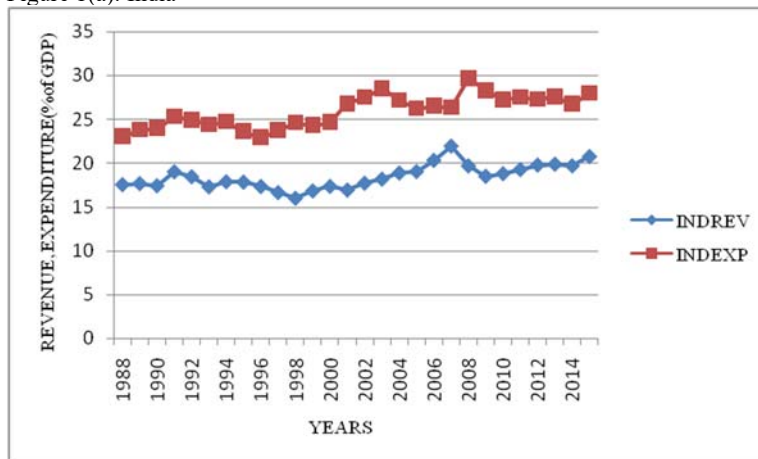


Figure 1(b): Sri Lanka

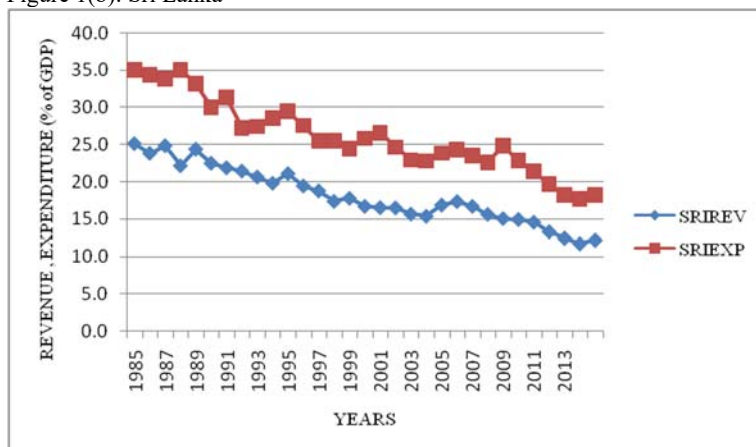


Figure 1(c): Bangladesh

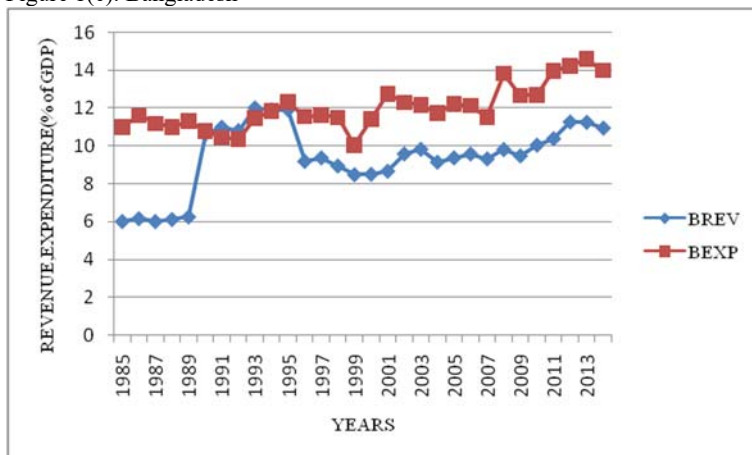


Figure 1(d): Pakistan

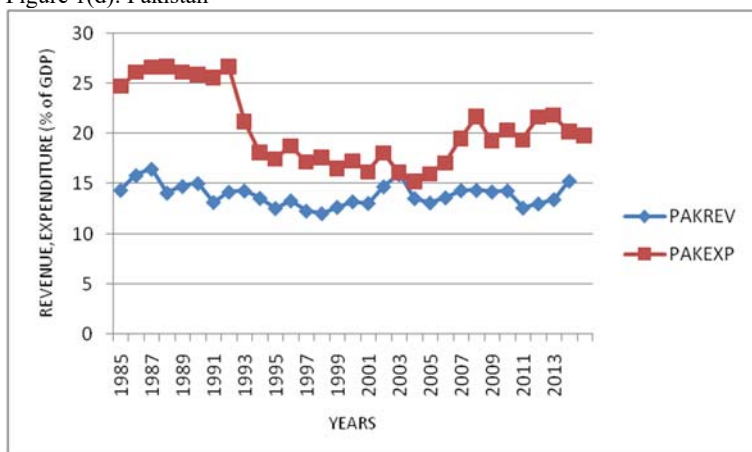
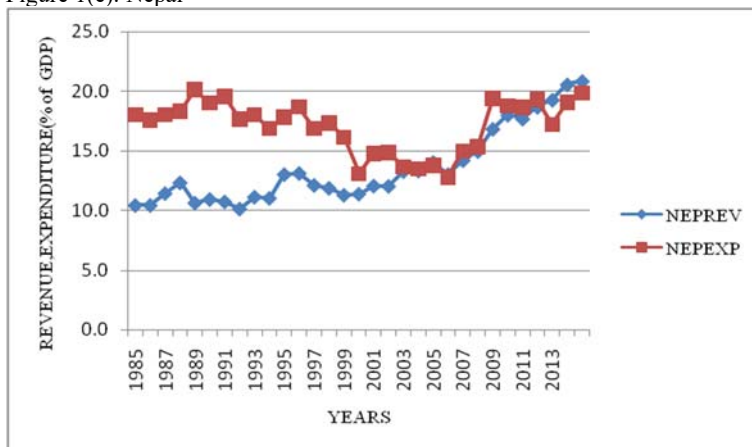
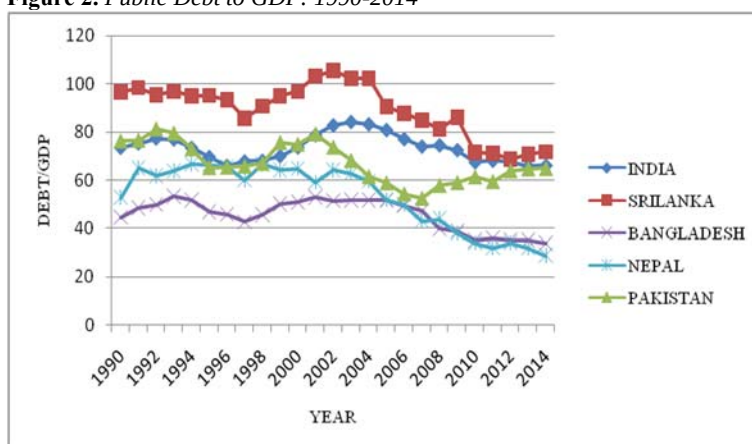


Figure 1(e): Nepal



Generally speaking, the debt to GDP ratio exhibits a declining trend after 2000 for all the countries (see Figure 2). In case of India, the debt ratio registers a decline from 2003 that marks the period of implementation of Fiscal Responsibility and Budgetary Management (FRBM) Act. An uptick in the debt ratio during 2007-08 may be observed in case of India, Pakistan and Sri Lanka reflecting the effect of the Global Financial Crisis.

Figure 2. Public Debt to GDP: 1990-2014



The declining trend in debt /GDP ratio points towards long-term sustainability of public debt. However, along with the level of debt, its composition, maturity profile, cost etc. have important consequences for sustainability. In this regard, the following observations can be made:

- i) The post reform period witnessed a decline in the share of external debt in all the countries. Currently, a larger share of public debt in South Asia is domestic, which reduces exposure to exchange related risks and adds to sustainability. In 2014, the share of external debt in public debt in India was only 7.1% compared to 15.1% in 1999. In Pakistan, share of external debt declined from 51.7% in 2000 to 31.7% in 2014. Sri Lanka and Bangladesh also witnessed a decline in the share of external debt in total debt from mid 90s. Sri Lanka currently holds 42.2% of debt externally compared to 54.4% in 1995. Nepal has a relatively higher share of external debt in the total public debt (63%) but much of the external debt is on concessional terms hence, sustainability is not considered at risk.
- ii) The interest cost of debt is another crucial indicator of sustainability. The ratio of interest payments to revenue receipts (IP/RR) witnessed a decline in case of only India, Pakistan and Nepal between 1996-2014. The ratio for India declined from an average of 35.7% in 1996-2000 to 22% in 2014. For Nepal, it came down from 10.9% in 1996-2000 to 4% in 2013. The IP/RR ratio exhibited a slightly increasing trend in case of Bangladesh and Sri Lanka. In case of Bangladesh, the ratio went up from 14.36 in 1996-2000 to 15.5% in 2010. The increase may be attributed to greater reliance on high cost domestic borrowing. In consonance with its highest debt ratio in the region, Sri Lanka registers the highest IP/RR ratio (40 and 37% respectively in

2013 and 2014 respectively) The situation is worrisome as the ratio is higher than the tolerable ratios of interest burden recommended by institutions like World Bank (35%), IMF(30%).

- iii) In terms of maturity profile of debt, India is most comfortably placed with short-term debt comprising only 8% of total debt and average term to maturity (ATM) of around 10.23 yrs in 2014-2015 which is high compared to international standards. Sri Lanka and Bangladesh are reasonably comfortable with share of short-term debt in total debt of order 22.4% and 16.5% respectively. In Pakistan, however, the share of floating debt (with maturity up to one year), constituted a whopping 54.5 percent of the domestic debt in 2013 indicating an elevated refinancing risk. The country however recently achieved improvement in its risk profile by retiring an outstanding rupees 1.2 trillion in short maturity treasury bills and replacing it with long maturity Pakistan Investment Bond in amount of Rs. 1.8 trillion, 2013-14. Sri Lanka too slightly reduced the weight of short term debt from 23.7 to 22.4 percent in 2013-14 through issuance of 30 years treasury bonds. (World Bank, 2014).

To sum up, it may be said that in the post reform period debt ratio have generally registered a decline from 2000 in the region. There are some improvements in the composition as well. Debt is mostly of domestic origin implying low currency risk. The countries have also been undertaking efforts to improve the debt risk profile by shifting towards the longer end of yield curve. The cost indicators show visible improvements in India and Nepal but interest payments still pose a substantial burden on budgets in Sri Lanka. Moreover, a synchronized behavior of revenue and expenditure may be observed for all countries. However, expenditure as a share of GDP on average exceeds revenue which seemingly supports weak sustainability hypothesis

4.2. Econometric analysis

In this section, we focus on the econometric examination of sustainability conditions as discussed in Section 3 for each individual country. In order to set the stage for cointegration analysis, the series are subjected to the investigation of unit roots. For that purpose, in addition to ADF and PP unit root tests, the breakpoint unit root test considering a break type of additive outlier (AO) is applied ⁽²⁾.

Table 2. Results of Unit Root Tests

Country	ADF		PP		Breakpoint Test (Additive Outlier)
	Level	FD	Level	FD	ADF
				Revenue	
India	-3.08	-5.59**	-3.16	-5.99**	-3.48 [2004]
Bangladesh	-1.81	-4.90**	-1.81	-4.91**	-4.12[2010]
Pakistan	-1.76	-6.58**	-1.63	-6.60**	-4.78[2006]
Sri Lanka	-2.79	-6.47**	-2.3	-6.14**	-4.31[2006]
Nepal	-1.45	-5.43**	-0.926	-8.34**	-4.77[2007]
				Expenditure	
India	-2.96	-4.34**	-2.52	-4.414**	-4.52[2000]
Bangladesh	-1.79	-5.48**	-1.80	-5.53**	-4.72[2007]
Pakistan	-2.07	-6.81**	-2.06	-7.12**	-3.80[2007]
Sri Lanka	-2.88	-4.45**	2.55	-9.05**	-4.27[2005]
Nepal	-2.46	-6.31**	-2.43	-6.91**	-3.23[2009]

Country	ADF		PP		Breakpoint Test (Additive Outlier)
	Level	FD	Level	FD	ADF
				Debt	
India	-1.45	-3.60**	-1.35	-3.64**	-4.50[2008]
Bangladesh	-2.67	-5.19**	-1.70	-5.22**	-4.1[2006]
Pakistan	-2.59	-5.49**	-2.62	-5.50**	-3.6[1997]
Sri Lanka	-1.68	-5.23**	-6.30	-5.27**	-4.22[2008]
Nepal	-1.81	-7.27***	-2.06	-7.2***	-4.77[2004]
				Primary Balance	
India	-4.08**	-7.22***	-4.09**	-8.1***	-4.95**[1996]
Bangladesh	-4.29**	-5.4**	-2.67	-5.58**	-5.6***[1998]
Pakistan	-2.17	-6.99**	-2.04	-7.31**	-4.99**[1996]
Sri Lanka	-3.53*	-5.69**	-3.40*	-14.4***	-5.78***[2007]
Nepal	-4.32**	-6.8***	-4.20**	-14.4***	-4.88**[2003]

Note: FD denotes First Difference. Mackinnon's CVs (with trend and intercept) for ADF and PP tests are -4.33, -3.58 and -3.22 for 1%, 5% and 10% respectively. ***, **, * show significance at 1%, 5% and 10% respectively. Results for breakpoint tests are for levels of variables. The choice of model from the four available models is based on the significance of the break in trend and break in the intercept. CVs for break in intercept (for trend and intercept specification) which is the preferred model in most of the cases are -5.3 and -4.85 respectively for 1% and 5%.

As shown in Table 2, ADF and PP tests provide overwhelming evidence that Revenue, Expenditure and Debt series contain a unit root in levels.

For the first-differenced specification, both the tests reject the null of unit root indicating that the three series are I(1) for all countries. The primary balance series, however, turns out to be I(0) for India, Bangladesh and Nepal.

The results of break point unit root test are broadly in conformity with the previous test results. The primary balance series after allowing for an endogenous break turns stationary at level for Pakistan and Sri Lanka. Overall, therefore, the evidences indicate that all series except primary balance are first-order integrated.

As a first step towards investigating the existence of a long-run relationship between revenue and expenditure, the Johansen-Juselius test has been applied. The results of the test indicate presence of one cointegrating relationship between R and G in case of Bangladesh and Sri Lanka.⁽³⁾ For rest of the countries the test fails to reject the null of no cointegration raising prospects of non sustainable fiscal stance.

However, this conclusion might be misleading if there has been a shift in the long-run relationship due to a structural change. In order to account for possibility of structural break, Gregory and Hansen (1996) test has been employed.

As shown in Table 3 the null hypothesis of no cointegration is rejected by all three tests, namely ADF, Z_a and Z_t test under the regime shift model in case of India and by ADF and Z_t test in case of Bangladesh. Both ADF and Z_t tests consistently reject the null under all break specifications for Pakistan and Sri Lanka providing strong support in favor of cointegration. The identified break dates in case of India and Sri Lanka correspond to the commencement of rule based fiscal management. The two countries implemented Fiscal Responsibility and Budgetary Management (FRBM) Act and Fiscal Management Responsibility Management Act respectively in 2003 that resulted in a subsequent decline in debt/ GDP ratio.

Table 3. Testing for regime shifts in cointegration: Gregory-Hansen test

Country	ADF	Z α	Zt
India			
C	-4.16 [2003]	-20.8[2004]	-3.7[2004]
C/T	-4.51[2003]	-24.6[2004]	-4.5[2004]
C/S	-9.73***[2003]	-47.9**[2004]	-13.93***[2004]
Bangladesh			
C	-3.75[1994]	-20.0[1995]	-3.82[1995]
C/T	-4.90*[1994]	-24.8[1994]	-4.95*[1994]
C/S	-9.06***[1994]	-42.67*[1994]	-8.89***[1994]
Pakistan			
C	-4.66**[1995]	-24.7[1997]	-4.78**[1995]
C/T	-5.68***[2002]	-29.1[2002]	-5.9***[2002]
C/S	-5.11**[1998]	-29.02[1998]	-5.26**[1998]
Sri Lanka			
C	-6.71***[2004]	-38.4*[2003]	-7.58***[2003]
C/T	-6.67***[2003]	-36.4[2003]	-6.79***[2003]
C/S	-6.57***[2003]	-37.49[2003]	-7.74***[2003]
Nepal			
C	-5.5***[1997]	-30.2[1997]	-5.6***[1997]
C/T	-4.35[2009]	-20.3[2009]	-3.78[2009]
C/S	-4.47[2009]	-21.8[2008]	-3.8[2008]

Note: ***, **, *denote rejection of null of no cointegration at 1% and 5% and 10% respectively. Figures in parenthesis show endogenous break dates. Approximate asymptotic critical values reported in Gregory and Hansen (1996, p. 109, Table 1) are used.

Finally, in case of Nepal the empirical support in favor of cointegration comes from the level shift model. The Z_α test in most of the cases fails to reject the null, which might be due to low power of the test.

For robustness of the results, we perform the Carrion-i-Silvestre and Sanso's cointegration test. As revealed by Table 4, the null hypothesis of cointegration could not be rejected by any of the six models at 5% significance level for India and Bangladesh while four out of six models support presence of cointegration for the rest of the countries.

Table 4. Results of Carrion-i-Silvestre and Sanso Cointegration Test (2006)

Country	India	Bangladesh	Pakistan	Sri Lanka	Nepal
A _n	0.13[2002]	0.132[1997]	0.22**[1995]	0.16**[2002]	0.145[1999]
A	0.085[2004]	0.089[1994]	0.065[1999]	0.05[2002]	0.107**[1991]
B	0.044[2001]	0.132[1997]	0.045[2000]	0.042[2002]	0.082[1991]
C	0.059[1997]	0.031[1994]	0.061 [2004]	0.029[2002]	0.058[1992]
D	0.157[1993]	0.10[2000]	0.068[1996]	0.29***[1994]	0.19**[1992]
E	0.060[1993]	0.050[1994]	0.08**[2004]	0.064[2003]	0.040[2004]

Note: H₀: cointegration with break at unknown time. Critical values are from Table 2 of Carrion-i-Silvestre and Sansó (2006).

Overall, the empirical evidences establish the long-run relationship between revenue and expenditure in presence of structural break for all the countries.

After confirming cointegration, the next step is to estimate the coefficients of long-run relationship and draw inferences regarding degree of sustainability. As reported in Table 5, point estimates of slope parameters obtained from DOLS turn out to be smaller than one in all cases. The restriction on the coefficients consistent with 'strong' fiscal sustainability ($b=1$) is rejected at high significance levels except for Bangladesh thus supporting 'weak' sustainability.

Table 5. *Estimates of Long Run Relationship (DOLS Approach)*

Country	b	Chi square statistic for b=1
India	0.81	4.44(0.03)
Bangladesh	0.95	.190(0.66)
Pakistan	0.519	5.99(0.01)
Sri Lanka	0.596	4.86(0.02)
Nepal	0.72	5.53(0.01)

Note: figures in parenthesis show p values.

‘Weak’ fiscal sustainability implies that government expenditures are systematically higher than government revenues. Therefore, although the IBC is satisfied in the strict sense (because the bubble term goes to zero), the upward pressure on the stock of debt is likely to increase the risk of default, forcing the government to offer higher interest rates to service its debt (Quintos, 1995).

Given the mixture of stationary and non-stationary variables in the model as established from the unit root tests, fiscal policy reaction function is estimated using ARDL co-integration technique. Table 6 suggests the existence of long-run relationship between primary balance, public debt, output gap and expenditure gap for Bangladesh, India, Pakistan and Sri Lanka as the computed F-statistic exceeds the critical upper bound at 95% confidence interval. The results are inconclusive for Nepal as the F-statistic lies between the upper and lower bounds.

Table 6. *Results of bound test for cointegration*

Country	F statistic	Cointegration
Bangladesh	6.69**	Yes
India	7.84***	Yes
Pakistan	4.59**	Yes
Sri Lanka	5.99***	Yes
Nepal	4.01	Inconclusive

Note: The critical values are cited from Narayan (2005) for restricted intercept and no trend.

The long run parameter estimates are reported in Table 7.

Table 7. *Estimated long run coefficients using ARDL approach*

	Bangladesh		India		Pakistan		Sri Lanka	
	coeff	t- val	coeff	t- val	coeff	t- val	coeff	t- val
B_{t-1}	.023	2.84 (.01)	.104	2.99 (0.00)	.036	5.16 (.00)	.031	2.44 (.02)
$(B_{t-1})^2$	.042	3.12 (0.00)	0.120	2.43 (0.02)	.0013	2.20 (0.04)	0.001	1.81 (0.08)
Ygap	.024	2.94 (.00)	.33	1.78 (0.09)	-.35	-2.87 (.00)	.209	2.19 (.03)
Ggap	-.029	-4.32 (.00)	-.044	-3.86 (0.00)	-.31	-2.81 (.01)	-.203	-2.24 (.03)
R^2	0.79		0.72		0.65		0.87	
Adj R^2	0.72		0.58		0.59		0.84	
F statistics	11.41(0.00)		5.00(0.00)		10.95(0.00)		25.16(0.00)	
D.W.	2.14		2.10		2.16		2.03	
Serial correlation	F=0.42(0.52)		F=1.79(0.201)		F=1.62(0.21)		F=0.035(0.85)	
Heteroskedasticity	F=0.343(0.56)		F=0.007(0.93)		F=0.04(0.82)		F=0.013(0.90)	
Ramsey's Reset Test	F=1.48(0.23)		F=3.23(0.09)		F=0.24(0.62)		F=0.35(0.60)	

Note: For annual data, Pesaran and Shin (1999) recommended choosing a maximum of two lags. From this, the lag length that minimizes Schwarz Bayesian criterion (SBC) is selected. Figures in parenthesis are p values.

The long run coefficients of public debt is positive and statistically significant indicating that fiscal authorities react systematically to rising public debt ratio to ensure fiscal sustainability. The estimates indicate that the primary balance improves on average between 0.02 and 0.10 percentage point in response to a one percentage point increase in debt ratios thus confirming fiscally responsible behavior. For Bangladesh, India and Pakistan the response of primary balance to the squared debt term is positive and significant. For India and Bangladesh this coefficient is larger than the coefficient of lagged debt implying a stronger fiscal response when debt-to-GDP ratios are higher.

The coefficient on output gap is positive in case of India, Pakistan and Sri Lanka. This implies that a positive shock to the output gap raises primary surplus by a factor of 0.02, 0.33 and 0.209 on average in Bangladesh, India and Sri Lanka respectively. The coefficient is however weak in terms of statistical significance in case of India. In case of Pakistan, the coefficient is negative suggesting a procyclical character of fiscal policy. The coefficient of expenditure gap is negative across countries indicating that an increase of expenditure above its potential lowers primary surplus. The estimated statistics shows that the model specification seems to pass all diagnostic tests successfully.

The short-run error correction models linked to the long run functions reported in Table 8 show that the explanatory variables maintain their long run signs in the short run as well. Consistent across the countries is the sign and significance of the estimated coefficient of lagged primary balance varying in the range of 0.23 to 0.54. Fiscal policy is thus found to have a strong degree of inertia in the region, causing the sign and magnitude of primary budgets in one year to depend substantially on previous years' budgetary outcome and decisions. This should be no surprise, as government budget plans typically run over several years, and many of the revenue and expenditure items are irreversible in the short term. The response of primary balance to lagged debt is however significant only for India and Bangladesh and the coefficient of squared debt is significant for all countries but Sri Lanka.

Table 8. Results of Short Run Error Correction Model

	Bangladesh		India		Pakistan		Sri Lanka	
	coeff	t- val	coeff	t- val	coeff	t- val	coeff	t- val
ΔPS_{t-1}	0.20	3.76 (0.00)	0.234	3.33 (0.00)	0.34	2.76 (0.01)	0.54	3.80 (0.00)
ΔB_t	.0069	2.30 (0.03)	0.14	1.35 (.19)	0.007	.297 (.77)	.014	.67 (.50)
$\Delta(B_{t-1})^2$	.029	3.12 (0.00)	0.15	2.67 (0.01)	.003	2.06 (0.05)	.001	.27 (0.78)
ΔY_{gap_t}	.40	3.08 (0.00)	.25	1.59 (.12)	-.068	-2.87 (0.00)	.09	1.87 (.07)
$\Delta Y_{gap_{t-1}}$	.42	2.73 (0.01)						
ΔG_{gap_t}	-.039	-4.19 (0.00)	-.129	-2.05 (.05)	-.061	-2.07 (0.05)	-.18	-3.77 (0.00)
$\Delta G_{gap_{t-1}}$			-.111	-2.35 (.03)			-.104	-2.87 (0.01)
ECM	-.113	-7.77 (0.00)	-.86	-4.49 (0.00)	-.19	-3.5 (0.00)	-.45	-3.22 (0.00)

Note: For annual data, Pesaran and Shin (1999) recommended choosing a maximum of two lags. From this, the lag length that minimizes Schwarz Bayesian criterion (SBC) is selected. Figures in parenthesis are p values.

The coefficient of the error correction is statistically significant across countries. The negative ECT shows that the system is driven to its long run cointegration path. The coefficient of ECT reflecting the speed of adjustment is estimated to be around 11% for Bangladesh, 86% for India and 19% and 45% for Pakistan and Sri Lanka respectively.

5. Conclusion

The study examines the issue of fiscal sustainability for five major South Asian economies namely, India, Pakistan, Bangladesh, Sri Lanka and Nepal for period 1985-2014 using two alternative approaches. First, we assess whether there is a long-run relationship between the government revenues and expenditures. Second, we investigate if the fiscal rule that relates the primary surplus and debt holds for the countries.

The results of Gregory and Hansen (1996) and Carrion-i-Silvestre and Sanzo (2006) tests confirm the presence of long-run relationship between government revenue and expenditure for all the countries. The ARDL estimates of fiscal reaction function indicate a positive long-run response of primary balance to rising public debt ratio in case of India, Bangladesh, Pakistan and Sri Lanka. However, since the size of the cointegrating slope parameter between revenue and expenditure is significantly less than one, except for Bangladesh, fiscal sustainability exists only in weak form. The weak sustainability implies compliance to IBC in the strict sense but point to difficulties in marketing of future debt.

Though not indicating sustainability in strong form, our results point to an improvement in the fiscal outlook of South Asia compared to some of the previous studies. First, an overview of the fiscal profile during the study period point to declining trend in debt ratios since 2000 and some improvements in its composition. The declining share of external debt in total debt indicates lowering of currency risk. Moreover, the countries have also been putting serious efforts to improve the risk profile of debt by shifting towards the longer end of yield curve.

Unlike Olekalen and Cashin (1997), our results are able to establish a long-run relationship between government revenue and expenditure in case of India. This is because our study covers the post reform period where government is having a more cautious approach towards fiscal management. Moreover, our estimate of cointegrating slope parameter indicates a much higher speed of adjustment to the IBC compared to Goyal, Khundrakpam and Ray (2004). Contrary to Jha (2004) who could not find cointegrating relationship between government revenue and expenditure for Nepal (for 1960-1996) and Pakistan (for 1956-1999), our study utilizing more recent data and accounting for structural breaks provides evidence in favor of synchronized movement between revenue and expenditure for both the countries.

The results thus establish that South Asian countries have adhered to their intertemporal budget constraints in the post reform period. However, in view of the weakly sustainable fiscal stance, except in case of Bangladesh, the countries still need to reinforce their commitments to long-term fiscal discipline.

Notes

- (1) See Afonso and Jalles (2012) for a formal proof.
- (2) As discussed in Vogelsang and Perron (1998), for an unknown shift date situation, the AO framework may be preferable to the innovational outlier statistics (IO), even if the data generating process is an IO process.
- (3) Full details of the results from standard cointegration methodologies are available from the authors upon request.

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The determinants of stock prices: Evidence from the Turkish banking sector

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Abstract. *This study examines the causality relationship of the stock prices of 10 deposit banks traded in Borsa Istanbul with industrial production index, exchange rates and money supply using monthly observations and focusing on the period between June 2007 and October 2016. The panel causality test is used to examine the causality relationship between variables. The analyses showed that the industrial production index is not one of the determinants of the stock prices of the banks examined.*

Keywords: Panel causality, Turkish banking industry, Stock price, Money supply, Exchange rates.

JEL Classification: C33, E40, G21.

1. Introduction

The financial crisis that started in the United States towards the end of 2007 and that grew into a global crisis within a short period of time had a negative impact on global economic activities. These developments also had an impact on the Turkish economy that had integrated with international markets and interrupted the process of finding low-cost funds and financing development. The reason for this is the fact that the amount of domestic savings that would accelerate economic growth and contribute to the accumulation of capital is low. These negative developments had an impact also on the banking sector that plays a major role in transforming savings in the monetary, loan and capital markets into capital. In 2010, there were even banks that suffered from liquidity shortage and the liquid assets/short term liabilities ratio was an important early warning indicator (Bektaş and Gökçen, 2011). Providing finance for sustainable economic growth by investing in capital market tools became popular. As it is known, there are numerous banks traded in Borsa İstanbul (BIST) and the capital market provides funding by exporting stocks. Taking into account that the amount of domestic savings is low, it is important for sustainable economic growth to examine the determinants of the stock prices of the banking sector that is the engine of any country's economy.

This study examines the determinants of the stock prices of 10 deposit banks that have got at least five years of regular data and that are traded under the banks and private financial institutions sector in BIST. The literature examination shows that industrial production index, real exchange rate and money supply (M2) are generally taken as the variables as the determinants of stock prices of banks. Therefore, this study is going to examine the relationship between stock prices and the three variables in question. To this end, the characteristics of the data matrix are taken into account and the panel data analysis techniques are used.

A literature summary is provided in the second part of the study and the third part focuses on econometric methodology. The fourth part focuses on the findings of the application and the last part is the conclusions part.

2. Literature summary

Literature study shows that there are numerous studies carried out in various countries to find the determinants of stock prices.

The study carried out by Shiller and Grosman in 1980 examines the determinants of variables in stock prices. The findings showed that there were more data available with respect to consumption and that would lead to a change in expected real interest rates. They concluded that the changes in real interest rates needed to be taken into account in order to evaluate changes in stock prices (Shiller and Grosman, 1980).

The study by Narayan and Singh in 2014 examines the determinants of the stock prices for the banking system in India via the panel data technique. It was found for 13 banks that there was a cointegration relationship between stock prices, economic activities, interest rates and exchange rates. According to the findings, it was concluded that while economic activity level and exchange rate increased stock prices, the increase in interest rates decreased stock prices of banks (Narayan et al., 2014).

The study by Hartono in 2004 analyses the impact of revenue and profit share distributions on stock prices between 1979 and 1993. According to the findings of the study, while positive revenue data obtained after negative dividend data increased stock prices, positive dividend data obtained after negative revenue data decreased stock prices (Hartono, 2004).

According to the study conducted by Tandon and Malhotra in 2013 using the data of the New York Stock Exchange between 2007 and 2012, the sampling included 95 companies and the linear regression model used showed that there was a significant positive relationship between stock prices and book value, revenue per stock and price earnings ratios. They also found that there was a reverse relationship between dividend yield and stock prices (Tandon and Malhotra, 2013).

In 2011, Nisa and Nishat applied the General Dynamic Panel Method to 221 companies listed in the Pakistan Karachi Stock Exchange and tried to project productive parameters between stock price changes and macroeconomic indicators and basic financial data. According to the findings of this study, the past price movements, company size and yield by share were identified as the factors that had the greatest impact on stock prices (Nisa and Nishat, 2011).

The study by Hussainey and Ngoc in 2016 showed that the price levels in the Vietnamese stock market moved in the same direction with industrial production but also concluded that short and long term interest rates used as monetary indicators had a reverse impact on stock prices (Hussainey and Ngoc, 2009).

The study by Gregoriou, Healy and Gupta carried out in 2015 in order to identify the determinants of stock prices in the telecom sector concentrated on the data from 160 countries and 45 companies between the years 2000-2011 using the panel data analysis. According to the results obtained based on the analysis of financial and non-financial results at the company level, they concluded that capital expenditures and book value had got the most impact on stock prices (Gregoriou et al., 2015).

The study by Rahman, Sidek and Tafri (2009) concentrated on identifying the relationship between stock prices and macroeconomic indicators of the companies operating in Malaysia by using the Vector Autoregression (VaR) methodology. According to the results obtained by the Vector Error Correction Model (VECM), the changes in the Malaysian stock index were in integration with the money supply, interest rate, exchange rate and industrial production changes. According to the results of the lag test and variance decomposition analysis, it was concluded that the macroeconomic factors in question had a strong dynamic interaction with stock prices (Rahman et al., 2009).

The study by Maysami, Howe and Hamzah (2004) identified that the Singaporean stock exchange and real estate index had a relationship of integration with short and long term interest rates, industrial production, general price levels, exchange rate and money supply (Maysami et al., 2004).

The study by Hsing (2011) examined the relationship between the Hungarian stock index and macroeconomic variables by using the GARCH model. According to the findings, while the factors that had a positive impact on the stock index were real GDP, the ratio of

state debt stock to the GDP, nominal effective exchange rate and the German stock index, the factors that had a negative impact were the real interest rate, expected inflation rate, the Euro zone bond yield and the M2 money supply (Hsing, 2011).

3. Econometric methodology

The panel causality test introduced to literature by Kónya (2006) is the test used for the causality analysis that is the main area of examination of this study. This test seems to be a causality test based on the unrelated regression (GIR) technique. Contrary to the panel causality tests that exist in literature, the critical values used in the Kónya (2006) panel causality test are critical values with bootstrap produced specially for each and every horizontal cross unit.

The Kónya (2006) panel causality test offers more advantages compared to others given the fact that it can make projections that do not take into consideration the horizontal cross dependency that exists in panel data models and as it can make the causality analysis for series that are not unit root or cointegrated. This eliminates the need to conduct a priori tests such as unit root and cointegration (Kónya, 2006, p. 991).

The equilibrium system that will be used for the Kónya panel causality test is as follows (Kónya, 2006: 981):

$$\begin{aligned}
 Y_{1,t} &= \alpha_{1,1} + \sum_{i=1}^{ly_1} \beta_{1,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_1} \delta_{1,1,i} X_{1,t-i} + \varepsilon_{1,1,t} \\
 Y_{2,t} &= \alpha_{1,2} + \sum_{i=1}^{ly_1} \beta_{1,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_1} \delta_{1,2,i} X_{2,t-i} + \varepsilon_{1,2,t} \\
 &\vdots \\
 &\vdots \\
 Y_{N,t} &= \alpha_{1,N} + \sum_{i=1}^{ly_1} \beta_{1,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_1} \delta_{1,N,i} X_{N,t-i} + \varepsilon_{1,N,t} \\
 X_{1,t} &= \alpha_{2,1} + \sum_{i=1}^{ly_2} \beta_{2,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_2} \delta_{2,1,i} X_{1,t-i} + \varepsilon_{2,1,t} \\
 X_{2,t} &= \alpha_{2,2} + \sum_{i=1}^{ly_2} \beta_{2,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_2} \delta_{2,2,i} X_{2,t-i} + \varepsilon_{2,2,t} \\
 &\vdots \\
 &\vdots \\
 X_{N,t} &= \alpha_{2,N} + \sum_{i=1}^{ly_2} \beta_{2,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_2} \delta_{2,N,i} X_{N,t-i} + \varepsilon_{2,N,t}
 \end{aligned}$$

The l in the equilibrium shows the length of lag (Kónya, 2006, p. 982-983). While N indicates the number of horizontal cross units ($j = 1, \dots, N$), t shows the time dimension ($t = 1, \dots, T$). The Kónya (2006) panel causality test is based on the Wald test statistics.

As different bootstrap critical values are used for each and every horizontal cross units used in the equation, it is not necessary that the series for which causality analysis will be conducted are stationary. Therefore, the causality analysis could be conducted based on the level values of variables (Kónya, 2006, p. 979).

The Granger causality test is tested via different alternatives for the Kónya panel causality test. These are as follows: While the $\delta_{1,j,i}$ variable is not equal to zero for all units, if the $\beta_{2,j,i}$ variable is equal to zero for all variables, then the causality is unilateral, from X to Y only. If it is the opposite, then the causality is from Y to X. If none of the $\delta_{1,j,i}$ and $\beta_{2,j,i}$ variables are equal to zero, then there is a two-way causality between X and Y. If both of the $\delta_{1,j,i}$ and $\beta_{2,j,i}$ variables are equal to zero, then there is no causality between X and Y.

4. The findings of the application

The monthly observation values for the 2007:06-2016:10 period was used in the empirical part of the study and the variables of the monthly geometrical mean of daily stock closing prices, the industrial production index (2010=100), the real effective exchange rate based on consumer price index (2003=100) and money supply were examined. These data were obtained from the Central Bank of the Republic of Turkey (TCMB) Electronic Data Distribution System (EVDS) and the Borsa Istanbul (BIST) database.

The main purpose of the study is to examine the causality analysis between the stock prices of banks and exchange rate, money supply and industrial production index. This analysis is carried out by making use of the Kónya (2006) panel causality test. As the Kónya panel causality test is not sensitive to the stationarity and cointegration levels of the series, the causality test can be conducted based on the level values of the series without any need for a priori test. The results obtained for the Kónya panel causality test are provided in the tables.

Table 1. *The causality between exchange rate and stock prices of banks*

		H ₀ : Exchange Rate does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	Wald Sta.	1%	5%	10%
Akbank	4.97937***	11.65834	6.88091	4.81850
Finansbank	3.96569	10.21269	6.03131	4.28804
Garanti Bank	3.61845	11.68188	6.84584	4.84750
Halkbank	0.58957	11.84783	6.85713	4.80089
ICBC Bank	6.66667**	11.08715	6.65919	4.87185

		H ₀ : Exchange Rate does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	Wald Sta.	1%	5%	10%
İş Bank	1.16943	11.58401	6.94754	4.92937
Şekerbank	3.50519	11.41903	6.73060	4.84289
Vakıfbank	2.52543	11.48155	6.66139	4.76698
Yapı ve Kredi Bank	0.40044	11.33119	6.94233	4.88012
Denizbank	3.49501	10.76521	6.06521	4.37681

Note: ** and *** indicate the rejection of main hypothesis at 5% and 10% significance levels, respectively.

According to the findings of the causality analysis, the causality relationship from exchange rate to stock prices had a significance level of 10% for Akbank and 5% for the ICBC Bank. In this regard, it could be said that the exchange rate provides useful information for the stock prices of the bank in question.

Another causality analysis examines the existence of causality from industrial production index to stock prices. The findings are tabulated in Table 2. This table indicates that there is no causality relationship from industrial production index to stock prices. This could be interpreted as industrial production index has got no impact on these banks' stock prices.

Table 2. *The causality between industrial production index and stock prices of banks*

		H ₀ : Industrial Production Index does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	Wald Sta.	1%	5%	10%
Akbank	2.35791	11.85322	6.92368	5.00336
Finansbank	0.51081	10.37212	5.94715	4.30132
Garanti Bank	2.43581	11.97232	7.17594	5.13268
Halkbank	0.06003	12.08553	7.05418	5.14414
ICBC Bank	2.77138	12.08356	7.37127	5.15721
İş Bank	1.56856	12.03231	7.16260	5.18540
Şekerbank	1.82060	12.05072	7.21437	5.14097
Vakıfbank	1.22530	12.16399	7.17454	5.17596
Yapı ve Kredi Bank	0.56876	11.71123	6.98578	4.91095
Denizbank	0.07977	9.89323	6.13609	4.56335

The findings of the panel causality test that examines causality between money supply and stock prices are tabulated in Table 3. According to this table, there is a causality relationship from money supply to stock prices with a significance level of 10% for Akbank and Garanti Bank. This could be interpreted as, similar to previous findings, money supply provides useful information for the formation of stock prices for the banks in question.

Table 3. *The causality between money supply and stock prices of banks*

		H ₀ : Money Supply does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	Wald Sta.	1%	5%	10%
Akbank	7.68120***	14.35967	8.69578	6.37848
Finansbank	2.64232	12.60932	7.20197	5.23588
Garanti Bank	7.20454***	15.82047	9.90945	7.12553
Halkbank	0.10964	15.44828	9.77356	7.02080
ICBC Bank	3.69700	15.75587	10.2469	7.72581
İş Bank	2.94148	15.49848	9.50588	6.92059
Şekerbank	0.89879	15.46148	9.98591	7.55696
Vakıfbank	3.69748	15.18643	9.17950	6.73177
Yapı ve Kredi Bank	0.82954	13.95300	8.62271	6.24622
Denizbank	1.69516	13.03049	8.06046	5.83457

Note: *** indicate the rejection of main hypothesis at 10% significance level.

The findings of the causality analysis are summarized in Table 4. According to these findings, the direction of causality for Akbank and the ICBC Bank is from exchange rate to stock prices. The causality from money supply to stock prices is true for Akbank and Garanti Bank. Finally, no causality relationship has been observed from money supply to stock prices.

Table 4. *Konya panel causality test results*

Banks	<i>E.R. → S.P.</i>	<i>I.P. → S.P.</i>	<i>M.S. → S.P.</i>
Akbank	✓	X	✓
Finansbank	X	X	X
Garanti Bank	X	X	✓
Halkbank	X	X	X
ICBC Bank	✓	X	X
İş Bank	X	X	X
Şekerbank	X	X	X
Vakıfbank	X	X	X
Yapı ve Kredi Bank	X	X	X
Denizbank	X	X	X

Note: E.R., S.P., I.P. and M.S. indicate the Exchange Rate, Stock Prices, Industrial Production Index and Money Supply, respectively.

5. Conclusion

Panel data analysis techniques were used in this study in order to examine the determinants of the stock prices of 10 deposit banks that are traded in BIST under the banks and private financial institutions sector and that have got at least five years of regular data. To this end, the causality relationship between the stock prices of these banks and industrial production index, Consumer Price Index based real effective exchange rate and money supply was examined via the Konya Panel Causality Test. The causality test was used to investigate the causality relationship between the stock prices of the banks and exchange rate, money supply and industrial production index. It was found that there was a causality relationship with a significance level of 10% for Akbank and 5% for the ICBC Bank from exchange rates to stock prices. In addition to this, the causality relationship from money supply to stock prices had a significance level of 10% for Akbank and Garanti Bank. No causality relationship was identified for any banks between industrial production index and stock prices.

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Job complexity and wage bargaining

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Abstract. *The objective of this paper is to qualify and discuss the effects of public policies according to bargaining solution used between workers and firms. We compare the effects of three solutions, Nash, Kalai-Smorodinsky and Equal-Sacrifice in a matching model where the job complexity is endogenous and workers are differentiated by their qualification level. We show that the choice of solution is extremely important since the effects of unemployment benefits on unemployment, labor market participation and on the job complexity can be completely opposite.*

Keywords: Bargaining, Nash, Kalai-Smorodinsky, Equal-Sacrifice, Complexity, Unemployment benefits.

JEL Classification: J64, J68.

1. Introduction

Despite the relevance of matching models to study the dynamics of the labor market (Pissarides, 2000), it is legitimate to ask the question on the fact that these models use systemically Nash as a rule for surplus sharing. The only use of this solution could skew the results by overestimating or underestimating the effects of the policies studied (Gerber and Upmann, 2006; Anbarci et al., 2002; Laroque and Salanié, 2004). There are other solutions that can provide more appropriate responses to the realities of the labor market. Among them we can include the Equal-Sacrifice (ES) and the Kalai-Smorodinsky solution (KS) (Kalai-Smorodinsky, 1975).

Our paper fits into this line and aims to study the effects of increased unemployment benefits in a matching model where the job complexity is endogenous. In this framework, workers are vertically differentiated by their qualification level and the productivity depends both on the degree of complexity and on the ability (i.e. qualification level) of the worker who is occupying it. This matching model was developed by Amine and Lages (2010). The effects of unemployment benefits are analyzed according to the bargaining solution used (Nash, KS and ES). We show that the increase in unemployment benefits has the effect of making more complex jobs when using Nash and the opposite when wages are negotiated according to KS and ES solutions.

The rest of paper is organized as follows. The model is presented in Section 2. Then, the bargaining solutions are discussed in Section 3. The solution to the model and the results of our analysis are presented in Section 4.

2. The model

As mentioned in the introduction, we use, in this article, the matching model developed by Amine and Lages (2010) and in which we consider an economy populated by a large exogenous number of workers and a large endogenous number of firms. Workers are vertically differentiated by their qualification level, denoted by z , and have an infinite horizon. z is distributed according to a continuous distribution, $G(z)$, with support $z \in [z_{min}, Z]$. The density of $G(z)$ is denoted by $g(z)$. Each firm offers a single job. All firms and workers are risk neutral and have the same rate of time preference denoted by r . In line with Amine and Lages (2010), each firm i in this economy requires a minimal ability, called $\hat{z}_i$, for her future worker. In this perspective, we assume that the productivity of a job- i , noted $y_i(a_i, z)$, depends both on the degree of complexity and on the ability (i.e. qualification level) of the worker who is occupying it. Formally, $y_i(a_i, z)$ is written as follows: $y_i(a_i, z) = A(a_i) + a_i z$. The endogenous variable a_i ($a_i \geq 0$) measures the degree of complexity of the job offered by firm i . Considering that an increase in complexity must raise skilled workers productivity (decrease unskilled workers productivity), $A(a_i)$ is a decreasing and concave function.

Meetings between firms with a vacant job and *active* unemployed workers are summarized by a constant-returns matching function (Pissarides 2000). Let, θ , represent

the labour market tightness (*i.e.* the ratio of vacant jobs, V , to *active* unemployed workers U). Formally, the matching function, noted $\pi(V, U)$, is an homogenous function of degree 1 and is increasing function in V and U . Thus, the probability for a firm to meet an *active* worker satisfies: $q = \pi(V, U)/V = \pi(1, 1/\theta) = q(\theta)$. Concerning workers, the hiring probability, noted p , is written as follows: $p(\theta) = \theta q(\theta)$. Contrary to $q(\theta)$, the probability that an *active* worker finds a job is an increasing function of θ .

Let's consider the expected lifetime utility of an *active* worker. At the stationary state, if this worker holds job- i , his/her lifetime utility $W_i(z)$ depends on his wage $w_i(z)$ and on the destruction rate s . We assume that unemployed workers income is composed of unemployment benefits b . Their expected lifetime utility $W_u(z)$, depends on the probability $p(\theta)$ of finding a job. As a result, in the stationary state, utilities $W_i(z)$ and $W_u(z)$ satisfy:

$$rW_i(z) = w_i(z) - s(W_i(z) - W_u(z)) \quad (1)$$

$$rW_u(z) = b + p(\theta)(W(z) - W_u(z)) \quad (2)$$

where $W(z)$ is the lifetime utility of workers with ability z when holding a job different from i .

We consider that the firms jobs are either vacant or filled. The value of job- i filled with a worker with ability z , $J_i(z)$, depends on the net instantaneous income ($y_i(a_i, z) - w_i(z)$) and on the future profits taking into account that the firm can die at any time with probability S . It satisfies:

$$rJ_i(z) = y_i(a_i, z) - w_i(z) - s(J_i(z) - J_{vi}(z)) \quad (3)$$

As long its job is not filled, firm i must invest c to create this job and to look for a worker. Furthermore, opening a new job is more profitable if the probability $q(\theta)$ is high. The value J_{vi} satisfies:

$$rJ_{vi} = -c + \frac{q(\theta)}{1 - G(\hat{z})} \int_{\hat{z}_i}^z (J_i(z) - J_{vi}) g(z) dz \quad (4)$$

Taking into account of the free-entry assumption, we admit that new jobs will be created until the optimal value of a job vacant be equal to zero. In addition, the expected value for any variable in the model satisfy the following expression:

$$\bar{x}_i = \frac{1}{1 - G(\hat{z}_i)} \int_{\hat{z}_i}^z x_i(z) g(z) dz \quad (5)$$

In the stationary equilibrium, the unemployment rate u is a decreasing function of the recruiting probability $p(\theta)$ (for a given level of S):

$$u = \frac{s}{s + p(\theta)}. \quad (6)$$

3. Wage bargaining and surplus sharing

In this section, we'll see how the employee-employer couple will share the surplus created using three solutions: Nash generalized, Kalai-Smorodinsky and Equal-Sacrifice.

3.1. Nash solution

Using Nash solution, the surplus created by a firm/worker is divided between the two agents according to their respective bargaining strength. In fact, if β ($0 < \beta < 1$) represents the workers bargaining strength, the maximization program for firm i is:

$$\text{Max } (W_i(z) - W_u(z))^\beta (J_i(z) - J_{vi})^{(1-\beta)} \quad (7)$$

Solution of this program implies that global surplus is divided between the two agents as follows:

$$W_i(z) - W_u(z) = \beta(W_i(z) - W_u(z) + J_i(z) - J_{vi}) \quad (8)$$

$$J_i(z) - J_{vi} = (1-\beta)(W_i(z) - W_u(z) + J_i(z) - J_{vi}) \quad (9)$$

3.2. Kalai-Smorodinsky solution

The Kalai-Smorodinsky solution is to set the maximum values for the employer and for the employee. The maximization program is written as follows:

$$\phi^{KS} = (J_i(z) - J_{vi})(W_i(z)^{\max} - W_u(z)) - (J_i(z)^{\max} - J_{vi})(W_i(z) - W_u(z)) = 0 \quad (10)$$

The maximum utility of a worker $W_i(z)^{\max}$ and the maximum value of filled-job $J_i(z)^{\max}$ satisfy:

$$rW_i(z)^{\max} = y_i(z) - s(W_i(z) - W_u(z)) \quad (11)$$

$$rJ_i(z)^{\max} = y_i(z) - b - s(J_i(z) - J_{vi}(z)) \quad (12)$$

Given the last two expressions, we get:

$$W_i(z) - W_u(z) = \frac{W_u(z) - y_i(z)}{J_{vi}(z) + b - y_i(z)} (J_i(z) - J_{vi}) \quad (13)$$

3.3. Equal-Sacrifice solution

This solution (Aumann and Maschler 1985) equalizes the sacrifice from the maximum feasible payoff net of the threat point. Bargaining under this rule is then written as follows:

$$W_i(z)^{\max} - W_i(z) = J_i(z)^{\max} - J_i(z) \quad (14)$$

Using the equations (11) and (12), we establish the following expression:

$$y_i(z) - w_i(z) = w_i(z) - b \quad (15)$$

4. Model equilibrium

Solving the model consists of establishing interactions at the stationary equilibrium, between labor market tightness θ , degree of complexity a and ability threshold $\hat{z}$. We first study and specify the optimal degree of job complexity, and then describe wage setting and job creation processes.

4.1. Optimal job complexity

When entering the labor market, firm i decides on the degree of complexity of the created job (a_i) and on the ability threshold ($\hat{z}_i$). These optimal choices result from maximization of the asset value J_{vi} with respect to both variables with the constraint that $\hat{z}_i$ is not lower than $\hat{z}$.

Using equations (3) and (4), we show that J_{vi} can be written as a function of the pair $(a_i, \hat{z}_i)$. We obtain the following expression:

$$rJ_{vi} = -c + \frac{q(\theta)(1-\beta)}{(r+s)(1-G(\hat{z}))} \int_{\hat{z}_i}^z [y_i(a_i, z) - r(W_u(z) + J_{vi})] g(z) dz \quad (16)$$

In the symmetric equilibrium, the first order conditions can be written as follows:

$$\frac{1}{1-G(\hat{z})} \int_{\hat{z}}^z z g(z) dz = -A'(a) \quad (17)$$

$$y(a, \hat{z}) = A(a) + a\hat{z} = b \quad (18)$$

Taking into account of the function $A(a)$ concavity, we obtain that the derivative of job complexity a with respect to the ability threshold $\hat{z}$ is positive. We show then that an increase in ability threshold ($\hat{z}$) leads to a rise in job complexity (a) thus reducing the labor market participation. Moreover, equation (18) shows that a worker is considered *active*, in this economy, only if his productivity (*i.e.* his qualification level) allows to obtain a positive or null global surplus.

Note that these two optimization results (17) and (18) have already been established by Amine and Lages (2010). So we remember them only for use in our analysis but the demonstration and interpretations related to this optimization are available in the article cited above.

4.2. Job creation process

4.2.1. Nash solution

We use equations (8) and (9) in order to establish interactions, at the stationary equilibrium, between labor market tightness, degree of complexity and ability threshold. We obtain an expression of the workers' share in the global surplus:

$$W(z) - W_u(z) = \frac{\beta}{1-\beta} \frac{y(a, z) - w(z)}{r+s} \quad (19)$$

Using equations (1) and (2), we deduce a second expression for the workers' share in the global surplus:

$$W(z) - W_u(z) = \frac{w(z) - b}{r+s+p(\theta)} \quad (20)$$

From these two expressions for the workers' share ($W(z) - W_u(z)$), we establish the wage setting equation :

$$\bar{w} = \bar{y} - \frac{(1-\beta)(r+s)(\bar{y}-b)}{r+s+\beta p(\theta)} \quad (21)$$

Since we assume firm free entry, we can establish a second expression of the average wage:

$$\bar{w} = \bar{y} - \frac{(r+s)c}{q(\theta)} \quad (22)$$

Substituting equation (21) in (22), we obtain an other expression between endogenous variables of the model:

$$-c + \frac{q(\theta)(1-\beta)(\bar{y}-b)}{r+s+\beta p(\theta)} = 0 \quad (23)$$

4.2.2. KS solution

Substituting equations (2) and (3) into equation (13) yields:

$$W(z) - W_u(z) = \frac{(y(z) - w(z))(b - y(z))}{(b - y(z))(r+s) - p(\theta)(y(z) - w(z))} \quad (24)$$

Using the expressions of utilities (1) and (2) a second expression of ($W(z) - W_u(z)$) is obtained:

$$W(z) - W_u(z) = \frac{w(z) - b}{r+s+p(\theta)} \quad (25)$$

Using the two equations of ($W(z) - W_u(z)$), one establishes a second expression between the model equilibrium variables:

$$\frac{\bar{w} - b}{r+s+p(\theta)} = \frac{(\bar{y} - \bar{w})(b - \bar{y})}{(b - \bar{y})(r+s) - p(\theta)(\bar{y} - \bar{w})} \quad (26)$$

4.2.3. Equal sacrifice solution

Using the expression (15), we establish an expression of the average wage:

$$\bar{y} - \bar{w} = \bar{w} - b \quad (27)$$

Since we assume firm free entry, we can establish a second expression of the average wage:

$$\bar{w} = \bar{y} - \frac{(r+s)c}{q(\theta)} \quad (28)$$

By replacing the last two expressions we get :

$$\bar{w} - b = \frac{(r+s)c}{q(\theta)} \quad (29)$$

This equation determines ability threshold $\hat{z}$ as implicit function of labor market tightness θ and job complexity a .

4.3. Numerical analysis

In this section we will analyze the effects of increased unemployment benefits on the job complexity and on the labor market participation. These effects will be qualified according to bargaining solution (Nash, KS, ES). Given the ambiguity of some theoretical results, we will use a numerical analysis. Indeed, this model is calibrated in order to represent a situation similar to the French economy.

In accordance with current real rate, the annual rate of time preference is estimated at 5%. The job destruction rate is fixed at 0.15 in order to represent an employment flow compatible with the French situation.

We use a Cobb-Douglas function of the form $\pi(\theta) = h\theta^\eta$ to represent the matching function. In accordance with standard matching models (Cahuc and Lehmann 2000), we choose an elasticity, noted η , of this function with respect to vacant job equal to 0.5. The bargaining power is fixed at 0.5. The Hosios condition is hence satisfied. Unemployment benefits, which are funded by a neutral tax, represent 50% of wage. In this economy, for an unemployment benefits level equal to 0.5, unemployment rate reaches 11.46%.

For these simulations, we assume that the complexity function $A(a)$ is quadratic ($A(a) = -a^2$). Qualification level is distributed among workers according to a continuous distribution, $G(z)$, with $G(z) = \alpha(z - z_{min})$. The labor market participation rate, noted τ , satisfies: $\tau = 1 - G(\hat{z})$. The following table summarizes the effects of rising unemployment benefits.

Table 1. The unemployment benefits effects depending on the bargaining solution

	θ	$\hat{z}$	a	$\bar{y}$	$\bar{w}$	$p(\theta)$	$q(\theta)$	u	$\tau = 1 - G(\hat{z})$
b_{nash}	—	+	+	+	+	—	+	+	—
b_{ks}	+	—	—	—	—	+	—	—	+
b_{es}	+	—	—	—	—	+	—	—	+

According to the results in the table above, the effects of increased unemployment benefits on variables model are standard and have already been demonstrated in several articles (Amine and Lages, 2010). Indeed, in a matching model, when wages are negotiated by the Nash rule, an increase in unemployment benefits has the effect of making jobs more

complex and therefore firms more selective. This accentuation of the complexity and selectivity results in an increase in productivity and wage. However, job creation is becoming less profitable for firms as their share in the overall surplus decreases as the workers' bargaining power is strengthened with higher unemployment benefits.

However, when the surplus sharing is done according to the KS or ES solution, we establish the inverse of the effects obtained with the Nash solution. Indeed, an increase in unemployment benefits, in the case of KS and ES, has the effect of making jobs less complex and therefore firms less selective. This decrease complexity and selectivity results in a deterioration of productivity and hence the average wage. Despite the increase of b , firms are encouraged to create more jobs, hence the increase in θ , as their share in the surplus increased. Unemployment decreases and participation in the labor market also increases.

5. Final remarks

As we explained in the introduction, the aim of this paper is to show that the use of the generalized Nash rule as surplus sharing solution between workers and firms is not always relevant. In other words, we have shown that the choice of the solution may distort results about effects of public policies.

Using a matching model in which the choice of complexity of jobs is endogenous, we have shown that higher unemployment benefits can have two completely opposite effects on labor market performance based on the bargaining solution (Nash, KS, ES). Indeed, papers that focus on matching models should qualify their results and conclusions and explain why Nash is used systematically.

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Macroeconomic models used in structural analysis of GDP

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Abstract. *In this paper, the authors present some models useful for the analysis of the Gross Domestic Product. The study capitalizes official data published by the National Institute of Statistics from Romania. As the principal indicator of the macroeconomic results in the national economies, the Gross Domestic Product is influenced by a variety of factors, whose impact can be estimated with the help of appropriate models. After presenting some aspects on the evolution of Romania's Gross Domestic Product, the authors propose a set of econometric models, based on the simple and multiple regression approach, which are able to measure the impact of final consumption, on one hand, and the turnover of the companies acting in the retail sector, on the other hand, on the main indicator considered in the research. The models are tested against R-squared and Adjusted R-squared parameters, and the results of estimations are further explained.*

Keywords: gross domestic product, final consumption, turnover, regression, parameter, public, private.

JEL Classification: B22, B23, E21.

1. Introduction. Literature review

GDP is calculated by all countries and it represents, under synthesized form, the quantitative and qualitative evolution registered by a country in a given period of time.

If we compare this indicator obtained by our country in recent years with the one realized by the European countries, the situation would be clearly negative, our country being on one of the last places, but an explanation can be found through the gap in the social-economic development. The situation is not any different even if we compare the GDP achieved by Romania with the same indicator achieved by countries in Central and Eastern Europe, who walked the path of transition in the same time with our country. In this context, comparisons are more enlightening because it highlights certain developments that occurred in roughly similar circumstances and the sharp drop of this indicator in our country compels us to seek real causes of such developments.

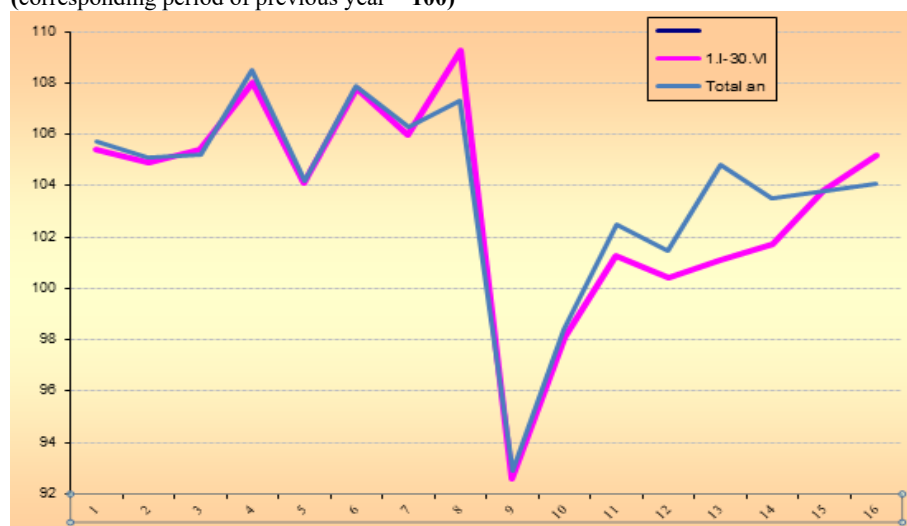
From this point of view, we consider that the most objective is the comparison of GDP index realized by our country with the levels of the same indicator registered by Cyprus, Estonia, Latvia, Lithuania, Czech Republic, Poland, Hungary, Slovenia, Slovakia and Bulgaria. We find that, starting with 1990 and until 1995, these indicators have registered differentiated development, in most of them a downward trend being produced, before micro stabilization. From 1995 until the end of 1999, this process of considerably decrease of GDP continued especially in Romania, the country that remained alone from the ones mentioned above in the situation of having a low GDP indicator. After 2000, GDP registered a growth process. It is significant that in 2007 GDP was by 6.0% higher than in 2006, but in absolute numbers is still far from the potential that Romania has. In 2005, GDP was in absolute numbers and current prices of 287.1863 billion lei, meaning over 100 billion dollars at the rate of 2.85 lei/USD on 31.12.2005. In 2006 the GDP, recorded a level of 342.2 billion lei, meaning approximately 142.7 billion dollars at the rate of 2.40 lei/USD, which represents an increase of 7.7% compared to 2005. In 2007, GDP was in absolute numbers and current prices 404,708.8 million lei, that is over 169.4 billion dollars at the rate of 2.4564 lei/USD on 31.12.2007, which represents an increase of 6.1% compared to the previous year. In 2008, GDP reached 514.654 million lei. Compared to 2007, GDP grew by 7.1% in 2008. In 2009, due to a lack of proactive programs, the "election budget" from 2008 and 2009 and under the devastating effect of the crisis, GDP fell to 491,273.7 lei, registering a decrease in deflated data by -7.1%. In 2010 the GDP reached 522,561.1 million lei, and in 2011 was 578,551.9 (recorded minimum wages are not deflated being expressed in current prices of each period). In 2012, the GDP was 587,494.4 million. In 2013, the GDP was 637,583.1 million, with 3.4% higher than in 2012. In 2014, GDP reached 668,143.6 million, recording an increase of 3.1% over 2013. In 2015, GDP registered a value of 712,832.3 million lei. In 2016, in the first semester, GDP reached the value of 325,572.9 million lei, the level which is undoubtedly higher than the one registered in the same period of time in previous years until present day. In Hungary, a country which we can compare with, there was a fluctuating trend of GDP growth from 1.3% in 1996, 4.6% in 1997, 5.1% in 1998, 5.9% in 1999, 7.7% in 2000 and 3.5% in 2002 3.7% in 2003, 2.1% in 2004, 4.1% in 2005, 3.9% in 2006, 3.7% in 2007, 0.5% in 2008, 1.1% in 2009 and - 1.6% in 2010. In 2010, GDP decreased by -1.0%, being 522,561.1 million lei.

Hungary and Poland are countries which, although they also encountered a number of difficulties over time, they switched to an improvement of the activity which allowed them a quantitative increase of the GDP indicator.

In our country, if in 1996 this indicator showed a 3.9% increase compared to 1995, in the next period of 1997 there was a decrease of 6.6%, in 1998, a decrease of 7.3% and in 1999, a decrease of 3.2%. Starting 2000, GDP registered a steady upward trend, increasing by 3% in 2001, with 5.3% with 4.8% in 2002, 4.9% in 2003, 8.4% in 2004, 4.1 in 2005, 7.7% in 2006, 6.0% in 2007 and 7.1 in 2008. The estimation was made compared with the previous year. In 2009 he began the real rebound, registering a decrease of -7.1% compared with the previous year. The decrease percentage of GDP continued in 2010, when GDP was reduced by -1.6% and for 2011 the GDP increased by 2.5%. In 2012 also it was a slight increase (1.1%), and in 2013 was registered a comparable increase of 3.4% in 2014 to 3.1% and 3.8% in 2015.

GDP evolution between 2001-2016

(corresponding period of previous year = 100)



* Temporary data, estimated for 2016.

Source: National Institute of Statistics, Statistical Bulletin no. 7/2016.

Aisen and Veiga (2013) discuss on the political instability's negative effects on the economic development and growth. Alfaro, Chanda, Kalemli-Ozcan Sayek (2004) analyze the role of financial markets at the local level in the development of the foreign component of investments in the national economy and of the economic growth.

Anghelache, Anghel, Manole and Lilea (2016) develop on instruments of modeling, in economy, finance, and information technology. Anghelache, Manole, and Anghel (2015) study the influence of final consumption and gross investments on the Gross Domestic Product, they apply the multiple regression model, another work by the authors extends the regression model to include the changes in inventories and the influence of net exports. Anghelache and Anghel (2015) measures the correlation between the evolutions of Direct Foreign Investments sold and Gross Domestic Product. Anghelache, Anghelache and Ursache (2015) present a structural analysis of the FDI evolution.

Anghelache and Anghel (2016), Anghelache, Mitruț and Voineagu (2013), Anghelache (2008), Dornbusch, Fischer and Startz (2007), Newbold, Karlson and Thorne (2010) describe the instruments of macroeconomic and macro-statistics. Atanassov and Kim (2009) analyze the connection between labor and corporate governance, their study is supported by international evidence. Blonigen, Davies, Waddell, and Naughton (2007) evaluate the FDI through the application of spatial autoregressive relations. Büthe and Milner (2008) study the politics of developing countries regarding the foreign direct investments. Censolo and Colombo (2008) analyze the structure of public consumption in a particular type of economy. De Michelis and Monfort (2008) approach the correlations between Gross Domestic Product, regional convergence and European policy oriented towards cohesion, Jones and Wren (2006) approach the correlation between FDI and regional economy. Dobrodolac (2011) develops on the role of econometric models in managerial processes. Dumitrescu, Anghel and Anghelache (2015) develop an econometric model for the analysis of GDP. Ghysels (2001) explains the econometric-based study of time series with seasonal character.

Hanson and Stein (2015) develop on the correlation between monetary policy and real rates on long term. Koulakiotis, Lyrouti and Papasyriopoulos (2012) analyse the impact of inflation on the Gross Domestic Product. Manole, Anghelache, Jweida, Niță and Marinescu (2016) measure the impact of export activities on the economic growth, Pistoiresi and Rinaldi (2012) approach a similar topic. Nielsen (2015) discusses on uncertainty of economic growth at global level. Reis (2009) analyzes the properties of the aggregate consumption time series.

2. General aspects regarding linear model based on regression function

The regression model is a statistical and econometric instrument used to determinate the relationship of dependence between two variables in a given time horizon. At the macroeconomic level, it is important that a number of result indicators of results is analyzed both static, but dynamic. In this sense, we can identify the direction and pace of development of the considered indicator (variable).

Moreover, it is important to determine if between the considered variables is a correlation and how intense is that connection. Through regression model, we realize this goal. Thus, the calculation of regression parameters, by their sign and size, highlights the existence, direction and intensity established between the analyzed variables.

The regression model can be linear or non-linear. Setting regression model is made after studying data series and graphic representation.

Linear regression model is:

$$y = a + b \cdot x + \varepsilon, \text{ where;}$$

y = the dependent variable (explained);

x = the independent variable (explanatory);

ε = residual variable;

a, b = regression parameters estimated using regression function based on data series used to define two variables.

From the graphical representation of data series results the possibility that the cloud of points is synthesized by drawing a straight line, because the equation shown above is of a straight line.

In non linear regression model, the function is as follows:

$y_i = a * x_i^b$, symbols used are the same as in the situation of the linear model.

A nonlinear regression model is resolved by bringing linearity using logarithms and after antilogarithms.

In this context, the initial model becomes:

$\log y_i = \log a + b * \log x_i$,

where:

$\log a$ = parameter of the free term;

$\log y_i$ = dependent variable;

$\log x_i$ = independent variable.

Next, substitutions are made:

$\log y_i = y'_i$

$\log x_i = x'_i$

$\log a = a'$.

Applying these substitutions, the model becomes:

$y'_i = a' + b' * x'_i$.

From this equation, is determined the equation system from which the regression parameters are calculated. In this case, linear regression model can be simple linear regression or multiple linear regression.

According to the number of variables taken into consideration, models can have the form of simple regression or multiple regression.

3. GDP had an oscillating trend in 2009-2016

Analysis of socio-economic development of our country cannot be made only on the basis of data studies which covers and highlights, at a macroeconomic level the development stage of the country, resulted in the evolution of GDP. Individual analysis of the evolution of this indicator, although it is likely to highlight the macroeconomic situation which Romania transits, is not sufficiently eloquent, some opinions and points of view leading to the conclusion that, perhaps, the concrete conditions in our country are particular, or, the analysis tries to identify, at any costs, only the negative aspects.

Therefore, we will conduct a comparative analysis of how this GDP indicator evolved between 2001-2016 and 1997-2000 period, based on indexes based chain (comparing the level of the current year to the previous year) and into a context that suits us, central and eastern European countries.

This eventually analysis is more edifying than a single analysis, which could be "affected" by the interpretation that may be insufficiently relevant due to internal conditions or to an exhaustive comparison with all European countries which can also generate interpretations, such as a number of European countries have social, economic conditions, different from those in our country.

The only way to a concrete analysis of these elements regarding the GDP evolution is a comparative study of the evolution in Romania and in other central and eastern European countries such as Czech Republic, Hungary, Poland, Slovenia, Slovakia, Bulgaria, Latvia, Lithuania, Estonia and Cyprus.

These ten countries establish, along with Romania, the core countries of Central and Eastern European countries which have embarked on the same path in roughly similar conditions. It is not included in this analysis the situation of European states that emerged from the disintegration of the former USSR nor entirely those resulting from the disjunction of the former SFRY. Also Albania, which currently does not report essential and accurate data about the socio-economic development cannot be taken into consideration.

This element appeared as essential in the analysis conducted by economists, who started from the fact that such macro stabilization, on the background of a change and in the context of credibility of suggested electoral programs, can be hopeful.

Compared with Latvia, Lithuania, Hungary, Poland, Slovakia and the Czech Republic, Romania registered in 2001-2013 some annual average increase of GDP growth rate, although in 2009-2011 has manifested the decrease under the impact of the crisis and inefficiency of the governance program.

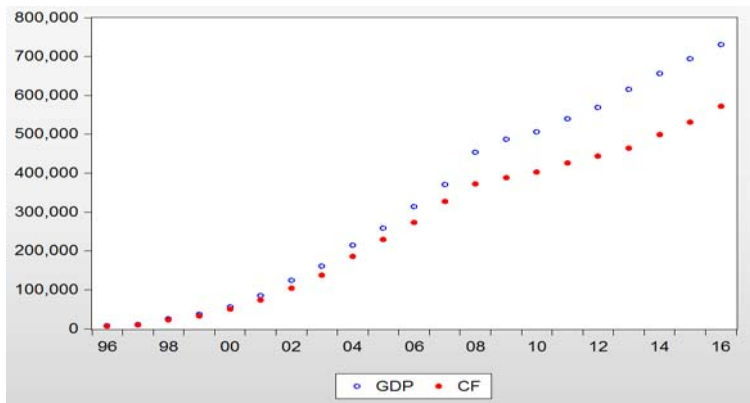
We conclude that, in terms of economic level, Romania was in a good situation until 2008, being alarming the decrease from 2009-2010 and the insignificant pace from 2011-2012. 2013 shows a revival, with a growth of 3.4% and in 2014 the growth was 3.1% over the previous year, and in 2015 the increase was 3.8% compared to 2014.

The way that GDP evolved in 2015 until present day is conclusive, given that this indicator covers also services, so all the activities of the national economy. It means that those transfers of activities have been realized from one sector to another which is likely to stimulate the strengthening of market economy, but only to increase the desire to invest in specific economic sectors of Romania, on the condition that quantitative and qualitative level of costs of domestic and international market are accepted. Deficiency crisis programs from 2009-2012 is lacking proactive anti-crisis measures that would certainly have positive effects. 2013-2016 period marked a reversal based on a more realistic allocation of resources.

4. Analysis of the correlation between GDP and final consumption

In the proposed linear regression model, final consumption, as a factor of influence, it will be considered an independent variable and influenced indicator, GDP, variable outcome. Estimation of linear regression model is based on data on the two indicators collected for the period 1996-2016.

Graphical representation of the two sets of values, for the period mentioned, is shown in the figure below:



Distribution of the values according to the above chart allows us to conclude that the trend of development for the two indicators is similar, which leads to the conclusion that there was a direct correlation, linear between GDP and final consumption.

Estimation of the parameters of the regression model proposed was realized using a dedicated software application, the results being shown in the figure below:

Dependent Variable: GDP
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 03/03/17 Time: 12:59
Sample: 1996 2016
Included observations: 21
GDP = C(1)+C(2)*CF

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-14289.11	6551.944	-2.180897	0.0420
C(2)	1.300769	0.020186	64.43923	0.0000
R-squared	0.995445	Mean dependent var		329688.3
Adjusted R-squared	0.995205	S.D. dependent var		251433.7
S.E. of regression	17409.92	Akaike info criterion		22.45786
Sum squared resid	5.76E+09	Schwarz criterion		22.55734
Log likelihood	-233.8075	Hannan-Quinn criter.		22.47945
F-statistic	4152.415	Durbin-Watson stat		0.375157
Prob(F-statistic)	0.000000			

We note the quality of the regression model, certified by the values of R-squared tests and Adjusted R-squared, which exceed 0.995.

Thus, the equation model may be written in the following form:

$$\text{GDP} = -14289,11 + 1,300769 \text{ CF}.$$

Parameters of the Regression model allow the demarcation of some useful conclusions for the research approach. For an increase in final consumption of 1 leu, GDP will record an addition of 1.3 lei. The high and negative value of the free term indicates the existence of other influencing factors for the GDP, factors that were not considered in the analysis. These factors show an adverse effect on GDP.

5. Highlighting the connection between GDP and other macroeconomic indicators using multiple linear regression mode

Information obtained by using simple linear regression model is not always sufficient to characterize the evolution of an economic phenomenon and, especially, to identify possible future development. To retrieve these shortcomings, in the expertise literature were introduced multiple regression models in which the evolution of the dependent variable is defined by two or more variables factor.

Starting from a series of data regarding the evolution of GDP in the last fourteen years, and of the turnover domestic trade in Romania – broken down on turnover in retail trade conducted by companies which have majority ownership of state and trading companies with private majority ownership – we propose a multiple regression model that allows us to analyze the links between these indicators.

For this purpose, we consider as resultant variable the GDP value, and as the variable, relative the value of the turnover in retail trade by ownership. Data were processed from TEMPO Online data base of the National Institute of Statistics of Romania. Some data were extrapolated by the authors.

The structure of the proposed multiple regression model is as follows:

$$GDP = a + b_1 * TPR + b_2 * TPB,$$

Where:

TPR = turnover in retail trade, companies with majority private capital;

TPB = turnover in retail trade, companies with majority state ownership.

The estimation results of the regression model:

Dependent Variable: GDP				
Method: Least Squares (Gauss-Newton / Marquardt steps)				
Date: 03/04/17 Time: 12:48				
Sample (adjusted): 1997 2016				
Included observations: 20 after adjustments				
GDP=C(1)+C(3)*TPR+C(4)*TPB				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	103836.1	31207.67	3.327261	0.0040
C(3)	1.961810	0.497023	3.947122	0.0010
C(4)	-25.84415	8.549222	-3.022983	0.0077
R-squared	0.882371	Mean dependent var		345775.1
Adjusted R-squared	0.868532	S.D. dependent var		246628.7
S.E. of regression	89423.80	Akaike info criterion		25.77764
Sum squared resid	1.36E+11	Schwarz criterion		25.92700
Log likelihood	-254.7764	Hannan-Quinn criter.		25.80680
F-statistic	63.76111	Durbin-Watson stat		0.503651
Prob(F-statistic)	0.000000			

The model is characterized by significant values of R-squared tests and Adjusted R-squared, higher than 0.86.

Equation model can be represented as follows:

$$GDP = 103836.1 + 1.961810 \times TPR + (-25,84415) \times TPB.$$

The influences of the factors on GDP can be described as follows:

- Turnover of private owned companies exert a positive influence, respectively an increase with 1 leu of the indicator, GDP increases by 1.96 lei.
- Turnover related to companies with majority public capital has a negative impact on GDP.
- The value of the free term is highly compared with the regression coefficients associated with the independent variables, allowing us to consider that on the GDP are other factors that were not considered in this study.

6. Conclusions

The Gross Domestic Product of Romania is influenced in a significant manner by the final consumption, as the regression model applied is characterized by high values of the R-squared and Adjusted R-squared tests. If the final consumption rises by 1 unit, the Gross Domestic Product will be greater, by 1.3 units. The analysis of the turnover of companies in retail trade outlines a positive impact in the case of privately-owned companies, while a negative influence is observed in the situation of public companies. Both regression estimations outlined the existence of additional factors, not taken into consideration at the construction of the models. Furthermore, these factors, in the case of the final consumption-based model are posing a negative effect on the main indicator.

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On the life and death of distance

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Abstract. *Buch et al. (2004) explain the “distance puzzle” suggesting that the distance coefficient only measures the importance of bilateral trade with distant countries relative to closer ones, while a large part of the positive effect of decreased distance costs on trade volumes can be captured in the intercept – expected to be positively influenced. Comparing the course of the intercept when trade growth is included to when removed (using an adjusted specification for the model), we do not seem to find any evidence that the impact of (assumed) decreased distance costs can be traced in the intercept. We also find no “death of distance” in “relative” trade over time, consistent with the majority of literature.*

Keywords: gravity model, distance puzzle, distance coefficient, bilateral trade.

JEL Classification: F14, F17, F60.

1. Introduction

The gravity model has been one of the most prominent empirical models in economics and international trade specifically. However, during the more than half a century it has been around, since it was introduced by Tinbergen in 1962 in his *Shaping the World Economy*, it has gone through ups and downs. Whatever its initial success and wide use in policy, as Bergeijk and Brakman (2010) underline gravity analysis experienced reduced academic popularity in the 1970s and 1980s, due to the lack of a proper economic foundation or, as Anderson (2011, p. 2) puts it, “the absence of an accepted connection to economic theory” rendering the gravity model a respected empirical tool, still problematic in its theoretical foundations (Bergeijk and Brakman, 2010).

Nevertheless, in the last thirty years it has largely regained its popularity thanks to the improvement of its theoretical foundation and the renewed interest of researchers regarding the impact of geography on trade, while the contributions of Anderson, van Wincoop, Bergstrand and Egger have been significant.

In its basic form the gravity model of trade is as follows:

$$T_{ij} = \frac{GDP_i^{b_1} GDP_j^{b_2}}{D_{ij}^{b_3}} \quad (1)$$

It is commonly estimated in logs including an intercept:

$$\log T_{ij} = \text{int} + b_1 \log GDP_i + b_2 \log GDP_j + b_3 \log D_{ij} \quad (2)$$

where:

T_{ij} is the bilateral trade between countries i and j , GDP_i the economic mass of country i indicated by GDP_i and D_{ij} the distance between the two countries. The latter is thought to be used mainly⁽¹⁾ as a proxy for transport costs⁽²⁾ and even though it has consistently been statistically significant, the distance effect has proved to be quite controversial among the researchers. Some have argued that as transport costs have been shrinking over time, the same is the case with the significance of distance. This view has often been vividly expressed in titles, such as the famous “The Death of Distance: How the Communications Revolution Is Changing our Lives” (Cairncross, 1997) and “The world is flat” (Friedman, 2005).

Nonetheless, a majority of the research on the gravity model of trade points towards a different direction⁽³⁾. Leamer and Levinsohn (1995, p. 1387) argue that the distance effect on trade patterns has not been declining as time passes or -putting it simply- opposed to what most would think, “the world is not getting dramatically smaller”. Similarly, Frankel (1997) concludes that there is no evidence suggesting a decrease of the distance coefficient in more than a century of estimates.

Even more surprisingly - for some - Disdier and Head (2008) find that after a small decrease in the distance effect in the period 1870-1950, it even began to rise thereafter, while Carrère and Schiff (2005) argue that the importance of distance has increased for many countries. Berthelon and Freund’s (2008) results from regressions imply that the

significance of the distance effect has augmented since 1980, since distance sensitivity has increased for approximately one fourth of the industries and decreased in only a few of them.

The puzzle has often attracted the interest of researchers, who have offered some insight on the relatively constant -or even increasing- coefficient of distance in gravity models of trade over time. Jacks (2009) simply suggests that the increase of the distance effect over time may have been correctly identified and trade costs may have recently not decreased as much as most would think. Leamer and Levinsohn (1995) pose that the increase in trade across oceans can be almost fully explained by the increase in the economic sizes of Europe and Asia emphasizing the decline of the US share of world GDP and the dispersion of economic mass rejecting that the world is shrinking.

Moreover, there have also been more elaborate explanations on the increasing distance coefficient⁽⁴⁾. Brun, Carrère, Guillaumont and de Melo (2005) introduce remoteness, as well as an augmented trade barrier function in the gravity equation in order to correct for some misspecification issues in the standard gravity equation which employs distance as a proxy for transport costs or trade barriers. In this way, they find an 11.1 percent decrease in the distance effect on bilateral trade over the period 1962-96 (i.e. coefficient from 1.35 in 1962 to 1.2 in 1996).

At the same time, others have questioned the distance coefficient as a measure that – fully – captures the distance effect or distance costs. Buch, Kleinert and Toubal (2004) characterize the interpretation of the coefficient as an indicator of a shift in distance costs as deceiving showing that proportional changes in distance costs causing proportional changes in trade flows (i.e. DC in $t=1$ are $1/\lambda$ of their level in $t=0$ and trade flows are λ times what they were in $t=0$) do not affect the distance coefficients, but are solely reflected in the intercept. Testing the robustness of these results, they find that even in the case of non-proportionally changing distance costs changes in average levels of exports are reflected in a changing intercept. Of course, they emphasize that in real data this effect is mixed with omitted variables maybe included in the intercept. Further, they argue that the distance coefficient measures how important bilateral economic activities with distant partners are relative to others closer to the home country. Thus, a decrease in the coefficient indicates that trade with the former increases relative to that with the latter, while an increase in the coefficient the opposite.

Motivated by this notion, this paper's aim is to investigate whether increases in bilateral trade due to decreased distance costs are indeed reflected in the intercept of the gravity model. The paper is organized as follows: after this introduction and review of literature, the next section presents the methods and data used, section 3 discusses the results and the last section concludes.

2. Methods and data

We estimate equation (1) both in its standard form and adjusted for growth by removing the percentage increase of both the mean/total trade flow and GDP, that is:

$$AT_{ij} = \frac{AGDP_i^{b_1} \times AGDP_j^{b_2}}{D_{ij}^{b_3}},$$

$$AT_{ij} = T_{ij,t} \times \frac{\sum_{j \neq i} T_{ij,t-1}}{\sum_{j \neq i} T_{ij,t}},$$

$$AGDP_i = GDP_{i,t} \times \frac{\sum_{i=1}^n GDP_{i,t-1}}{\sum_{i=1}^n GDP_{i,t}} \text{ (same for } j)$$

n the number of all pairs of countries worldwide⁽⁵⁾ and t the time trade takes place (where $t=0$ the base year). In this way, the equation accounts only for the changing significance of trade with close/distant countries and not possible increases in trade flows due to decreased distance costs.

To elaborate on our rationale, since bilateral trade is adjusted for world trade growth⁽⁵⁾, the two countries' GDPs have also to be adjusted for world GDP growth⁽⁵⁾, on the grounds that the removed trade growth would stem not only from reduced distance costs (which we want to account for), but also from GDP growth, which Buch et al. (2004) have also assumed to be zero in their analysis. In this way, the equation accounts only for the (intertemporally changing maybe) relative significance of trade with distant/close countries (with the part of the distance effect reflected in the intercept absorbed), but not for the overall increase in trade; the average trade flow and average GDP remain constant.

For each year (apart from the first one), trade flows and GDPs are adjusted for growth relative to the previous used year, that is 10-year-growth, so we are going to compare how the intercept changes from a year's standard model to the next year's standard versus the next year's adjusted model. According to Buch et al. (2004) we expect the intercept to increase more (or fall less) when remaining in the standard model opposed to when we switch to the adjusted one, where the suggested positive effect of reduced distance costs on the intercept has been removed (average level of exports remains constant).

Several standard dummy variables for common official language, contiguousness, present or past colonial relationship, common GATT membership, membership in common regional trade agreement are implemented into the model to mitigate omitted-variable bias⁽⁶⁾, so equation (2) is estimated in the following form (in both adjusted and standard form):

$$\begin{aligned} \log T_{ij} = & \text{int} + b_1 \times \log GDP_i + b_2 \times \log GDP_j + b_3 \times \log D_{ij} + b_4 \times \text{comlangoff}_{ij} + \\ & + b_5 \times \text{contig}_{ij} + b_6 \times \text{colhist}_{ij} + b_7 \times \text{comgatt}_{ij} + b_8 \times \text{rta}_{ij} \end{aligned} \quad (3)$$

Data comes from the CEPII 'light' gravity dataset. The model is estimated with cross-section OLS adding \$1 million to all known zero trade flows⁽⁷⁾ for years 1966, 1976, 1986, 1996 and 2006 using all country pairs (i.e. 9,373) for which there is available data.

3. Results

The results for both the traditional and the adjusted model are presented in the tables below:

Table 1. Adjusted model

	1966	1976	1986	1996	2006
Intercept	0.30542 (1.143)	-0.5749* (-2.171)	-1.8518*** (-6.846)	-3.3842*** (-11.472)	-4.9791*** (-16.351)
Log(AGDP)	0.2095*** (21.878)	0.3777*** (39.957)	0.4539*** (47.314)	0.5714*** (59.215)	0.6670*** (66.965)
Log(AGDP)	0.2177*** (21.774)	0.3642*** (38.248)	0.4024*** (43.694)	0.4835*** (55.832)	0.5441*** (59.522)
LogD _{ij}	-0.2382*** (-8.634)	-0.4137*** (-14.901)	-0.4128*** (-14.457)	-0.4566*** (-14.222)	-0.4594*** (-13.864)
Contiguous	0.0836 (0.668)	0.0532 (0.437)	0.2983* (2.437)	0.3335** (2.668)	0.6137*** (4.785)
Common official language	0.1012* (1.983)	0.1956*** (3.917)	0.1947*** (3.863)	0.3432*** (6.659)	0.4048*** (7.665)
Colonial link	0.9417*** (7.033)	1.0818*** (8.271)	1.2382*** (9.406)	1.0354*** (7.7)	0.8354*** (6.054)
Common GATT membership	0.0677 (1.647)	-0.0003 (-0.007)	0.1027** (2.664)	0.1106* (2.428)	0.3175*** (6.183)
Regional Trade Agreement	0.9339*** (5.147)	1.2300*** (9.406)	1.4026*** (12.966)	0.9645*** (2.428)	1.1403*** (15.628)
R squared	0.1132	0.2845	0.3629	0.4441	0.5056

Note: ***, **, * and ' indicate significance at the 0.1%, 1%, 5% and 10% levels respectively.

Table 2. Standard model

	1966	1976	1986	1996	2006
Intercept		-1.0486*** (-3.876)	-2.3262*** (-8.506)	-3.4561*** (-12.083)	-5.7203*** (-19.385)
Log(GDP)		0.3696*** (39.987)	0.4409*** (49.239)	0.5593*** (66.930)	0.6577*** (75.630)
Log(GDP)		0.3642*** (38.289)	0.4048*** (44.296)	0.4960*** (59.311)	0.5553*** (63.349)
LogD _{ij}		-0.4137*** (-14.887)	-0.4297*** (-14.159)	-0.5469*** (-17.605)	-0.5495*** (-17.248)
Contiguous		0.0561 (0.462)	0.2914* (2.400)	0.3194** (2.650)	0.6207*** (5.052)
Common official language		0.2050*** (4.102)	0.2224*** (4.444)	0.3820*** (7.691)	0.4324*** (8.554)
Colonial link		1.0836*** (8.286)	1.2133*** (9.290)	0.9349*** (7.209)	0.7259*** (5.489)
Common GATT membership		-0.0225 (-0.587)	0.1613*** (4.238)	-0.0475* (-1.080)	0.2627*** (5.337)
Regional Trade Agreement		1.2081*** (9.237)	1.2899** (11.994)	0.8425*** (10.231)	0.9623*** (13.715)
R squared		0.2846	0.3730	0.4832	0.5461

Note: ***, **, * and ' indicate significance at the 0.1%, 1%, 5% and 10% levels respectively.

Table 3. Intercept changes

	1966 to 1976	1976 to 1986	1986 to 1996	1996 to 2006
Standard to standard (growth included)	-1.3540	-1.2780	-1.1298	-2.2642
Standard to adjusted (growth removed)	-0.8803	-0.8056	-1.0576	-1.5230

Firstly, we notice that the distance coefficient increases from 1966 to 1976 and again from 1986 to 1996, while remains constant for the other two periods, which suggests no “death of distance” in terms of “relative” trade, consistent with most studies. Secondly, regarding the issue in question, even if we disregard the decreasing trend of the intercept in both models -which may stem from other factors than the distance effect, such as the increasing R^2 over time or omitted variables bias- this trend does not appear to be weaker when growth included, whereas according to Buch et al. (2004) analysis the increase in trade flows due to decreasing distance costs would have a positive/increasing effect on the intercept. In fact, growth included the intercept experiences consistently larger decreases compared to when growth is removed.

4. Conclusions

We find the distance coefficient to be persistent in both specifications of the gravity model suggesting no “death of distance” in ‘relative’ trade over time, consistent with the majority of literature. Furthermore, contrary to Buch et al. (2004) analysis suggesting that an overall increase in trade volumes due to a decreasing distance effect would have a positive-increasing effect on the intercept, we do not seem to find any evidence that an (assumed) decreasing distance effect is captured in the intercept. In fact, the intercept experiences consistently larger decreases when growth is included opposed to when removed. All in all, we can conclude that: a) either the distance effect has remained “alive and well” in terms of total trade volume as well or b) if the distance effect has decreased, as most would think, our analysis of the data does not seem to trace its impact in the intercept of the gravity model.

Notes

- (1) Even though the basic intuition is that distance affects transports costs, Linnemann (1966) and Frankel (1997), for example, see three kinds of costs related to the distance effect on trade; shipping costs, time elapsed in transporting and cultural unfamiliarity, while Portes and Rey (2005) argue a relation with information costs.
- (2) Whatever the scarcity in transport costs data, which is the factor having often led to the employment of distance as a proxy, there are also studies that have directly used the transport costs, such as Baier and Bergstrand (2001), Hummels and Lugovskyy (2006), Hummels (1999), Limao and Venables (2001), Estevadeordal, Frantz and Taylor (2003).
- (3) Of course, a decline in the distance coefficient has been found for earlier years. Jacks (2009) documents clear declines in the importance of this effect over time during the nineteenth century.
- (4) The efforts so far are not in any case limited to the ones reported here. For some more explanations on the distance puzzle, see Coe, Subramanian and Tamirisa (2007), Boulhol and Serres (2009), Lin and Sim (2012), Buehler and White (2014), Larch et al. (2015).

- (⁵) In practice we use all 9,373 available pairs, so it is those pairs' trade growth and the respective countries' weighted GDP growth (since it depends on how many times each country is in a pair in the data).
- (⁶) Ideally, the dummy variables would also be adjusted for increases in trade agreements etc., but their nature as dummy variables does not allow for it.
- (⁷) That is, we use $\ln(1+T_{ij})$ in the estimation. Silva and Tenreyro (2006) propose the use of the Poisson pseudo-maximum likelihood (PPML) estimator to cope with zero-values and error heteroscedasticity, which is inconsistent with OLS estimation. However, as Gómez-Herrera (2012) underlines, heteroscedasticity does not affect the coefficients' estimates, but only their variance, while Martínez-Zarzoso (2013) finds the PPML estimator to be outperformed by OLS in out of sample forecast. Finally, Egger (2005) suggests that the Hausman-Taylor model be considered for estimation of cross-section gravity models.

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Vectors of economic growth in the eastern area of the EU

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Abstract. *In this paper, the author analyzes the most recent trends in the evolution of the Gross Domestic Product for a panel of EU countries from the Eastern Europe, including Romania. The study pursues the evolution of the main indicator of the national economies, the dynamics of GDP per capita, and the components of the Gross Domestic Product, grouped according to the expenses method, all these factors seen as vectors of economic growth. The influence of the factors is also evaluated by multiple regressions. The situation of each country is discusses, together with cross-border comparisons.*

Keywords: Gross Domestic Product, consumption, foreign trade, expenses.

JEL Classification: E01, E60.

1. Introduction. Literature review

The Gross Domestic Product is one of the main indicators from the national accounts. It measures the results of economic activity developed within the borders of a country and is also suitable for cross-border comparisons.

One of the methods used to calculate the Gross Domestic Product is the expenses method, which allows, for subsequent studies, the analysis of the contribution of each factor considered by the method to the structure and evolution of the GDP. The method is based on a sum of factors, thus the dynamic and structural analysis of factor's influences follows the balance method: the absolute modification of the main indicator is influenced by the modifications of its factors.

Anghelache, Soare and Popovici (2015) describe the influence of final consumption on the Gross Domestic Product of Romania, they conclude, following an analysis on annual data for 2003 to 2013, that there is a strong influence of final consumption on the evolution of Romanian GDP (Anghelache et al., 2015, p. 51). Anghelache, Diaconu, Marinescu, and Popovici (2016) realize a comparative analysis on the main indicator of the Romanian economy for the period 2001-2016. Georgescu (2016) presents some issues on the Gross Domestic Product, he outlines the new approaches determined by the introduction of the ESA 2010 system. Păunică (2014) develops on the economic benefits of investments in social infrastructure.

Ioniță (2015) develops on the stabilization, at macroeconomic level, for the Romanian, Czech and Hungarian economies, he analyzes, among other indicators, the growth rate. Pawlas (2015) presents some selected aspects on the initial members of the Visegrad Group, the analysis includes a discussion on the GDP of those countries.

Pipień and Roszkowska (2015) approach the statistical estimation of the Polish Gross Domestic Product. Matkowski, Rapacki, and Prochniak (2016) evaluate, in a comparative manner, the economy of Poland. Todorov (2016) presents some engines of growth for the Bulgarian economy, while Rădulescu (2016) realizes an evaluation of the Romanian and Bulgarian economies. Vlatka, Sanja, and Mile (2015) examine the role of foreign trade in the Croatian economic system.

2. Research methodology and data

We shall analyze the data regarding a panel of countries from the Eastern Europe, which are members of the European Union: Romania, Bulgaria, Hungary, Czech Republic, Croatia, Poland. The common characteristics on which these countries were selected consider the fact that they are members of the EU, belonged to the area subjected to communism political/economical system, and were not part of the Soviet Union. As measure of economic growth, we have selected the principal indicator of any national economy, namely the Gross Domestic Product. As specified by Eurostat, *"Gross domestic product (GDP) is a measure for the economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation."* (<http://ec.europa.eu/eurostat/web/products-datasets/-/tec00114>)

The data were drawn from the Eurostat online database, quarterly datasets, for both the Gross Domestic Product, GDP per capita and components of total GDP. The data source is specified for each graphic. The base of our analysis is the expenses-based method for the computation of the Gross Domestic Product, as presented by Anghelache, Mitruț and Voineagu (2013). According to this method, the formation and evolution of the Gross Domestic Product are influenced by the following factors:

- effective final consumption, which in turn is composed of the final consumption associated with households and the final consumption related to public administration activities;
- the gross formation of capital;
- net exports of goods and services.

The analysis is based on the philosophy of the balance method, as the factors relate to the main indicator through an additive formula. In this respect, we shall emphasize the weight of each factor in the value of the Gross Domestic Product for each country.

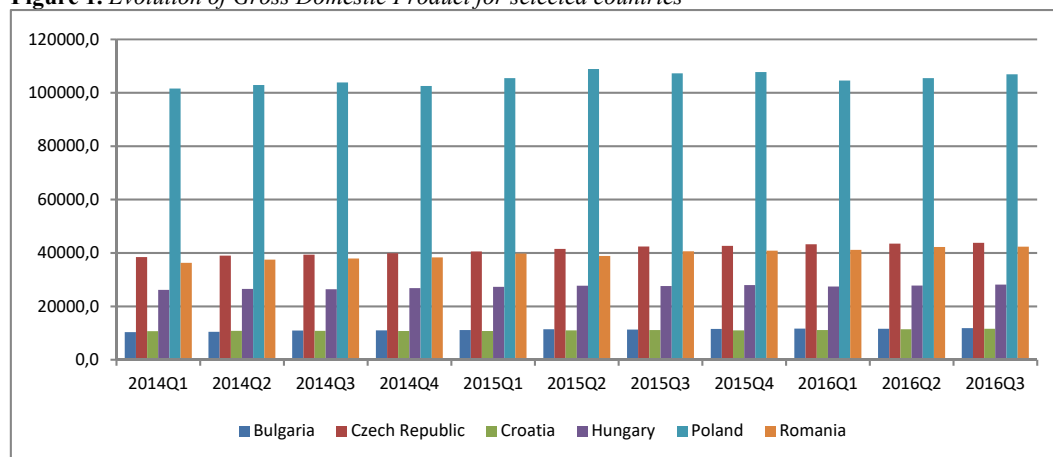
Then, the analysis was substantiated by an econometric analysis on the same set of factors, measuring the influences of the independent variables on the Gross Domestic Product. We have estimated a multiple regression model for each country and have discussed on the parameters and characteristics of the individual models.

3. Results and discussions

Analysis of the Gross Domestic Product evolution

In this section, we shall pursue, at first, the analysis of the Gross Domestic Product, from multiple viewpoints. First, we will consider a comparative approach and outline the trend of the indicator, measured as total value, across the time interval considered, for selected countries.

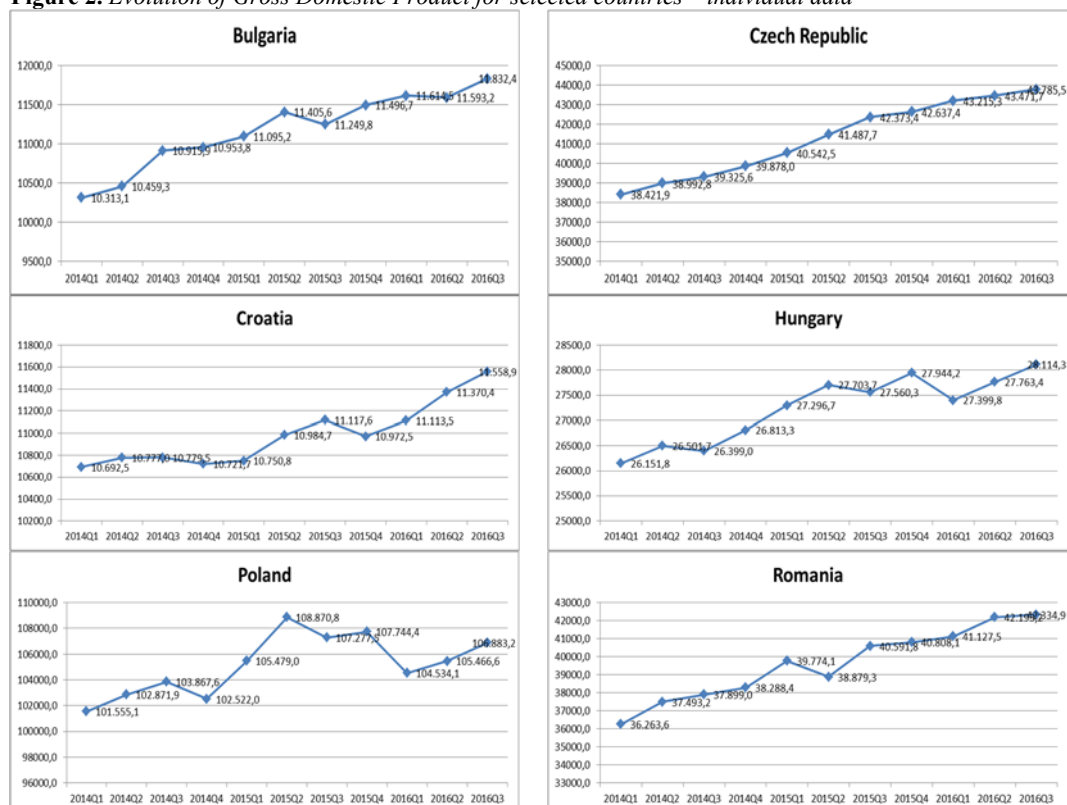
Figure 1. *Evolution of Gross Domestic Product for selected countries*



Source: Eurostat, <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina010>, accessed 5 February 2017, graphical representation by the author.

It can be seen that, for the select panel of countries, the biggest value of GDP is associated with Poland, roughly ten times bigger than the lowest country in the group – Bulgaria. This observation is valid for the entire set of data. Romania is placed on the third place, below Czech Republic, but ahead of her neighbors – Bulgaria and Hungary. As this analysis alone does not provide significant conclusions on the comparisons between countries, we shall focus then on the analysis of the evolution of GDP for each country. The results, in a visual format, are presented in the figure below:

Figure 2. Evolution of Gross Domestic Product for selected countries – individual data

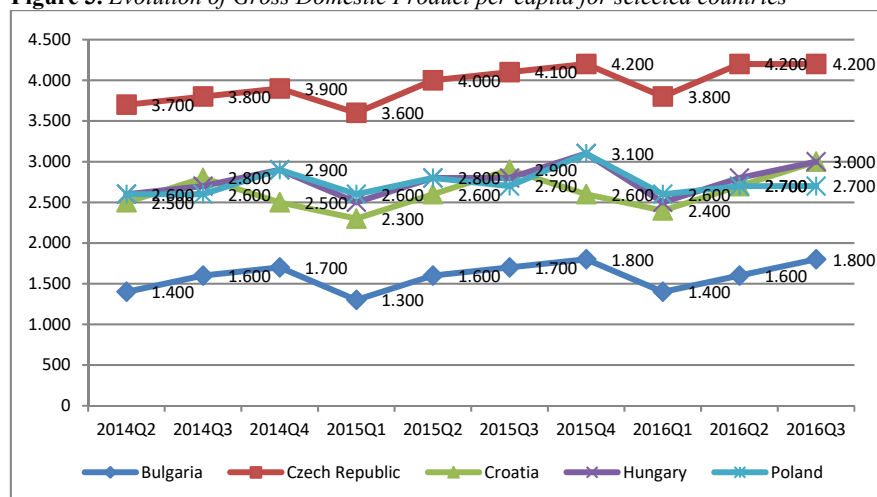


Source: Eurostat, <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina010>, accessed 5 February 2017, graphical representations by the author.

The evaluation of individual data series reveals significant information on each country. There can be observed the steady increase of the analyzed indicator, across the entire interval, with the exception of Poland, for which the last measured value is below the maximum one; however the recovery trend is present and visible. The Czech Republic was the least affected by sinuous trends in the dynamics of the Gross Domestic Product, as the dataset shows the most convincing upward trends of all six countries. Bulgaria, Croatia, Hungary, Poland and Romania experienced, at given moments, sudden drops in the GDP level, drops that can be explained, from a low-granularity perspective, through the components' contributions, as delimited by the expense method.

Next, we will take into account the level of the GDP/capita, which offers a higher degree of comparability among the national economies included in our study. The graphical representation of the dataset is presented in the figure below:

Figure 3. *Evolution of Gross Domestic Product per capita for selected countries*



Source: Eurostat, *Main GDP aggregates per capita [namq_10_pc]*, accessed 5 February 2017, graphical representation by the author. The source indicated does not include data for Romania.

The comparative analysis via the GDP per capita is more suggestive than the study based on the total value of the Gross Domestic Product. Thus, we can see that the highest value of the indicator is associated with Czech Republic, for the entire interval considered. The second, third and fourth positions are held by Croatia, Hungary and Poland. Bulgaria has the lowest value of GDP per capita. Also, to be noted that the level of the indicator does not have a straight-line trend and its evolution is marked by up- and downturns, for all countries. The last two values for the Czech economy are identical to the maximum measure, the same comparison is valid for the last value of the Bulgarian GDP per capita. The last values for Poland and Hungary are smaller than the peak level.

4. Contribution of GDP components to the economic development

For the scope of our analysis, the following components were taken into consideration:

- Government final consumption expenditure, measured in current prices;
- Final consumption expenditure of households and NPISH, also measured in current prices;
- Gross fixed capital formation, current prices;
- External balance of goods and services, current prices.

We have analyzed the contribution of these factors to the evolution of the Gross Domestic Product in the countries included in the panel and thus we outlined the mode in which the evolution of each component has influenced the evolution of the main indicator.

The results are presented, in a graphical format, in the figure below:

Figure 4. Evolution of Gross Domestic Product's components for selected countries – individual data



Source: Eurostat, calculations made by the author, data from tables at:

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina010>

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina030>

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina020>

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina040>

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=teina050>

accessed 7 February 2017.

For the Bulgarian economy, the data reveal the major impact of the component “*Final consumption expenditure of households and NPISH*”, whose percentage in the formation of GDP is greater than 60% for the entire interval subjected to analysis. The “*Gross fixed capital formation*” covers some 19-21%, and „*Government final consumption expenditure*” accounts for weights around 15-17%.

To be noted that the external balance records a positive evolution, from a starting level below 0 in Q1 2014, to a positive, greater as absolute value at the end of the interval, but the contribution of this component is below 2% and has a descending trend.

For the Czech Republic, we can outline the greater contribution of the external balance, which accounts for 5.28-7.50% (the minimum and maximum weights measured across

the dataset). The „*Government final consumption expenditure*” records a contribution between 19-20%, the “*Gross fixed capital formation*” has a weight around 24-26%. The most significant factor of the Czech GDP is the same that in the case of Bulgaria, the “*Final consumption expenditure of households and NPISH*”, with a less major impact on the main indicator, with values around 47-48%.

The structure and evolution of the Croatian GDP is mainly attributed to the “*Final consumption expenditure of households and NPISH*”, whose contribution ranges, across the time interval for which data were collected, from 57% to 59%. This weight is close to the levels recorded for Bulgaria. The factors “*Gross fixed capital formation*” and „*Government final consumption expenditure*” participate with similar quotas, that is between 19% and 20%. The foreign trade has a less visible contribution, but we can notice the growth trend at the end for the last quarters.

In Hungary, the trend of the Gross Domestic Product can be explained through the significant quota of the “*Final consumption expenditure of households and NPISH*”, which is close to 50% during the period analyzed. The following places in the hierarchy are held by the “*Gross fixed capital formation*” and „*Government final consumption expenditure*”, accounting for some 20%. There can be seen a reverse of those two indicators’ impact, as the percentage associated with the first factor decreased following a peak in Q2 2015. The contribution of the export/import balance presents an upward tendency, and maintains in the last four quarters around the level of 10%.

The analysis of the Polish GDP and components emphasizes the major share associated to the factor “*Final consumption expenditure of households and NPISH*”, with values close to 58-60%. The formation of gross fixed capital records values between 18% and 21%, while the public consumption is placed between 17-18.14%. The impact of these two factors has almost the same value in the last quarter. The foreign trade indicator has a very low value (for the final part of the time interval, there are no data available).

The Gross Domestic Product of Romania is mainly influenced by the “*Final consumption expenditure of households and NPISH*”, recording a contribution of more than 60%, reaching a peak of 63.39% in the last quarter of the interval analyzed. The formation of fixed capital amounts for percentages between 23-26%, with the balance of foreign trade having a negative influence. To be noted, during the last four quarters for which data were taken, the absolute value of the indicator is very low and also records a major downturn from previous values which, although negative, had measure order below 200 million euros.

5. Analysis of the Gross Domestic Product evolution under the influence of components – econometric approach

A more complex approach, based on linear regression, will reveal the impact of the influence factors considered on the Gross Domestic Product. We shall use the same dataset and draw a multiple regression model for each country.

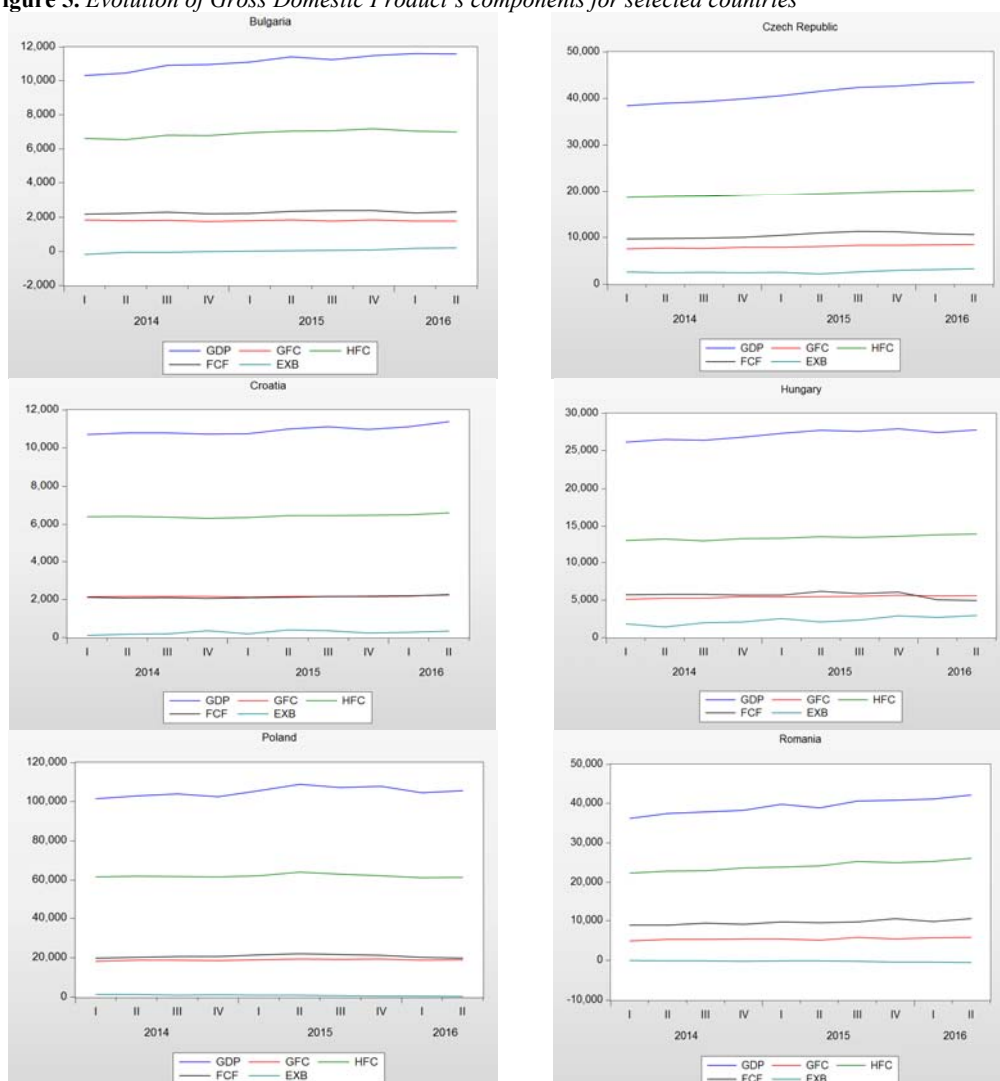
The foundation of the multiple regression model is to outline the influence of several factors on an indicator that is assumed as principal. We will approach, first, the

comparative graphical analysis of the indicators' evolution, for each country taken individually. Thus, for each country, the following variables were defined:

- GDP: Gross Domestic Product;
- GFC: Government final consumption;
- HFC: Final consumption of households;
- FCF: Gross fixed capital formation;
- EXB: External balance of goods and services.

The graphical representation of the regression model parameters is drawn in the figure below:

Figure 5. Evolution of Gross Domestic Product's components for selected countries



Note: data not available for the Polish EXB variable were estimated by the authors.

The above figure reveals the quasi-linear link between the main indicator of our study and its influence factors. We observe, also, the major contribution posed by the HFC variable – the final consumption of the households. Also, the dynamics of the relative contributions of all factors can be observed, in relation with the trend of the Gross Domestic Product.

This conclusion allows us to focus next on the estimation of the multiple regression, following the principle of an individual model for each country. The general structure of the proposed models is the following:

$$\text{GDP} = c(1) + c(2) \times \text{GFC} + c(3) \times \text{HFC} + c(4) \times \text{FCF} + c(5) \times \text{EXB}$$

where:

$c(1)$: the free term;

$c(2) \dots c(5)$: the quotients of the influence factors included in the model.

To estimate the regression models, we have used a specialized software, and the results are presented in Figure 6.

Figure 6. Regression models describing the influences of Gross Domestic Product's components for selected countries

Bulgaria

Dependent Variable: GDP
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 02/14/17 Time: 16:10
Sample: 2014Q1 2016Q2
Included observations: 10
GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2880.895	1756.428	1.640201	0.1819
C(2)	1.141881	1.124703	1.015273	0.3566
C(3)	0.985269	0.308893	3.189672	0.0243
C(4)	-0.319886	0.643641	-0.498994	0.6403
C(5)	2.558144	0.525840	4.863944	0.0046
R-squared	0.979536	Mean dependent var	11109.71	
Adjusted R-squared	0.963165	S.D. dependent var	455.2428	
S.E. of regression	87.37212	Akaike info criterion	12.08508	
Sum squared resid	38169.43	Schwarz criterion	12.23637	
Log likelihood	-55.42541	Hannan-Quinn criter.	11.91911	
F-statistic	59.83338	Durbin-Watson stat	2.259945	
Prob(F-statistic)	0.000207			

Croatia

Dependent Variable: GDP
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 02/14/17 Time: 16:14
Sample: 2014Q1 2016Q2
Included observations: 10
GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1798.095	2273.221	0.790990	0.4648
C(2)	0.087548	1.075214	0.081424	0.9383
C(3)	0.599609	0.645585	0.928784	0.3956
C(4)	2.297311	0.824229	2.787225	0.0386
C(5)	0.640975	0.177222	3.616783	0.0153
R-squared	0.976890	Mean dependent var	10928.02	
Adjusted R-squared	0.958403	S.D. dependent var	222.4970	
S.E. of regression	45.37919	Akaike info criterion	10.77484	
Sum squared resid	10296.36	Schwarz criterion	10.92813	
Log likelihood	-48.87419	Hannan-Quinn criter.	10.60887	
F-statistic	52.84005	Durbin-Watson stat	2.748043	
Prob(F-statistic)	0.000279			

Czech Republic

Dependent Variable: GDP
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 02/14/17 Time: 16:05
Sample: 2014Q1 2016Q2
Included observations: 10
GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-18120.61	5344.834	-3.390304	0.0195
C(2)	0.044923	1.347252	0.033344	0.9747
C(3)	2.949216	0.829788	3.554180	0.0163
C(4)	0.186727	0.246481	0.757572	0.4829
C(5)	-0.155338	0.350500	-0.443190	0.6761
R-squared	0.995555	Mean dependent var	41034.63	
Adjusted R-squared	0.991999	S.D. dependent var	1848.641	
S.E. of regression	165.3569	Akaike info criterion	13.36094	
Sum squared resid	136714.5	Schwarz criterion	13.51223	
Log likelihood	-61.80471	Hannan-Quinn criter.	13.19497	
F-statistic	279.9682	Durbin-Watson stat	2.778205	
Prob(F-statistic)	0.000005			

Hungary

Dependent Variable: GDP
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 02/14/17 Time: 16:21
Sample: 2014Q1 2016Q2
Included observations: 10
GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-703.5835	3431.648	-0.205028	0.8456
C(2)	0.556675	0.795893	0.699435	0.5155
C(3)	1.455836	0.394280	3.692394	0.0141
C(4)	0.762468	0.175413	4.346695	0.0074
C(5)	0.407460	0.187733	2.170428	0.0821
R-squared	0.974379	Mean dependent var	27153.39	
Adjusted R-squared	0.953883	S.D. dependent var	637.6879	
S.E. of regression	136.9426	Akaike info criterion	12.98395	
Sum squared resid	93766.40	Schwarz criterion	13.13515	
Log likelihood	-59.91927	Hannan-Quinn criter.	12.81789	
F-statistic	47.53897	Durbin-Watson stat	2.080137	
Prob(F-statistic)	0.000361			

Poland

Dependent Variable: GDP
 Method: Least Squares (Gauss-Newton / Marquardt steps)
 Date: 02/14/17 Time: 16:28
 Sample: 2014Q1 2016Q2
 Included observations: 10
 GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-4609.341	18156.32	-0.253870	0.8097
C(2)	2.402782	1.181978	2.032848	0.0978
C(3)	0.924610	0.477597	1.935964	0.1106
C(4)	0.446351	0.445845	1.001136	0.3627
C(5)	-2.564047	0.985217	-2.602520	0.0481
R-squared	0.972548	Mean dependent var	105018.9	
Adjusted R-squared	0.950586	S.D. dependent var	2407.891	
S.E. of regression	535.2580	Akaike info criterion	15.71023	
Sum squared resid	1432506.	Schwarz criterion	15.86152	
Log likelihood	-73.55114	Hannan-Quinn criter.	15.54426	
F-statistic	44.28336	Durbin-Watson stat	1.892565	
Prob(F-statistic)	0.000428			

Romania

Dependent Variable: GDP
 Method: Least Squares (Gauss-Newton / Marquardt steps)
 Date: 02/14/17 Time: 16:48
 Sample: 2014Q1 2016Q2
 Included observations: 10
 GDP=C(1)+C(2)*GFC+C(3)*HFC+C(4)*FCF+C(5)*EXB

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1229.844	3632.760	0.338543	0.7487
C(2)	1.640899	0.649972	2.524567	0.0529
C(3)	0.717545	0.237935	3.015715	0.0296
C(4)	1.260221	0.389112	3.238707	0.0230
C(5)	1.012434	1.183160	0.855704	0.4312
R-squared	0.986527	Mean dependent var	39331.82	
Adjusted R-squared	0.975749	S.D. dependent var	1871.289	
S.E. of regression	291.4125	Akaike info criterion	14.49421	
Sum squared resid	424606.3	Schwarz criterion	14.64550	
Log likelihood	-67.47105	Hannan-Quinn criter.	14.32824	
F-statistic	91.52858	Durbin-Watson stat	2.093852	
Prob(F-statistic)	0.000073			

Note: data not available for the EXB variable were estimated by the authors.

The estimations have generated the following results:

For Bulgaria, the most significant influence is given by the EXB factor, showing the importance of the foreign trade in the economy of this country. For an increase by unit of the EXB, the GDP of Bulgaria is supposed to grow by almost 2.56 units, which is a very favorable influence. Next, in descending order, are the public consumption, the household-related consumption, and the formation of fixed capital. To be noted that this last factor has a negative influence on the Gross Domestic Product. The values for R-squared and Adjusted R-Squared are situated above 0.96, thus it can be considered that the model estimated provides a very accurate description of the interaction between the macroeconomic indicators. The free term is very high, compared to the quotients of the independent variables.

The evolution of the Gross Domestic Product in the case of Czech Republic is determined, in the highest measure, by the final consumption of the households. The growth by unit of this factor will conduct to almost 2.95 units to be added to the GDP. The influences of the other factors are very low compared to the top one, and we outline the negative sign of the quotient for net exports, providing incentive that a better position of the foreign trade might contribute to a more sizable growth of the Czech economy. The values of the tests R-squared and Adjusted R-Squared are significant, so the evolution for the Gross Domestic Product can be explained in a significant manner on the basis of the estimated model. The free term reaches a very low level, as it is negative, but its absolute value is far greater than the parameters that measure the influence of the factors.

Croatia is characterized by the major impact of the investments variable on the evolution of the Gross Domestic Product. An increase by one monetary unit of this factor will generate a growth of the main indicator by more than 2.29 units. All the influences of the other factors are favorable, the least important factor in this context is the public final consumption. To be observed, the high level of the free term some 600 times greater than the biggest quotient of the independent variables. The model is reliable enough, with the two reference parameters having values over 0.95.

In Hungary, the determinants of the model are similar to the values recorded for Croatia. The most important factor which impacts the evolution of the Gross Domestic Product is the expenses of the population, made for final consumption. It determines, for a unit

increase, the modification in the same way of the Gross Domestic Product by more than 1.4 units. All other factors are characterized by positive influence, but their regression quotients are below the unit level.

The regression model for the Polish GDP outlines a considerable influence of the public consumption indicator, with a regression quotient of over 2.4. Less significant influences are posed by the consumption of the households and investments, respectively. The model explains in a sufficient proportion the evolution of the main indicator for the time period considered, as R-squared is greater than 0.97 and Adjusted R-squared is slightly higher than 0.95. The free term, negative, has a very low value compared to the regression parameters.

In the case of Romania, the estimated model emphasizes the influence of public consumption, with a quotient of 1.64, followed by the investments (1.26), net export (1.01) and household consumption (0.71). The determinants have values over 0.97, which provides evidence on the reliability of the model and outline the intensity of the correlation between the independent variables and the Gross Domestic Product, and the value of the free term, almost 750 times greater than the biggest regression parameter, shows the influence of additional factors, not taken into consideration at the construction of the model.

6. Conclusions

The main factor that contributes to the formation of the Gross Domestic Product, for all economies taken into consideration, is the “*Final consumption expenditure of households and NPISH*”. The least significant share in the GDP is associated, for all countries, to the foreign trade balance, while the two other factors included in our study take the middle position in the hierarchy. As all economies depend in a great manner on the final consumption, the highest influences are observed in Bulgaria, Poland, Croatia and Romania. Significant contribution of the foreign trade activity results affect the evolution of the GDP in the Czech Republic. The greatest value of Gross Domestic Product, within the dataset considered, is associated with Poland. While analyzing the GDP per capita, the best performances correspond to the Czech economy.

Upon the econometric analysis of the Gross Domestic Product evolution, an overall observation of the six models indicates that the R-squared and Adjusted R-Squared have significant values for all equations, which represents a good reliability of each model and the possibility to use this kind of models for future analyses, given the strength of the correlation GDP – independent variables drawn from the expenses method. Also, the values of the free term are elevated enough to recommend further research, but the integration of the factors we proposed in a multiple regression model is justified by the principle of the expenses method, therefore additional analyses must take into consideration another principle according to which the factors should be selected. Not in the last row, the final consumption’s impact, measured by the sum of quotients $c(2)$ and $c(3)$, is the “engine” of GDP evolution in the case of four countries – Czech Republic, Hungary, Poland and Romania.

As all countries analyzed share a common historical background in the last 50 years, at least from the political and economic viewpoint, the large share of the main influence factor previously outlined calls for measures that are adequate to encourage the increase of the investments, as a factor with a more sustainable impact on the future development of the national economies.

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Performance management in the context of globalization

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Abstract. *All managers focus on obtaining a progress by changing work styles, implementing new technologies, increasing the production capacity, improving the products and services. All organizations either public or private demand a strategy that clearly defines the attainable objectives, the problems most likely to appear, the necessary resources and means.*

Performance management is a new approach to evaluating personnel. It's general aim getting higher results for the organization, team and individuals. Performance management must be seen as a meeting, so that for both the manager and people he's working with is means having a open mind, a mutual wish of finding constructive solutions. Performance management always means focusing on three separate detections: performance, competence and professional future. The first two directions represents mutual commitments that are to be studied (for the past) and stipulated (for the future).

Keywords: human resources management, globalization, international organizations (corporates), cultural differences, personal policies.

JEL Classification: M12, O16.

1. Introduction

Managers' contributions are analyzed in terms of their abilities to lead the organization, to follow the directions of its development and of their capacity for negotiation. Actual requirements must be constructive and proactive; managers must anticipate the organizational needs on short and long term. Their role is to develop policies that bring solutions to problems, to forecast the evolution of the economic and social environment, both internally and externally, to influence and create the necessary attitude for organizational success among employees.

Corporations find various solutions that can go from an absolute formalism to modern solutions, adequate for the human resources management concept. The personnel policy can not develop independently from the business strategy, managers having to achieve the goals of the organization, the ones concerning employees as well, and also to be concerned about its actual or potential customers.

Managers are involved in problem solving, which makes it possible to achieve progress by changing work methods, implementing new technologies, increasing the production capacity, improving goods and services in terms of quantity and quality.

The human resources strategy will vary depending on the internal needs and the nature of the activities at the organizational level. There is a common feature of home offices, which are seen as conglomerates that decide the structure of the financial resources they allocate to their branches. Some corporations may decide to follow the same personnel policies for their subsidiaries, but have to consider that there may be some problems. Organizational strategies are dependent on the economic situation of the company, of the market or of the suppliers, and personnel plans and policies should be designed so that management decisions would lead to the growth of business volume, sales, profit and number of employees.

2. Influencing factors in human resource management

International management of human resources is the procurement, allocation and efficient use of human resources within a corporation. Thus, it requires a broader vision and is subject to greater risks than the local management of human resources. The HR manager working at the headquarters of a corporation must coordinate the payment systems of different countries. Both managers at headquarters and those from subsidiaries must face racial and ethnic problems; even within a single branch, the human resources manager could be responsible of coordinating an amalgam of employees: employees from the local population, from the home country of the organization, as well as employees from other countries.

There are risks associated with the management of human resources domestically and also internationally, where the risks can be even higher. These risks could be terrorist attacks, kidnappings, coups or violent events in countries where corporations have branches; the life of employees and their families could be jeopardized.

If managers of foreign branches do not achieve adequate results and are recalled to the home office, this failure could harm the organization. Another risk is the expropriation or

nationalization of assets of a corporation in a foreign country. If corporations' policy is antagonistic to that of the trade unions of the host country or to the attitude of major political groups, the organization may be forced to leave the country and the property and assets can be seized or put under government control.

Among the concepts used in international human resource management in an attempt to help corporations become more efficient, we have chosen: ethnocentric orientation, which involves transferring human resources practices and policies of corporations to its foreign subsidiaries. The branches are run by people from the home office that keep a tight control over the policies of subsidiaries.

Polycentric orientation implies that foreign branches are relatively independent from headquarters. HR policies are developed so as to meet local conditions. HR activities in the subsidiaries are led by local managers from the host country.

The regional orientation is visible in the regional clusters of subsidiaries. HR policies are coordinated in the region. Branches are headed by people from any of the countries belonging to the region. Coordination and communication within the region are very good, but limited between the region and corporate headquarters.

Geocentric orientation involves the adoption of HR policies that pursue the objectives of the entire network of corporations, both in the home and foreign branches. These objectives can include policies applicable to all branches or policies tailored to the specific needs of certain branches, depending on what is best for maximizing global results. The firm is conceived as an international entity, rather than as a sum of local entities or foreign branches.

Firms that adopt an ethnocentric oriented management and prefer to use personnel from the home country for senior management of subsidiaries abroad must take account of any restrictions imposed by the governmental policies and the laws of the host country. There may be regulations to limit the use of staff not belonging to the host country, in order to compel corporations to hire and train staff coming from the local population, especially for technical positions and management positions. This situation usually occurs in developing countries, where technical and managerial training is rudimentary and local government uses foreign corporations as a means of development.

The level of managerial, educational and technological development in host countries differentiate between corporations that establish their branches in Europe facing opportunities and problems different from the branches from West Africa.

In Europe, the available labor force is well educated and has a good technical and managerial experience. Therefore, the opportunity to develop a polycentric strategy focused on a region or a geocentric strategy, in the field of human resources, is better. In the countries of West Africa technical and managerial education is limited and much of the labor force is unqualified and unable to cope with the production processes or activities of modern service. In this case the company needs a highly centralized management of human resources and very careful on-site monitoring by staff from the home country of the corporations.

The technology used and the nature of the corporations' activities are necessary factors to maintain specific standards of production, of quality control and require a high degree of centralization of human resource management and staff from the home country that need to monitor the implementation of these standards. On the other hand, certain products must be tailored to local markets to be successful in the countries where the corporation operates.

International management of resources depends on the organization's life cycle and the life cycle of its products on the international market. During the initiation stage, corporations focus on activities necessary for the entry to the international market and their involvement may be limited to exports or reduced sales operations. In this phase, corporations tend towards the ethnocentric orientation. In the functional development stage, the organization's international operations become an important development factor and include the emergence of working divisions that collaborate with external partners of the firm. A polycentric orientation will be adopted. In the controlled growth stage corporations will seek to increase productivity and reduce costs. Regional orientation is now the most appropriate. During the strategic development stage, domestic and international competition requires corporations to adopt a global attitude towards its operations, by adopting a geocentric orientation.

Culture, in particular national culture of personnel from corporate headquarters, plays a decisive role in choosing staffing practices. It can affect the central leadership decisions in two ways. Firstly, some cultures are more accessible than others where management adopts an ethnocentric orientation. Japanese corporations employ Japanese staff for managerial posts in their foreign branches. This happens more often than American or European corporations that have adopted the ethnocentric orientation.

The amalgam of cultures often met in foreign branches and the cultural differences between branches will limit the direction being taken. The bigger the cultural differences between branches, the more difficult it is for human resources specialists from headquarters to formulate and implement adequate human resources policies anywhere in the international environment. Therefore, although corporations may adopt an ethnocentric orientation of human resource management, policies and practices formulated by the headquarters can be totally inappropriate and unacceptable for certain branches. In this case, the adoption of guidelines focused on polycentric or regional orientation may be more appropriate.

Culture not only influences the organization's direction towards a certain type of personnel policy, but plays an important role in human resources managers' activities at the subsidiaries level. The role of a human resources manager is to develop practices that should be acceptable and compatible with local culture and acceptable in terms of central management. Simultaneous compliance with these two conditions is a difficult task for managers coming from the local population as well as for the ones coming from a country other than that of the subsidiary. Each of these people has its own "cultural baggage" that may affect their ability to conduct business effectively.

To analyze the link between cultural differences and human resource management practices is necessary to identify the main issues ranging from culture to culture.

The main elements that differentiate cultures were underlined in 1961, by F. Kluckhohn and F.L. Strdtbeck, as follows:

Dimension	Orientation	Definition
Human nature	Positive	Without any constraint, people will act in a reasonable and responsible manner
	Negative	Nobody can be trusted
	Mixed	People have both qualities and defects, and the attitude towards them will vary accordingly
Human relationships	Individualism	People's main responsibility is towards themselves
	Collectivism	Responsibility towards the family and the group is paramount; the ability to integrate into the group is important.
	Hierarchy	Similar to the collectivist orientation, except that the hierarchy is strictly followed
Philosophy of life	To contemplate	The essence of life is to live and to understand. The action itself is not important
	To act	The essence of life lies in action, the setting and achievement of objectives
The attitude towards nature	Subjugation	Human activities are subordinated to nature
	Harmony	People must live in harmony with nature.
	Domination	People can control their destiny and can dominate nature.
Orientation in respect to time	Towards the past	History is very important.
	Towards the present	Actions focus on the present; The current situation determine the course of future actions.
	Towards the future	Actions focus on the future and the goals.

Source: Kluckhohn and Strodtbeck, 1961.

Human resource planning within corporations is essential to the achievement of its objectives. However, implementation of HR planning procedures can be difficult in some foreign branches. In societies where it is considered that human actions and decisions are determined by nature, the need for human resource planning is reduced. The human resources manager of a subsidiary must use a means of recruiting and hiring staff consistent with local labor market and in compliance with local laws regarding staffing. Some corporations offer bonuses to attract valuable employees of local companies; in some countries the hiring process may require collaboration with the public employment office. This relates to companies belonging to a hierarchical culture. Sometimes employment agencies can provide personnel that are not trained for the posts in question and often it is difficult for the subsidiary to refuse the employment of these people. Applying a selection system is complicated by the fact that some tests used in the country of origin of corporations can be subjective and inappropriate in another medium. Personality tests were designed based on samples of the population in Western countries and the personality profile (according to the test) will be completely irrelevant to the Japanese and Thai, as it is very difficult to adapt the tests entirely or to translate them into the language of the host country. Some issues, such as discrimination based on race, sex or age may cause difficulties for human resources managers at subsidiaries. Personnel actions and activities of corporate human resources departments form the subject of the operations assessment to ensure they get the best results. For this purpose they use a variety of methods to evaluate the performance of employees; subordinates and supervisors often establish together the objectives to be met by subordinates. In other corporations, employees are not involved in any decision-making; supervisor has a different status and has more authority. Most methods for assessing individual performances were elaborated and developed in the United States, a society characterized by an individualistic culture.

Culture influences also the degree to which performance measurement will be accepted. Wage policies of the branch must be in line with local market wages, the laws and regulations concerning wages (minimum wage), union requirements, any legal restrictions (prohibition of wage discrimination based on gender) and cultural preferences. Meanwhile, the branch payment system must be linked to the central corporate strategy. In addition, the human resources manager of the branch must apply a separate and appropriate payment for expatriates employees or employees of nationalities other than local. Payment systems for

expatriates are often very different from those used for local employees of the branch. In many cases, expatriates earn more money than local employees for jobs equal in importance and complexity or even higher. These differences can lead to dissatisfaction for locals employees, who can feel unequally treated. Besides the problems that typically occur in developing assessment methods, there are certain factors that influence the corporation's assessment of performance of expatriates in foreign branches: devaluation of the host country's currency, local accounting methods, elements of ethics, the strategic role the subsidiary, time and distance, changes at the international level, interdependence between headquarters and subsidiary, market maturity.

Conclusions

Human resource management is a strategic function of corporations, representing a competitive advantage in meeting business development needs, in parallel with the development needs of employees. Creating strong teams, effective and positive communication, an open environment, employees' contribution in decision-making, they all lead to long-term benefits for both sides. Engaged employees are more efficient and the feeling of organizational affiliation increases productivity.

The globalization of an increasing number of corporations is likely to reduce the importance of their property's nationality, as a factor influencing the contribution of these companies to the economic welfare of their countries of origin. From the point of view of the host countries, the situation where foreign branches contribute to a greater extent to increase the training of the local workforce and to the research - development activities or to productivity growth in that area than does a local firm is fairly common.

Fundamental change at global level requires HR managers to understand demographic fluctuations, technological development and population mobility to compensate for the shortcomings of qualified personnel, of competences and jobs decline. Are corporations sufficiently prepared now to meet future challenges?

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Financial development, trade openness and economic growth in MENA countries: TYDL panel causality approach

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Abstract. *This paper examines the causal relationship between financial development (measured as Kaopen index and Line and Milesi-Ferreti index), trade openness and economic growth for 16 MENA countries within the panel co-integration techniques, panel VAR model and TYDL (Toda, Yamamoto, Dolado and Lutkepohl) Granger causality (1996), the empirical results show that both of finance-led growth and trade-led growth hypothesis seem to be rejected for the group as a whole. The results imply that financial development and trade liberalization do not seem to have made a significant impulse on economic growth for the period 1980-2014.*

Keywords: Financial development; Trade openness; Kaopen index; Milesi-Ferreti index; TYDL Granger causality.

JEL Classification: C33, E44, F10.

1. Introduction

In the last few years the most of developing countries have counted on liberalisation policies of both financial and trade systems to increase the economic growth, where trade sectors focuses on the barriers imposed on exchange goods between countries to reduce it, the financial sectors have considered as a policy of measure trying to transform the financial system by reducing costs and the inefficiency in the production processes then increase the economic growth.

The link between financial and economic development in the last twenty years has concluded to many and mixed results, for example, from King and Levine (1993) study ; the results suggested a significantly impact of financial development on economic growth, the same result had founded by Christopoulos and Tsionas (2004) and Livine et al. (2000); a few other studies had founded a negligible impact from financial development to economic growth as Andersen and Tarp (2003), Levine (2005) and Ang (2008a), Khan and Senhadji (2003) paper had concluded that financial development affects the economic growth by a very small manner, and they supposed that the relationship between the two variables can be a non-linear relationship, However, Ang and Mackibbin (2007) study had concluded that there is a significantly impact from economic growth to financial development, Patrick (1966) declared that in the case of financial development leading to economic growth, it is named the supply-leading hypothesis, in other hand when the economic growth inducing financial development, it is named the demand-following hypothesis (Shun et al., 2013, pp. 294-301), but by returning to Robinson (1952) and Lucas (1988) we found that many economists argue that there is no relationship between financial and economic development.

Fratzscher and Bussiere (2004) from e working paper named "Financial openness and growth: short-run gain, long-run pain?" declared that economic growth immediately after liberalisation is often driven by an investment boom and a surge in portfolio and debt inflows, which then become detrimental to economic growth in the medium-run to long-run, so, such a trade-off may be created by an investment and lending boom immediately after liberalisation, which ultimately may turn into a bust and a collapse, resulting in lower growth and possibly recession and financial crises in the medium-run (Mackinnon and Pill, 1997 and 1999).

From the neoclassical growth models (Solow 1957 and others) technological change is exogenous-unaffected a country's openness to world trade, but Grossman and Helpman (1992) have declared that trade policy affects long-run growth through its impact on technological change, and they pointed out that intervention in trade could raise long-run growth if protection encourages investment in research-intensive sectors for countries with an international advantage in this kind of goods (Harrison, 1996:pp. 419-447), the link between trade openness and economic growth has long been a big concern for all the countries around the world since the General Agreement on Tariffs and Trade (GATT) was signed in 1947, the WTO (World Trade Organization) is aimed to improve the standard living people in all member countries by boosting productivity through greater competition.

The aim of this paper is to examine the links between financial openness, trade openness and economic growth for 16 MENA countries using panel data over the period 1980-2014 (Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia and Turkey).

2. Literature review

The relationship between financial openness, trade openness and economic growth has been the subject of various and many articles since Adam Smith and Ricardo traditional models explained that openness would promote specialization, in the literature, the financial openness has recognized as the most important variable that impacts the economic growth, many studies have concluded that there is a significant affect from financial development to economic growth as Goldsmith (1969), Mackinnon (1973) and Shaw (1973), Benhabib and Spiegel (2000) examine whether financial development affects economic growth solely through its contribution to growth in primitives or factor accumulation rates or whether its also a positive impact on total factor productivity growth, the results suggest that indicators of financial development are correlated with total factor productivity growth, and the results show also a sensitive to the inclusion of country fixed effect.

Al-Awad and Harb (2005), this paper investigates the linkages between financial development and economic growth in the middle east countries using methods of panel co-integration and Granger causality, the results indicate that in the long-run term financial development and economic growth may be related to some level, in the short-run term, the panel causality points to real economic growth as the force that drives changes in financial development while individual countries causality fail to give a clear evidence of the direction of causations. Hassan et al. (2007) provide new evidence on the role of financial development in accounting for economic growth, using an unbalanced panel regressions and variance decomposition to examine what proxy measures are most important in economic growth, the findings suggest that there is a strong linkages between financial development and economic growth in high income OECD countries, but no in South Asian and Sub-Saharan African regions.

Apergis et al. (2007) examine whether a long-run relationship between economic growth and financial development exists or not using panel co-integration techniques for a dynamic panel of 15 OECD countries and 50 non-OECD countries over the period 1975-2000, three different measures of financial development are used in this paper, the first one is the liquid liabilities of the financial system which is defined as currency plus demand and interest-bearing liabilities of bank and non-bank financial depth used, the second indicator is the bank credit is defined as credit by deposit money banks to the private sector divided by GDP, and the third one is the private sector credit measures as the value of credits by deposit money banks and other financial institutions to the private sector divided by GDP, the findings support the existence of a single co-integration relationship between the variables, Further, the evidence points to a bidirectional causality between financial deepening and economic growth.

Baltagi et al. (2009), this paper examines which of trade and financial openness can help explain the pace of financial development, using annual data from developing and industrialised countries utilizing a dynamic panel estimation techniques, the findings reveal that the marginal effects of trade (financial) openness are negatively related to the degree of financial (trade) openness, thus, the results provide the Rajan and Zingales hypothesis which stipulates that both types of openness are necessary for financial development to take place. Yokee-Kee and Habibullah (2011) from a panel data perspectives using the GMM techniques developed by Arrellano and Bover (1995) tried to examine the causality between financial development and economic growth in developing countries (from Africa, Asia, Europe and Western Hemisphere), the findings reveal that although there exist evidence supporting the other views including the demand-following as well as non-causal relation between the economic growth and the financial deepening, these supports are not as strong as the supply-leading hypothesis.

Hsueh et al. (2013) examine the causal relationship between financial development and economic growth among ten Asian countries surveyed during period 1980-2007, the findings suggest that the direction of causality between the two variables is sensitive to the financial development variables used, moreover, the results support the supply-leading hypothesis as many financial development variables lead economic growth in some of the ten Asian countries especially in China.

Wadad Saad (2014), the objective of this paper is to determine whether a relationship exists between financial development and economic growth in Lebanon during the period 1972-2012, the results reveal a positive relationship between the two variables in the short-run term accompanied by a bidirectional Granger causality. Rehman et al. (2015) investigate the relationship between financial development, trade openness and economic growth in the Saudi Arabia over the period 1971-2012, the results indicate that there is a long-run relationship between the three variables, and the Granger causality exhibits unidirectional causality running from the trade openness to the economic growth and from the economic growth to financial development.

3. Data and methodology

The present research work has carried out the causal relationship between financial openness, trade openness and economic growth in MENA countries, we are led to resort to panel data from 16 MENA countries over the period 1980-2014, our data are obtained from different sources:

3.1. Data

a. Financial openness: we use in this paper two different proxies from the empirical literature that suggested various indicators of financial development where we find three types of measures, the first one is the *de jure* measures based on AREAER (IMF's Annual Report on Exchange Arrangements and Exchange Restrictions) by converting qualitative informations in to a quantitative databases, most important indicator used *de jure* measures is the index developed by Chinn and Ito (2006) named henceforth

KAOPEN, and the second type is the facto measures that are the main alternative to the de jure measures, where it captures information on financial integration that is distinct from that contained in the de jure indicators, in this case researchers specifically interested in FDI (Foreign Direct Investment) flows, the third one is the hybrid indicators that are another alternative, one if the drawbacks is that information about financial globalization is only part of eGlobe (trade information accounts for 50% of the index components) (Dreher, 2006: pp. 1091-1110), however it does provide information that is distinct from others.

The Kaopen index is the first index in our paper, this index based on binary dummy variables reflecting the restrictions on external accounts, the Kaopen index components four variables (k1, k2, k3 and k4), where the k1 represents the information on the existence of multiple exchange rates, k2 and k3 are the information on the transactions in the current and capital account, and the k4 is the information of the requirement of the surrender of export proceeds, when the Kaopen index takes high values it means that the country is open to capital flows, the second measure is the ratio given by Lane and Milesi-Ferreti (2006) based on panel data of 147 countries, it is calculated as the ratio of the sum of total external liabilities and total external assets to GPD, a high level of this proxy means more capital mobility in the economy.

b. Trade Openness: measured by the sum of total exports and total imports as a percentage of GDP at 2005 constant prices.

c. GDP: measured by GDP per capita.

3.2. Econometric methodology

a. Unit root tests: we use panel root tests to examine the degree of integration between the four variables, for this reason we use five different panel unit root tests (Levin, Lin and Chu (LLC); Im, Pesaran and Shin (IPS); Maddal and Wu (MW-ADF, MW-PP); Breitung (Br) and Hadri test (HD)) by utilizing the model of constant and deterministic trend.

***LLC test:** is the most widely used test depending on ADF (Augmented Dickey Fuller) based on equation (1):

$$Y_{i,t} = \alpha_i y_{i,t-1} + \beta_{i,t} y + \mu_{i,t} \dots ; i = 1, \dots, N ; t = 1, \dots, T , \quad (1)$$

where $\beta_{i,t}$ is the deterministic component, $\mu_{i,t}$ is the stationary process.

The test assumes that residuals are independently and identically distributed with mean 0 and variance σ_u^2 and $\alpha_i = \alpha$ for each value of i .

***IPS test:** Im et al. (2003); The IPS test is an extension of the LLC test that relaxes the homogeneous assumptions by allowing for heterogeneity in the autoregressive coefficients for all panel members, the test begin by specifying a separate ADF regression for each cross section:

$$\Delta y_{i,t} = a_i + \alpha_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t}; \quad I = 1, \dots, N; \quad t = 1, \dots, T, \quad (2)$$

where $y_{i,t}$ is the stand of each variable under consideration in the model, a_i is the individual fixed effect, $\varepsilon_{i,t}$ is the random variable (i and t) which is independent and normal distributed.

The null hypothesis is: $H_0: \alpha_i = 0$, for all i .

The alternative hypothesis is: $H_1: \alpha_i \neq 0$ for $i = 1, 2, \dots, N$

and $\alpha_i < 0$, for $i = N+1, N+2, \dots, N$.

***Maddal and Wu test:** this test use the Fisher's (1932) results to drive tests that combine the p-value from individual unit root tests, we define Ω_i as the p-value from any individual unit root tests for cross section i , to get the equation (3):

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^N \Phi^{-1}(\Omega_i); N(0,1), \quad (3)$$

where Φ^{-1} is the inverse of the standard normal cumulative distribution function.

***Breitung test:** The Breitung method differs from LLC in two distinct ways. First, only the autoregressive portion is removed when constructing the standardized proxies:

$$\Delta y_{i,t} = (\Delta y_{i,t} - \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j}) / S_i \quad (4)$$

$$\Delta y_{i,t-1} = (\Delta y_{i,t-1} - \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j}) / S_i, \quad (5)$$

where S_i are the estimated standard errors from estimating each ADF.

Second, the proxies are transformed and detrended:

$$\Delta y_{i,t}^* = \sqrt{\frac{(T-1)}{(T-t+1)}} \left(\Delta y_{i,t} - \frac{\Delta y_{i,t-j} + \dots + \Delta y_{i,t}}{T-t} \right) \quad (6)$$

$$y_{i,t}^* = y_{i,t} - y_{i,1} - \frac{t-1}{T-1} (y_{i,T} - y_{i,1}) \quad (7)$$

***Hadri test:** this test is similar to the KPSS unit root (Kwiatkowski-Phillips-Schmidt-Shin) and has a null hypothesis of no unit root in any of the series in the panel, this test is based on the residuals from the individuals OLS regressions of $y_{i,t}$ on a constant, or on a constant and trend:

$$Z = \frac{\sqrt{N} (LM - \xi)}{\varphi}, \quad (8)$$

where $\xi=1/6$ and $\varphi = 1/45$ if the model only includes constant, the second case $\xi=1/15$ and $\varphi=11/6300$ otherwise.

LM statistique allows for heteroskedasticity across i (LM1 with the associated heteroskedasticity assumption, LM2 is the heteroskedasticity consistent).

Table 1. Panel unit root tests

Test	Null hypothesis	Alternative hypothesis	Deterministic Component	Method for Autocorrelation Correction
LLC	There is a unit root	There is no unit root	None, F, T	Lags
Br	There is a unit root	There is no unit root	None, F, T	Lags
IPS	There is a unit root	Some cross sections without unit root	F, T	Lags
HD	There is no unit root	There is a unit root	F, T	Kernel
MW-ADF	There is a unit root	Some cross sections without UR	None, F, T	Lags
MW-PP	There is a unit root	Some cross sections without UR	None, F, T	Kernel

Source: Eviews9 user guides II, pp. 564-565.

b. Panel Co-integration: The first one who introduce the concept of spurious or nonsense correlations was Udne in 1926, but before the 1987 all economists were using the linear regressions on the non-stationary series, but this regressions as declared by the Nobel laureate Clive Granger and Paul Newbold are dangerous and could produce spurious regressions.

We use in this paper three different types of panel co-integration, Pedroni test (Engle-Granger based), Kao test (Engle-Granger based) and Fisher test (combined Johansen).

***Pedroni co-integration test:** this test is based on an examination of the residuals of a spurious regression using variables that integrate in first differences $I(1)$ and the variables are co-integrated if and only if the residuals are stationary at their level $I(0)$, by following equation (9):

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \dots + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad (9)$$

for: $t = 1, \dots, T$; $i = 1, \dots, N$; $m = 1, \dots, M$.

Where: y and x are integrated variables of order one $I(1)$ and α_i and δ_i are individual and trend effects.

***Kao co-integration test:** the same basic approach in Pedroni test is follows by Kao test but with specifies cross sections specific intercepts and homogeneous coefficients on the first stage regressors, Kao (1999) had used a bivariate model as follows:

$$y_{i,t} = \alpha_i + \beta_i x_{i,t} + e_{i,t}$$

$$y_{i,t} = y_{i,t-1} + \mu_{i,t} \quad (10)$$

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t}$$

for: $t = 1, \dots, T$; $i = 1, \dots, N$.

***Fisher co-integration test:** this test developed by Maddala and Wu (1999) is based on Fisher (1932) test that uses the results of the individual independent tests by combining the tests from each individual cross sections to get a test statistique for the full model, if Ω_i is the p-value from and individual co-integration test for cross section i , the null hypothesis for the full panel is:

$$-2 \sum_{i=1}^N \log(\Omega_i) \longrightarrow \chi^2_{2N} \quad (11)$$

χ^2 is based on Mackinnon-Haug-Michelis (1999) p-value for Johansen co-integration trace and maximum eigenvalue tests.

c. Toda-Yamamoto Granger causality (1995): The most common way to test the direction of causality is Granger (1969), Sims (1972) and Gwekes (1983), Granger causality is conventionally conducted by estimating VAR models, but this model suffers of the non stationarity problem, and the problem here is how to confirm the co-integrating relationship and how to estimate the VAR model when the system is integrated, the drawback of Granger causality (1969) test is the specification bias and spurious regression, in 1987 Engel and Granger declared that if X and Y two non-stationary and co-integrated variables the standard Granger causality is invalid procedure.

Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) developed a new procedure of Granger causality based on an augmented VAR modeling by introducing a modified Wald tests (MWald) statistique, and it can be applied with all the integration series types I(0), I(1) and I(2) for both non co-integrated or co-integrated variables, the TYDL (Toda, Yamamoto, Dolado and Lutkepohl) procedure composes from four steps, the first step is to find the maximum order of integration between the variables $d_{\max}$ where is the higher order of integration, the second step is to determine the optimal lag order (K) of VAR model in levels as usually choosed by Akaike information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quin information criterion (HQ), the final prediction error (FPE) and the sequential modified LR test statistique (LR), the third step is to estimate the VAR model (VAR(K+d_{max})) as follows:

$$\begin{aligned} KO_{it} &= \alpha_{1it} + \sum_{i=1}^{h+d} \beta_{1it} KP_{it-i} + \sum_{j=1}^{l+d} \gamma_{1it} FO_{it-j} + \sum_{k=1}^{c+d} \Delta_{1it} TO_{it-k} + \sum_{W=1}^{v+d} \xi_{1it} GDP_{it-W} + \varepsilon_{1it} \\ FO_{it} &= \alpha_{2it} + \sum_{j=1}^{l+d} \gamma_{2it} FO_{it-j} + \sum_{i=1}^{h+d} \beta_{2it} KP_{it-i} + \sum_{k=1}^{c+d} \Delta_{2it} TO_{it-k} + \sum_{W=1}^{v+d} \xi_{2it} GDP_{it-W} + \varepsilon_{2it} \\ TO_{it} &= \alpha_{3it} + \sum_{k=1}^{c+d} \Delta_{3it} TO_{it-k} + \sum_{i=1}^{h+d} \beta_{3it} KP_{it-i} + \sum_{j=1}^{l+d} \gamma_{3it} FO_{it-j} + \sum_{W=1}^{v+d} \xi_{3it} GDP_{it-W} + \varepsilon_{3it} \\ GDP_{it} &= \alpha_{4it} + \sum_{W=1}^{v+d} \xi_{4it} GDP_{it-W} + \sum_{k=1}^{c+d} \Delta_{4it} TO_{it-k} + \sum_{i=1}^{h+d} \beta_{4it} KP_{it-i} + \sum_{j=1}^{l+d} \gamma_{4it} FO_{it-j} + \varepsilon_{4it} \end{aligned}$$

Where d is the maximal order of integration order of the variables in the system, h, l, c and v are the optimal lag length of KP_{it} , FO_{it} , TO_{it} and GDP_{it} , ε_{1it} , ε_{2it} , ε_{3it} and ε_{4it} are error terms and are assumed to be white noise with zero mean constant variance and no autocorrelation.

KO: is the Kaopen index for the financial openness.

FO: is the Lane and Milesi-Ferreti index for the financial openness.

TO: is the trade openness index.

GDP: is the GDP per capita.

Finally, the TYDL procedure uses the MWald test statistique to test the causal relationships between the variables.

4. Empirical results

4.1. Unit root tests

To investigate the stationarity of the series used, we use the unit root tests on panel data (Levin, Lin and Chin (LLC); Breitung t-test (BRE); Im, Pesaran and Chin W-test (IPS); MW-ADF Fisher; MW-PP Fisher and Hadri test), the results of the tests are presented in Table 2:

Table 2. Unit root test

variables	Null: Unit root (assumes common unit root process)		Null: Unit root (assumes individual unit root process)			HADRI Z-test
	LLC	BRE	IPS	MW-ADF	MW-PP	
KO	-0.489 (0.312)	-1.158 (0.123)	-0.281 (0.389)	31.531 (0.294)	45.459 (0.019)	4.892 (0.000)
FO	0.174 (0.430)	-1.106 (0.134)	-1.131 (0.128)	40.532 (0.143)	42.289 (0.105)	9.558 (0.000)
TO	1.150 (0.875)	2.063 (0.980)	-0.737 (0.230)	43.228 (0.088)	48.333 (0.320)	5.751 (0.000)
GDP	2.153 (0.984)	6.929 (1.000)	2.694 (0.996)	16.634 (0.988)	9.300 (1.000)	8.450 (0.000)
D(KO)	-4.908 (0.000)	-6.364 (0.000)	-6.702 (0.000)	98.402 (0.000)	708.72 (0.000)	5.553 (0.000)
D(FO)	-7.785 (0.000)	-4.805 (0.000)	-8.904 (0.000)	134.229 (0.000)	288.196 (0.000)	-2.555 (0.994)
D(TO)	-3.600 (0.000)	0.735 (0.768)	-6.781 (0.000)	118.024 (0.000)	218.012 (0.000)	4.701 (0.000)
D(GDP)	3.780 (0.999)	6.485 (1.000)	-3.845 (0.000)	84.220 (0.000)	165.193 (0.000)	6.004 (0.000)

Source: Author computation using Eviews9.

It can be inferred from the Table 2 that the unit root hypothesis cannot be rejected when the variables are taken in levels. However, when the first differences are used, the hypothesis of unit root non-stationary is rejected. These results enable to test the cointegration among variables in I(1) level.

4.2. Co-integration test

The drawback of the previously mentioned (Johansen 1991, Engle and Granger 1987) co-integration tests is their failure to consider information across countries, recently developed techniques allow us to deal with non-stationary data in a heterogeneous panel, which yield substantial benefits by exploiting data from a cross-section, we are able to examine the cointegration between the four variables by using Pedroni, Kao and fisher tests.

Table 3. Panel cointegration tests

Pedroni co-integration test				
Alternative hypothesis: common AR coeffs. (within-dimension)				
	Statistic	Prob.	W.Statistic	Prob.
Panel v-Statistic	1.049466	0.1470	-1.201395	0.8852
Panel rho-Statistic	1.669918	0.9525	0.992695	0.8396
Panel PP-Statistic	2.045159	0.9796	-2.528337	0.0057
Panel ADF-Statistic	4.177478	1.0000	-2.159184	0.0154**
Alternative hypothesis: individual AR coeffs. (between-dimension)				
Group rho-Statistic	1.865636	0.9690		

Pedroni co-integration test				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	W.Statistic	Prob.
Group PP-Statistic	-2.395516	0.0083**		
Group ADF-Statistic	-7.501756	0.0000**		
Kao co-integration test				
ADF	-2.074	0.0190**		
Fisher co-integration test				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(trace test)	Prob.	(max-eigen test)	Prob.
None	129.8	0.0000**	116.5	0.0000**
At most 1	48.43	0.0096	49.47	0.0074**
At most 2	18.13	0.9228	19.21	0.8916
At most 3	19.56	0.8799	19.56	0.8799

Source: Authors computation using Eviews9.

From Table 3, the results inspired is that there is a conflict between the three tests, the Pedroni test shows that there is no co-integration between the variables (8 statistiques from 11), but the Kao test shows that there is a long-run relationship among the variables where the ADF statistique is -2.07 (Prob = 0.019 < 0.05), by passing to Fisher test we emphasize the Kao results, so, we conclude that there is a long-run relationship between the four variables in our study, Subsequently, we cannot apply the standard Granger causality (1969) and we must apply the TYDL Granger causality approach to avoid the spurious regression.

In the case of individual cross section results, we find that there is a co-integration relationship in 6 cross sections (Algeria, Iran, Lebanon, Syria, Morocco and Sudan), noting that in the case of Lebanon and Sudan the results show two vectors of co-integration.

Table 4. Panel cointegration tests (individual cross section)

Individual cross section results				
Cross Section	Trace Test Statistics	Prob.	Max-Eign Test Statistics	Prob.
Hypothesis of no cointegration				
Bahrain	36.2945	0.3817	20.3802	0.3154
Iran	50.5267	0.0274	29.3763	0.0291
Jordan	41.6386	0.1691	23.5074	0.1529
Kuwait	25.7984	0.8957	16.7591	0.6007
Lebanon	91.9038	0.0000	57.9448	0.0000
Qatar	40.7292	0.1974	27.2995	0.0543
Saudi Arabia	29.3168	0.8820	18.3256	0.6120
Syria	50.0906	0.0304	24.6047	0.1150
Egypt	50.3658	0.3265	27.3654	0.2012
Algeria	52.5287	0.0171	28.3024	0.0404
Mauritania	41.9156	0.1611	23.5846	0.1499
Morocco	44.1455	0.1070	27.8111	0.0468
Sudan	156.5376	0.0000	112.9975	0.0000
Tunisia	42.9543	0.1337	19.5465	0.3734
Tunisia	NA	0.5000	NA	0.5000
Turkey	46.5094	0.0665	24.8277	0.1083
Hypothesis of at most 1 cointegration relationship				
Bahrain	15.9142	0.7183	8.8020	0.8481
Iran	21.1505	0.3483	12.6445	0.4855
Jordan	18.1312	0.5564	16.1015	0.2190
Kuwait	9.0393	0.9911	8.1255	0.8958

Individual cross section results				
Cross Section	Trace Test Statistics	Prob.	Max-Eign Test Statistics	Prob.
Lebanon	33.9590	0.0157	24.7829	0.0146
Qatar	13.4297	0.8710	9.9616	0.7483
Saudi Arabia	22.5658	0.7982	19.2658	0.2200
Syria	25.4859	0.1448	17.5518	0.1475
Egypt	22.3255	0.1223	16.3259	0.2652
Algeria	24.2264	0.1910	17.1775	0.1638
Mauritania	18.3311	0.5417	12.3572	0.5128
Morocco	16.3344	0.6886	11.8120	0.5663
Sudan	43.5402	0.0007	34.7540	0.0004
Tunisia	23.4078	0.2266	15.6364	0.2468
Tunisia	31.7259	0.0296	16.7755	0.1828
Turkey	21.6817	0.3166	16.8059	0.1813

Source: Authors computation using Eviews9.

5. Toda Yamamoto Granger causality (TYDL)

The second step in testing for causality (after the determine of higher order of integration $d_{\max}$) is to investigate the optimum lag length (K) chosen by AIC, LR, FPE, SC and HQ, where we must be caution when we select the lag length, because if the chosen lag length is less than true lag, the omission of relevant lags can cause bias, and if it is more than true lag, cause the estimate to be inefficient (Caporal and Pittis, 1999), Table 5 shows that the optimum lag length is 1 ($k=1$) out of maximum of 6 lags length as selected by AIC, FPE, SC and HQ.

Table 5. Lag length selection

Lag	LR	FPE	AIC	SC	HQ
0	NA	1.32e+09	32.35182	32.40388	32.37270
1	2917.586	35132.94*	21.81839*	22.07869*	21.92281*
2	27.16076*	35634.47	21.83249	22.30103	22.02044
3	23.48059	36595.17	21.85891	22.53569	22.13040
4	22.74465	37642.53	21.88679	22.77182	22.24182
5	23.45207	38569.69	21.91059	23.00386	22.34915
6	8.719528	41830.26	21.99096	23.29247	22.51305

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

Source: Authors computation using Eviews9.

To verify the direction of causality between financial openness (Kaopen and Line and Milesi-Ferreti proxies), trade openness and economic growth using Toda Yamamoto (TYDL) causality test based on methodology estimated thought MWALD test, first we must estimate VAR(2) with $d_{\max}=1$ and $K=1$, by estimating the following system equations:

$$= \begin{bmatrix} \alpha 1it \\ \alpha 2it \\ \alpha 3it \\ \alpha 3it \end{bmatrix} + \sum_{i=1}^2 \begin{bmatrix} KOit - i \\ FOit - i \\ TOit - i \\ GDPit - i \end{bmatrix} \begin{bmatrix} \beta 1it & \gamma 1it & \Delta 1it & \xi 1it \\ \beta 2it & \gamma 2it & \Delta 2it & \xi 2it \\ \beta 3it & \gamma 3it & \Delta 3it & \xi 3it \\ \beta 4it & \gamma 4it & \Delta 4it & \xi 4it \end{bmatrix} + \begin{bmatrix} \varepsilon 1it \\ \varepsilon 2it \\ \varepsilon 3it \\ \varepsilon 4it \end{bmatrix} \begin{bmatrix} KOit \\ FOit \\ TOit \\ GDPit \end{bmatrix}$$

It's clear from Table 6 that there is no evidence for any causal relationship between all variables in any way, so we conclude that the variables are independent and both of financial openness and trade openness are useless and does not benefit the economic growth in MENA countries, these findings are approval the results of Robinson (1952) and Lucas (1988) and may other studies that suggest no relationship between financial development and economic growth, so both of supply-leading and demand-following hypothesis are rejected in MENA countries for the period 1980-2014 using both Kaopen index and Lane and Milesi-Ferreti index for measuring financial development.

Table 6. TYDL Granger causality results

Dependent variable: FO			
Excluded	Chi-sq	df	Prob.
GDP	0.063221	2	0.9689
KO	5.946246	2	0.0511
TO	5.233098	2	0.0731
All	8.205822	6	0.2234
Dependent variable: GDP			
Excluded	Chi-sq	df	Prob.
FIO	0.470725	2	0.7903
KO	2.118952	2	0.3466
TO	1.015777	2	0.6018
All	2.456943	6	0.8733
Dependent variable: KO			
Excluded	Chi-sq	df	Prob.
FIO	2.479198	2	0.2895
GDP	0.067295	2	0.9669
TO	4.823687	2	0.0896
All	5.871297	6	0.4378
Dependent variable: TO			
Excluded	Chi-sq	df	Prob.
FIO	1.661785	2	0.4357
GDP	1.494284	2	0.4737
KO	1.879131	2	0.3908
All	5.054144	6	0.5369

Source: Authors computation using Eviews9.

6. Conclusion

This paper examined the causal relationship between financial development measured by Kaopen index and Lane and Milesi-Ferreti index, trade openness measured by the sum of total exports and total imports as a percentage of GDP at 2005 constant prices and economic growth measured by GDP per capita for 16 MENA countries during the period 1980-2014 within a bivariate panel VAR model, TYDL Granger causality and the panel co-integration techniques, the empirical results indicate that out of 16 countries studied we find six co-integration relationships between the variables (Algeria, Iran, Lebanon, Syria, Morocco and Sudan), as for the full panel there is one vector of long-run

relationship between the variables. In addition, the results showed that both of supply-leading and demand-following hypothesis are rejected, so the hypothesis of finance-led growth and trade-led growth seem to be rejected for the MENA countries studied during the period 1980-2014, so despite all the liberalization efforts in international trade and financial development still very limited to impulse the economic growth in MENA countries as a group.

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Appendix

Table 7. Descriptive statistics

	FO	GDP	KO	TO
Mean	2.914132	7589.824	0.206451	0.533166
Median	1.412109	2790.240	-0.126347	0.531764
Maximum	34.15155	93352.02	2.389193	2.467072
Minimum	0.157283	256.5929	-1.894798	-0.001600
Std. Dev.	4.786887	12307.92	1.707981	0.423690
Skewness	3.705072	3.819108	0.192916	0.352434
Kurtosis	17.43311	21.43789	1.340129	2.808767
Jarque-Bera	5615.463	9028.092	67.63985	11.22382
Probability	0.000000	0.000000	0.000000	0.003654
Sum	1492.036	4128864.	115.4060	269.2488
Sum Sq. Dev.	11709.20	8.23E+10	1627.796	90.47472

The vulnerabilities of the gas supply system of the Republic of Moldova in the context of its energetic security

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Abstract. *In the context of the current “volatile” equation of energy resources at the world, regional and local level, impacted by the decline of the “sovereign oil era” and by the shifting of the weight center on the use of gas, renewable resources and increased efficiency – considered a new type of energy resource, the topic of energy security gains enhanced weight in the governments’ working agenda, in particular for the states currently in a situation of major dependency on the energy resources of other countries, as is the case of the Republic of Moldova, almost completely energetically dependent on the import of natural gases from Russia.*

The paper at hand aims to emphasize the energy security vulnerabilities of the Republic of Moldova, state which, following the signing of the EU Association Agreement and the entering into effect of this document in 2016 should become, as the EU member-states, energy security supplier for the EU.

The methodology used is preponderantly qualitative and based on the analysis of official documents, key information, case studies, the analysis performed in this paper providing important information for the policy makers’ agenda for planning and management purposes and for energy sector in the Republic of Moldova, in considering its foreign policy-specific national interests.

Keywords: EU, energetic mix restructuring, global energy scenarios, energetic dependency, energy policy instruments.

JEL Classification: O3.

1. Introduction

From the perspective of the evolution of the natural gas market, both at the European level and within the R. Moldova, the first years of the 21st century started sinuous, due to the geopolitical tensions, the energy security option of the EU member states and of the R. Moldova experiencing turning-point moments, if we refer, in the least, to the three incidents between Russia and Ukraine in years 2006, 2009 and 2014.

The crises in Ukraine started a real confrontation of the Russian-European relations, leading to the deepening of the global systemic crisis at the end of year 2014 and the damage to the support pillars of the old system: *international currency, financial markets, western alliances, the USA, world governance, democracy* etc. (GEAP no. 9, 2015).

At present, the national and regional gas system presents an apparent relaxation after surpassing the critical situations created as a result of the sudden changes of natural gas supply and demand, and here we refer to the scarcity or the demand shocks in this energy sector.

The globalization of the gas trade and of the diversification of the gas supply sources induce apparent benefits and world stability of gas supply security for consumers, since the real cause of the expansion and intensification of this energy resource is the widening of the geographic area of the repercussions of the shocks between demand and supply, which, in the past, used to be limited to single regions (IEA, 2016a).

Therefore, the analysts conclude than an analysis of the gas security in a region, for instance, in the Republic of Moldova, taking into account the impact of a single variable, namely gas as independent fuel in an individual region, such as Russia, is a wrong approach (Ibidem).

The consequences of R. Moldova's gas dependency in matters of national security must be analyzed in a wider context, that of the world energy system. In the period 1970-2015, the system was molded by four groups of key-factors: *the population and the growth of the labour force; the new technologies and productivity; the environmental priorities; international governance and geopolitical relations* (World Energy Council, 2016: p. 15). In the period 2014-2060, there is a series of uncertainties which will influence the future energy world: *pace of innovation and productivity; priority given to sustainability and climate changes; selected action instruments – balance between the use of markets and of state policy; evolution of international governance and geopolitical change* (Idem: p. 23).

At the end of this new road called by the specialists *The Great Transition*, the socioeconomic and political context will be characterized by a *low population and labour force, a series of new strong technologies, a greater appreciation of the planet's environmental limits*, as well as by a *change of the economic and geopolitical power towards Asia* (Idem: p. 20).

The paper at hand with holds for analysis one of the key-factors incident to the evolution of the global energy system in the two periods mentioned before, 1970-2015,

respectively, 2014-2060, namely, the *influence of the evolution of international governance and geopolitical changes* on the consequences of R. Moldova's gas dependency in matter of energy security.

2. The crepuscule of the black gold era and the transition to gas and renewable energies

A decisive factor contributing to the development of the gas energy market and to the increase of this resource's proportion in the energy mix (GEAP no. 9, 2015) is the change of paradigm regarding the *supremacy* of oil. We are facing a strong decline of the "era of sovereign oil", due to the depletion of oil, actually anticipated by several states which were able to rapidly adopt alternative energy strategies, such as the shale gas or renewable energies ⁽¹⁾, which led to the emergence of new forms of power in the sphere of international relations, a new governance, because we are witnessing a systemic change (GEAP no. 9, 2015).

The evolutionary picture of oil demand and supply, of extractions, stocks, as well as price, often confirm the Gaussian curve of Hubbert's theory⁽²⁾ that of a limited productivity of the oil deposits, directly proportionally dependent on the necessary energy quantity and not on its economic cost.

Reaching the geological limits of this energy resource significantly depends on the changes of population's life-style impacting the global oil demand, on the governmental policies, on the introduction of the new technologies, on the oil price etc. For example, the discovery of new technologies, which did not exist in Hubbert's time, allowed the US to reach today record-productions of oil and gas, currently unbalancing the demand and supply market.

From the perspective of the oil consumption at the world level, year 2005 represented the inflexion point: the oil demand of the Old World (Japan, the United States and Europe) was exceeded by that of the New World (the rest of the world), an increase largely justified by the high oil demand in China.

The decade which followed deepened this gap, with 29.1% in year 2011 and with 36% in year 2012, year when the oil demand in Western Europe was lowest and reached the lowest level since the end of year 1994 (Badkar, 2012).

In what concerns the evolution of the oil price in the long run, in the period 1970-2011, it registered three peaks: the first, at the beginning of the 20th century, due to the incipient stage of demand; the second, in 1973, brought about by the OPEC ⁽³⁾ embargo (First Oil Shock); and the third, recently (2008), as a result of the somber forecast regarding the short- and medium-term depletion of oil.

Starting with year 2014 and until the present, we are in a period of deflation of oil, triggered as a consequence of the *revolution of the hydraulic fracturing of oil clays in the US, of the re-commencing of production in Libya and of the OPEC "gambit"* ⁽⁴⁾ of 27 November 2014 (Crânganu, 2015a).

The fundamental axioms of demand and supply (Angelescu et al., 2003: p. 104) help explain the sudden decrease of price. Thus, at present, the fierce competition for the market share between the American and the OPEC producers, doubled by a decreasing oil demand world-wide, led to a steep drop of oil price to the critical levels of year 2005.

Among the causes invoked by the theoreticians and practitioners for this phenomenon are (Saefong, 2016) *the tensions between Iran and Saudi Arabia, the slowing-down of the growth rate of China's economy and the decrease of the global stock exchange markets, the increase of oil stocks in the US*, as a result of the significant increase of the oil production at the international level.

To this list, we can add the cold war of the cheap oil started by the two historically allied states, the US and Saudi Arabia, which are thus trying to submit Russia and Iran to their geostrategic interests, the first for the open war against Ukraine, and the second for its nuclear program, which would have allegedly terrorist purposes. In this way, Russia and Iran could reconsider their aggressive foreign policies from the last years, which may lead to the removal of the dollar as the main exchange currency, leaving room for the Euro⁽⁵⁾. Still, Russia's oil production reached, in 2014, a post-Soviet record level, suggesting that this country's main source of income was not affected by the American and European sanctions or by the crashing of the oil price.

A substitution of the dollar with another currency would have important repercussions, both on the economies of the states closely connected to the American economy, and on the dollar. An extreme scenario consists in the fact that this decision could be used to counter-balance the American hegemony by certain states or world organizations (such as OPEC) or by one or two major creditors which would ask for the return of their debts in euro⁽⁶⁾.

Not least, some analysts consider that the current policy of Saudi Arabia to flood the market with low-price oil also derives from a possible overthrow of political regime in this state⁽⁷⁾, and the expropriated oil reserves which, in short, make more attractive an accelerated production of oil, and its rapid sale, by using small prices, than a balanced production and the maintaining of oil stocks which, at a later date, may no longer belong to them, due to expropriation.

Since the current mixture of economic forces, unequal as intensity, maintained by the variation of the oil demand and supply, generates global economic unbalances, measures were initiated, from the OPEC and non-OPEC oil producers, to stabilize the oil market, agreeing, through an agreement concluded in year 2016, the adjustment of prices, by diminishing production (Petrini, 2016).

Of course, a new peak of the oil Price depends on the *observance of this agreement, on the increase of the US oil production and on the preservation of the dollar's supremacy as the international currency*.

However, recently, the adjustment of the oil supply appreciated as possible solution to the price-demand-supply equation is affected by the United States' transformation into a *swing producer*⁽⁸⁾ through its revolutionary development of the shale gas, today the US having no more storage space for the surplus of hydrocarbons (Crânganu, 2015b).

Therefore, we are facing the world governance system of the oil market – OPEC quite “damaged” (GEAP no. 9, 2015) and the United States – OPEC couple, which inversed their role in year 2015. However, in the future, the emerging economies (China, India etc.) will positively and considerably influence the demand of this resource, at the world level, at the opposite point of the impact degree being the oil demand of the European countries, which will decrease and will have an insignificant impact.

3. World energy scenarios and their influence on the gas demand of R. Moldova

The constraints on the world energy balance (and for which, currently, its oil and gas component represents the greatest challenge) non-exhaustively presented in the previous section, as well as the inefficiency of the incident governmental policies of the main actors with influence on it, induce an increased degree of uncertainty in the energy security decisions of the states highly-dependent on other states for their energy.

The energy-dependent states choose short-term solutions taken from the experience of other countries, most time without the foreseen long-term impact and without being able to closely follow their own geostrategic interests.

A relevant example in this sense is the R. Moldova, a state whose energy security is greatly influenced by the situation of total dependency on the import of natural gas from Russia. In addition, the market of the R. Moldova for natural gas and electricity is currently dominated by Gazprom⁽⁹⁾, and its current energy situation depends on the supply with natural gas and electricity from or through the Transnistria region, which implies a complex set of corporative relations, in which are included the interests of the Republic of Moldova, of the Transnistria region and of the Russian Federation (Emerson and Cenușă, 2016: pp. 133-136).

R. Moldova is making significant efforts to modernize its energy system, still inefficient and dependent on the imports of natural gas and electricity. In year 2016, the *Association Agreement* (AA) between the R. Moldova, on the one hand, and the EU, the European Atomic Energy Community and their member states, on the other hand, entered into effect, including in the AA the energy clauses from the *Partnership and cooperation agreement concluded with the European Communities and their member states*.

By means of this approach, the R. Moldova undertook the continuation of its efforts regarding the establishment of a common energy market with the EU⁽¹⁰⁾ and, implicitly, the implementation of a regulatory and institutional framework aligned to the common EU energy policy, where the regulatory core is *Energy Package III*, which presupposes a liberalization of the electricity and natural gas market (Marcotilo, 2015: pp. 3-4).

Despite the fact that the Association Agreement is a step considered by the specialists as a unique opportunity to solve the existing problems within the energy system of the R. Moldova, the Transnistria authorities strongly oppose the enforcement of AA, which will prevent a convergence of economies on the two sides of the Nistru.

The clauses vary from the insufficient understanding of the Agreement to the strong economic and political dependency on Russia, due to the five key-particularities of the regional economy: *major dependency on the imports from Russia; high current account deficit financed, directly and indirectly, by Russia; the regional economy depends more on the internal demand, preponderantly supplied by Russia; the budget of the region is strongly exposed to the liberalization of foreign trade; the region is close to depleting its foreign currency reserves, the “Transnistria ruble” being strongly supported by Russia* (Lupușor, 2015: p. 5).

Recently (February 2017), the authorities in Transnistria restated their desire to belong to the Russian Federation, declaring that they do not want to pay Transnistria’s gas debt to the Russians, in value of 5.8 billion dollars, because they consider themselves part of the “Russian world” and Russia’s vision on the energy model should be derived from this perspective⁽¹¹⁾.

The implementation deficiencies of *Energy Package III* are major and must be decisively corrected; in the contrary case, the R. Moldova will not align to the standards of the European Energy Community: *lack of transparency of biddings, possibility of offshore companies to take part in the tenders, lack of independence of the regulatory authority in matters of energy – the National Agency for Regulation in the Energy field, possibility of ANRE members to hold stock within the companies ANRE regulates (lack of sanction for the conflict of interests) etc.*

Taking into account the current geopolitical conditions, the balance of the world energy, as well as the constraints imposed by Russia on the economy of Moldova, the question arises naturally: *what will be the evolution of the energy market in R. Moldova in the context of the Great Transitions 2014-2060?*

The emergence of *innovative analysis techniques*, possible to apply to the study of public problems, as is the case of *simulation*, allows a significant progressive leap for the analysis of public policies, in general, and in particular for the analysis of the energy policy, simultaneously satisfying the need of the decisional factors to analyze these problems from a *multidimensional and systemic perspective*.

Looking towards year 2060, the World Energy Council presented in 2016 three world energy scenarios, simulated in critical uncertainty conditions, which were developed with partners Accenture Strategy and the Paul Scherer Institute. The exploratory (evolution) scenarios strengthen the ability of the politico-administrative decision-makers to define balanced policies, with consolidated legitimacy.

The scenarios were metaphorically named *Modern Jazz*, *Unfinished Symphony* and *Hard Rock* and were quantified using the Global Multi-Regional MARKAL Model (GMM)⁽¹²⁾. Each scenario describes the development of a possible future energy system at the global and regional level.

The GMM model contains 15 world regions. Major countries are modelled as separate regions: Brazil, China, the European Union⁽¹³⁾, India, Russia, and the USA. Aggregated regions include: Eastern Europe⁽¹⁴⁾ and Russia; South and Central Asia (excluding India); the developed far East (Japan, Korea and Taiwan); Australia together with New Zealand; other Latin America together with the Caribbean (excluding Brazil and Mexico); the Middle East together with North Africa; Canada together with Mexico; and Southeast Asia and the Pacific. For each region, scenario assumptions influence the dynamics of demand and supply technologies (cost, efficiencies, availability).

Two scenarios are successful, each with a different set of dominant tools, one that uses predominantly state directives (*Modern Jazz*) and the other predominantly markets (*Unfinished Symphony*). The type and application of technologies are the main differentiators across the scenarios: technologies that maximize comfort and benefits for individuals are contrasted with large-scale applications for the use and provision of public goods (World Energy Council, 2016: p. 29).

The third scenario, *Hard Rock*, explores the lowlands of weaker and unsustainable economic growth and investment driven by inward-looking policies. There is a patchwork of policies and new technologies that are predominantly the result of coping strategies from various groups and stakeholders (Ibidem).

The three scenarios use differentiated policy mechanisms and economic growth trajectories and reveal the following key features (Idem: p. 33. See more: pp. 30-31):

1. Modern Jazz (The outcome in 2060 is a world with a diverse set of resilient and lower-carbon energy systems): open economies; digital boost; consumer driven technology adoption; technology support; complex globalization; shifting hubs; growing global connections; free markets; enabling policies; new business models.
2. Unfinished Symphony (By 2060, the world has shifted to a resilient, integrated, global low-carbon energy system): intelligent growth; circular economies; local support; global mandates; unified action; strong global cooperation; regional integration; climate focused policy; global policy convergence.
3. Hard Rock (The outcome in 2060 is a fractured world, with a diverse set of economic, energy and sustainability outcomes): domestic growth and expertise; local content emphasis; lower GDP growth; energy security drives renewables; fragmented political and economic systems; power balancing alliances; security focused policy action.

In considering the results of these simulations, we aim to identify the vulnerabilities of R. Moldova's gas supply in the context of its energy security, taking into account the TPES evolution, as well as the evolution of gas in the structure of the energy mix at the world level, for the period 2014-2060, in all three scenarios, and as interest-areas withheld for

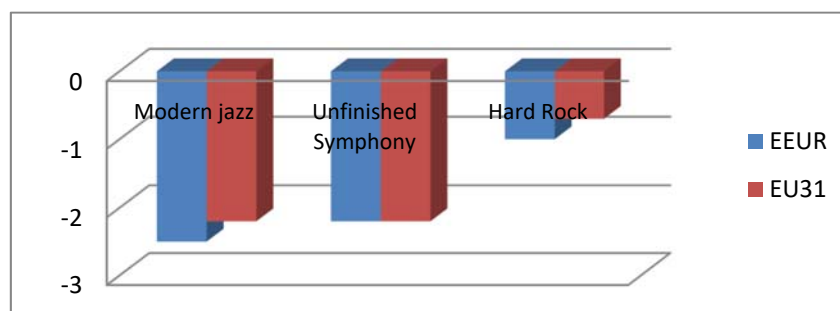
analyses there are: the aggregated area Eastern Europe (since Moldova is included by the GMM model in this region), Russia (due to Moldova's energy dependency on this state) and EU31 (due to the need to align Moldova to the EU energy policies, as a consequence of signing the Association Agreement, entered into effect in 2016).

Between 1971 and 2014, the world total primary energy supply (TPES) was multiplied by almost 2.5 times, increasing from 5523 MTOE to 13700 MTOE, and the proportion of natural gas in the energy mix increased from 16% to 21% (IEA, 2016b: p. 4). For the period 2014-2060, each of the three scenarios anticipates increases of TPES, but also of the proportion of natural gas, as follows:

- The Modern Jazz scenario anticipates an increase of the Primary energy demand with 25%, reaching in 2060 the value of 17013MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 29% (World Energy Council, 2016: pp. 48-50).
- The Unfinished Symphony scenario anticipates an increase of the Primary energy demand with only 10%, which will reach in 2060 the value of 15085 MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 24% (Idem: pp. 67-68).
- The Hard Rock scenario anticipates an increase of the Primary energy demand with 34%, reaching in 2060 the value of 18272 MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 24% (Idem: pp. 85-86).

In the three scenarios, TPES per capita peaks before 2030 and the primary energy intensity of GDP⁽¹⁵⁾ experienced different annual percentage reductions in all 15 regions (World Energy Council, 2016: p. 91), and in the EU31, respectively EEUR (Eastern Europe and Russia) regions, the anticipated values are reflected in the figure below.

Figure 1. Primary Energy Intensity % p.a. (2014-2060)



Source: Own elaboration after World Energy Council, 2016: pp. 48, 68, 86.

In what concerns the evolution of gas in the structure of the energy mix, in the two scenarios, Modern Jazz, respectively Unfinished Symphony, gas will keep its second position, after oil, until year 2030 and the natural gas assumes a much larger role in Modern Jazz (World Energy Council, 2016: p. 94). In the third scenario, Hard Rock, energy security will determine the change of the weight center from the natural to the unconventional gas (Idem: p. 95).

The Modern Jazz scenario emphasizes a weakening of OPEC's and Russia's influence on the natural gas market, due to the increase of the export of Australian and US LNG, phenomenon which increases the flexibility of the energy sector and, implicitly, determines the emergence of "windows of opportunity" for the increase of the natural gas demand, almost half of this demand being assigned to Asia by year 2030, and in the period 2030-2060, 50% of the increase of natural gas consumption at the world level will be assigned to China and India. Thus, gas becomes the "star" energy resource, cheaper and "cleaner" (including in what concerns transport). In Europe (EU31, Eastern Europe including Russia) until 2030, an increase of approximately 14% occurs in the gas demand, compared to the level of 2014, followed by a decrease of 5% until year 2060 (compared to year 2030), when it will reach the value of approximately 894 MTOE.

Even though the modernization continues with respect to the manners of exploiting the unconventional resources of natural gas will lead to an increase in its production (a maximum around year 2040), subsequently, unconventional gas production declines rapidly, settling at 323 MTOE in 2060 (Idem: p. 50).

The Unfinished Symphony scenario reflects a slow evolution of natural gas due to a moderate economic growth, as well as to a strict regulatory framework regarding gas emissions. Until year 2030, in Europe (EU31, Eastern Europe including Russia) an increase of approximately 12.40% will be recorded in the gas demand, compared to the level of 2014, followed by a decrease of approximately 22% until year 2060 (compared to year 2030), when it will reach the value of approximately 720 MTOE. This decline is compensated on the Asian continent, where China and India register together almost 41% of the increase of gas consumption in the period 2030-2060, due to replacing certain primary energy resources with natural gas in certain sectors of activity at the level of these two states (World Energy Council, 2016: p. 64).

The third scenario, Hard Rock, is characterized also by a moderate increase of natural gas as in the case of the Unfinished Symphony scenario, due to a weak economic growth and a diminishing of the trade exchanges, which will reflect in Russia's effort to stimulate supplies and in China's and NAM's effort to ensure their domestic demand until 2060, through investment in research and development, which will, however, bring about an increase in the as price. In the first stage, 2014-2030, natural gas growth in TPES is led by NAM and Europe (EU31, Eastern Europe including Russia). In the following period, 2030-2060, gas growth slows substantially in TPES in EUR, and in what concerns the production of gas, MENA will surpass the US as the number one producing region in 2050 (Idem: p. 88). NAM, China, Australia and Argentina are assessed as the future main states producers of unconventional gas, which will have a proportion of 26% of global gas production in 2030, but which will subsequently experience a rapid decrease in the period 2030-2060, in the context of a decreasing energy demand (Ibidem).

4. Conclusions

The consolidation of the energy security represents a permanent strategic objective in the work agenda of the politico-administrative decision-makers of any state, but nowadays increasingly difficult to reach in the context of a growing population at the world level and of a decreasing accessibility to the primary energy resources, whose reserves quickly diminishing⁽¹⁶⁾.

In the context of the current imbalances the world energy system is facing, with major negative impact at the socio-economic and political level, the problematic of energy security becomes increasingly acute for the states in a high dependency situation on the energy resources of other states, as is the case of the R. Moldova, almost completely-dependent on the import of natural gas from Russia.

The evolution of the energy system at the international level is uncertain, the conclusions extracted following the analysis of the three scenarios on the basis of the computerized model, the MARKAL energy model, offering each state relevant information for the consolidation of its energy policy and security. This simulation model became a modern instrument increasingly frequently used in the energy public policy elaboration stages because it reduces the opportunity for controversy and political friction, while serving the needs of private as well as public sector constituencies with an interest in the major research, innovation and deployment needs of energy system transformation (Jordan and Turnpenny, 2015: p. 259).

The three scenarios, *Modern Jazz*, *Unfinished Symphony* and *Hard Rock*, emphasizes the main challenges of the energy system at the international, regional or local level. The scenarios confirm that the energy security depends on the evolution of the relations between the great powers and the international organizations, as well as on the mix of action instruments selected by each separate state, on state directives and markets. From the perspective of energy equity, in all three scenarios, national governments set out to achieve universal energy access, but by 2060, energy accessibility and affordability varies substantially across the three scenarios (World Energy Council, 2016: p. 105). In any of the three scenarios, natural gas remains a “star” resource, which confirms at present, the correct decision of gradually introducing gas in activity sectors where oil held the monopoly, such as aviation. The risk of increasing the gap between the discovery of new deposits and the gas production, to which is added the uncertain evolution of the demand for gas obtained through unconventional sources, which today offers certain states important positions as possible suppliers, will consolidate Russia’s position in the top of the first states providers of natural gas.

The conclusions drawn from the three scenarios must be approached by the politico-administrative decision-makers in considering the fundamental dimensions of energy security (Idem: p. 103): *energy supply and delivery security*, as well as the *adaptation capacity of its energy system* and all this information is necessary and relevant for local

and central administration bodies for planning and management purposes and for energy sector in R. Moldova.

The “volatile” global equation of the energy resources, strongly influenced by the decline of the “sovereign oil era” and by the closing in the following years of a substantial amount of coal-fired capacity which in coming years as a result of a combination of environmental policies and plants reaching the end of their life-time⁽¹⁷⁾ may induce shocks to the gas markets whose flexibility must be considered by the policy makers.

In this sensitive context, the vulnerabilities⁽¹⁸⁾ of the energy security⁽¹⁹⁾ of the R. Moldova are also accentuated by the fact that it lays at the tensed confluence between the need to align to the *EU common energy policy* (based on the market and legal regulations) and the geopolitical constraints derived from the belonging to a regional block where Russia manifests abuses of dominant position, of monopole, on the gas market.

Following the signing of the Association Agreement, R. Moldova will have, the same as the EU member states, to become a supplier of energy security for the Union (Neguț et al., 2008: p. 6), adopting adequate measures at the national level. A fragility of the energy security will negatively reflect on its economic development (also based on the efficient consumption of energy resources), which will prevent the R. Moldova (state aspiring to the statute of EU member), to reduce its economic gap related to the level imposed by the accession criteria to the great European family.

What options does the R. Moldova have, as a country with an energy intensity of its economy higher than the OECD average and EU countries in the neighbourhood?⁽²⁰⁾ Even though the solutions depend on the political option of energy security of the government of R. Moldova, they must fall in line with the efforts made until the present by this state, on developing the renewable energy sector and increasing the energy efficiency.

R. Moldova must reduce its dependency on the import of gas from Russia and must focus on the development of local energy resources, for example, renewable resources, which currently enjoy favourable conditions (legislative, economic and fiscal etc.) in R. Moldova and which would allow a significant increase of the electricity production in this country (21).

Other measures which must be taken into consideration refer to the establishment of gas reserves, in order to attenuate the disturbances of the demand and supply, the diversification of the energy resources used, investments in technology and research, the expansion of the limited institutional capacity of the local authorities, which lack a *clear mandate for the appointment of regional energy managers, which results in limited identification and implementation of the energy efficiency measures at the local and regional level* etc. (Energy Charter Secretariat, 2015: p. 27).

Notes

- (1) See, for example, the case of USA, Germany, and China. In January 2007, the White House announced the resuming of the shale oil and gas drillings, energy resources estimated at 50000 billion dollars. Germany intends to reduce its dependency on nuclear energy and pass to renewable energy resources by 2022. China is preparing for a fleet of fully electrical vehicles, thus increasing the world fleet of fully electrical vehicles.
- (2) Geophysicist Marion King Hubbert elaborated a theory according to which the graphical representation of the oil production of an underground deposit is similar to Gauss's curve, the maximum being reached when half of the oil has been extracted. The theory was confirmed for the overall oil production of the USA with the occasion of the oil crisis of 1973, but also for other oil-producing countries. However, today it is considered wrong.
- (3) Acronym in the English language – the Organization of the Petrol-Exporting Countries. It was established in 1960 and, at present, the organization counts 12 members (oil-producing countries), out of which the most influential is Saudi Arabia, which is also the greatest oil producer at the world level.
- (4) In November 2014, Saudi Arabia gave up, after four decades, the control of the oil price by the increase/decrease of the quantities produced. Practically, OPEC allowed the free markets to decide the price of oil, even with the risk of flooding them with supra-production.
- (5) Russia, through its intention to create an alternative banking system, by means of BRICS, and Iran through its attempt to sell oil using the Euro as payment means.
- (6) See more (Perkins, 2007: p. 249).
- (7) See more oilprice.com, *Why Saudi Arabia Continues to Pump Crude at Record Levels*.
- (8) By *swing producer* is understood a supplier or a small group of oligopoly-type suppliers of a merchandise. They control the global deposits of the merchandise, have high production capacities and have the ability to influence prices and markets by decreasing the supply.
- (9) Gazprom is an energy company from Russia, the largest natural gas producing company in the world, which holds the monopole of the Russian extraction and production of natural gas.
- (10) Obligations already undertaken by the R. Moldova through its accession as member with full rights, in 2010, to the *Treaty for the establishment of the Energy Community*. Thus, in year 2011, R. Moldova agreed, from the political point of view, to transpose Energy Package III, which, among other things, requires the creation of a single, independent authority for the regulation of the energy market.
- (11) Declaration of the president of Transnistria, broadcast by the portal-news agency EurActiv.ro, Autoritățile de la Tiraspol nu vor să plătească pentru gazul rusesc: „Suntem parte a lumii ruse”, 2017.
- (12) GMM is a tool used to quantify and enrich the scenario storylines developed by the World Energy Council. GMM is a technologically detailed cost-optimization model that has been developed by the Energy Economics Group at the Paul Scherrer Institute (PSI).
- (13) EU28 together with Iceland, Norway and Switzerland.
- (14) Albania, Armenia, Belarus, Bosnia and Herzegovina, Georgia, Macedonia, Moldavia, Serbia, Turkey, Ukraine.
- (15) Energy intensity is the representative indicator regarding the efficiency of energy use at the national level and it represents the gross domestic consumption of primary energy, related to GDP. Primary energy intensity = TPES/GDP, GDP= Gross Domestic Product.

- ⁽¹⁶⁾ We refer to the certain data related to these stocks. However, there is also the abiotic theory, which states that oil is not a fossil fuel, but it is continuously produced inside the earth, through the physical/chemical/geologic processes at high depths.
- ⁽¹⁷⁾ For example, projections from the IEA point to a fall in coal-fired generation capacity in Europe of between 27% and 45% by 2030 (IEA, 2016a: p. 11).
- ⁽¹⁸⁾ Physical, economic, geopolitical and geostrategic, social risks, associated to environmental protection (See more on these risks in Neguț et al., 2008: pp. 6-8).
- ⁽¹⁹⁾ In (Neguț et al., 2008: p. 4), by *energy security* is understood the provision of the consumption necessary, under the aspect of accessibility (to new supply sources) and availability – respectively, of the long-term guarantee of continued deliveries. From the *consumers' perspective*, energy security means the geographical diversification of the demand, the use of a wider variety of energy resources and predictable, stable and as low as possible energy prices.
- ⁽²⁰⁾ However, it has to be noted that in the 2000-2013 period, the primary intensity of Moldova decreased significantly from 0.48 to 0.21 toe/th.2005 USD ppp. (Energy Charter Secretariat, 2015: p. 27).
- ⁽²¹⁾ For example, approximately 48% of the natural gas imports could be reduced by using the biomass resources (Caisin et al., 2015: p. 97).

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A formal look at the negative interbank rate

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Abstract. *This paper develops a simple theoretical model regarding the policy means of negative interbank rate against recession. It is found out that the adoption of such a rate does not differ much from a scheme of full-reserve banking. That is, this paper adds the negative interbank rate to those means aiming at zero bank profit to the extent that such is also the aim of the 100% reserve rule. And, to the extent that recession forms an equilibrium phenomenon, this policymaking is necessarily destabilizing towards some full-employment state of affairs, but the transition is not found to be smooth depending on how the elasticities of loan demand and deposit supply react.*

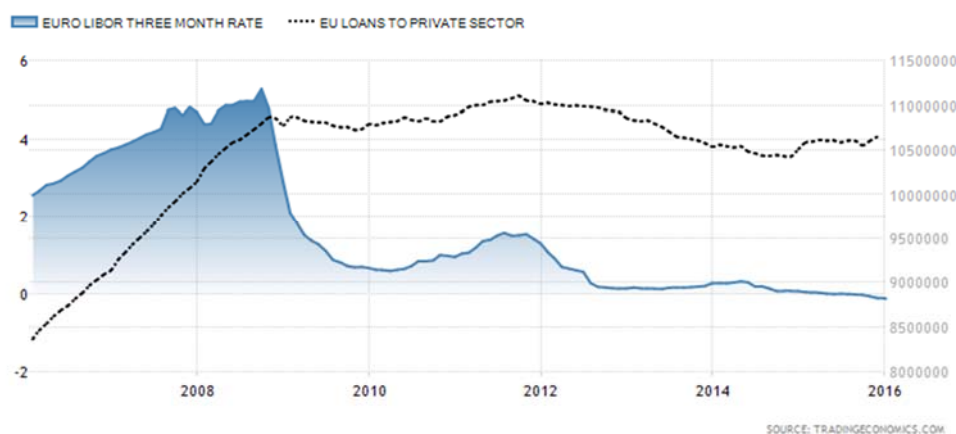
Keywords: Negative interbank rate, Full-reserve banking, Elasticities of loan demand and deposit supply.

JEL Classification: E31, E43, E44.

1. Introduction

There has been much discussion in the financial press in connection with the June and September 2014 drive of European Central Bank's policy interest rate applied on its deposit facility below zero. Also, certain major central banks in Europe have adopted negative policy rates to chastise bank liquidity that is not loaned out. Policymakers have gone an extra mile further "by (i) introducing negative deposit rates (-0.2 per cent) (ii) announcing cheap long term loans targeted towards credit growth and (iii) launching a sovereign bond buying programme... having much to do with the trend towards negative Euribor rates" (Filip, 2015). All, in response to global recession having made some to propose as a remedy the use of even "gift money" (Soldatos, 2015). But, all again, are interrelated if one judges from Buiter's (2009) "three ways to overcome the zero lower bound": Increase the money people hold to spend (Humphrey 2015). And, in so far as the interbank market particularly is concerned, policy shocks in the desirable direction can influence positively both the financial sector and the real sector of the economy given that this market is the main funding source of banks in loan creation. Figure 1 depicts the contribution of the negative Euribor to the supply of loans to the private sector.

Figure 1



Source: TradingEconomics.com

There has been much empirical work on these developments. Nevertheless, no formal discussion of the negative interbank rate as a policy means *per se* has been offered so far at least to this author's knowledge. Formal, from the viewpoint of theoretical modeling, this is what this short paper attempts in the next section. There do exist models involving the interbank rate à la Poole (1968) where profit maximizing banks choose the amount of interbank loans, and monetary policy may be disrupted if not all banks can have access to the interbank market (Vari, 2015). This paper takes the interbank rate to be exogenously set by the policymaker, and finds out that a regime of negative interbank rate does not differ much from a scheme of full-reserve banking. The model is fairly simple but it does uncover this important feature of the current policymaking based on real interest rate considerations, because: "Indeed, in standard models, only the real interest rate and spreads between real interest rates matter. Thus, in most respects, negative interest rate

policy is conventional” (Kimball, 2015, R5). And, to the extent that global recession forms an equilibrium phenomenon, this policymaking is necessarily destabilizing towards some full-employment state of affairs, but the transition is not found to be smooth depending on how the elasticities of loan demand and deposit supply react. Section 3 concludes with some remarks on the merits of negative interbank rate and the need to investigate systematically its connection with the business cycle.

2. The analysis

Consider an all-private sector economy, banks, firms, and consumers, who have instituted some authority to be intervening in the interbank market whenever is needed. Let:

$$L = \lambda D = \frac{1-h}{h} D \quad (1)$$

where L and D denote loans to the firms and deposits from consumers, respectively, h is the reserve ratio, and λ is thereby the credit multiplier. And, let bank profit be:

$$\Pi = [r_L(L) - r]L + [r(1-h) - r_D(D)]D \quad (2)$$

or in view of (1):

$$\Pi = \{[r_L(\lambda D) - r]\lambda + [r(1-h) - r_D(D)]\}D \quad (2')$$

where r_L and r_D are the lending and deposit interest rates, while r is the interbank rate. Under perfect competition, profit is zero, which yields from (2'):

$$r = \frac{r_D + \lambda r_L}{1-h-\lambda} = -\frac{r_D h + r_L(1-h)}{(1-h)^2} < 0 \quad (3)$$

These are nominal quantities. Letting p denote the inflation rate, (3) may be rewritten as follows:

$$\rho + p = -\frac{(\rho_D + p)h + (\rho_L + p)(1-h)}{(1-h)^2} = -\frac{\rho_D h + \rho_L(1-h)}{(1-h)^2} \quad (3')$$

Hence, under a $\rho = 0$, (3') gives the rate of disinflation accompanying it, which disinflation would be greater under a positive ρ , but less under a negative one. It turns out that $p = 0$ iff:

$$\rho^* = -\frac{\rho_D h + \rho_L(1-h)}{(1-h)^2} \quad (4)$$

Therefore, a negative interbank rate, punishing excess liquidity, would be growth promoting under price stability if (4) was satisfied. And, it would also be promoting a quasi-competitive banking, since *real* $\Pi = 0$, which would be the case under a 100% reserve rule. It “forces” presumably lending up to the point banks cover in real terms only their opportunity cost.

But, is price stability desirable? To answer this question let us see what $p = 0$ implies for bank pricing policy. Assume again nominal quantities and that the demand for loans and supply of deposits are given for simplicity (see e.g. Varelas, 2016) by:

$$L = A r_L^{-\varepsilon} \quad (5)$$

and

$$D = \Gamma r_D^\mu \quad (6)$$

where $\varepsilon > 1$ is the price elasticity of the demand for loans and $\mu < 1$ is the supply elasticity of deposits while A and Γ are positive numbers capturing the impact of bank regulation on bank productivity regarding L and D , respectively; regulation enhancing or diminishing bank productivity directly depending on whether these numbers exceed the unit or not. The assumption that $\varepsilon > 1$ reflects profit maximization under conditions of market power while if $\mu > 1$, an increasing r_D would be accompanied by exponentially increasing deposits. Solving (5) and (6) for the corresponding interest rate, inserting the solutions in (2) and maximizing it next with respect to L and D , one obtains from the first-order conditions that:

$$r = \frac{r_D(\varepsilon - 1)}{\varepsilon} \quad (7)$$

and

$$r = \frac{r_L(1 + \mu)}{\mu(1 - h)} \quad (8)$$

Equating (7) and (8) yields in turn that:

$$r_L = r_D \frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} \quad (9)$$

and hence, that in real quantities:

$$\begin{aligned} \rho_L + p &= (\rho_D + p) \frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} \Rightarrow \\ \rho_L &= \rho_D \frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} - p \frac{\mu(1 - h) + \varepsilon(1 + \mu h)}{\varepsilon(1 + \mu)} \end{aligned} \quad (10)$$

Under (4), $p = 0$; setting it in (10), the spread $(\rho_L - \rho_D)$ turns out to be higher than that without policy intervention, simply because setting $p = 0$ in (5) and (6) too, the demand for loans increases whereas the supply of deposits decreases. There appears to be a lot of credit rationing which could be relaxed if ρ was greater absolutely than the right-hand side of (4), since then $p > 0$ and the spread $(\rho_L - \rho_D)$ would become by (10) smaller. Indeed, if one reflects on that turning ρ negative is one more policy instrument against persistent recessionary trends, inflation rather than price stability is desirable.

Nevertheless (4) prompts a disequilibrium in the market of loanable funds, because equating (5) and (6), one obtains that:

$$r_D^\mu r_L^\varepsilon = \frac{A}{\Gamma}$$

and by virtue of (9):

$$r_D = \left(\frac{A}{\Gamma}\right)^{\frac{1}{\mu+\varepsilon}} \left[\frac{\varepsilon(1 + \mu)}{\mu(\varepsilon - 1)(1 - h)}\right]^{\frac{\varepsilon}{\mu+\varepsilon}}$$

and

$$r_L = \left(\frac{A}{\Gamma}\right)^{\frac{1}{\mu+\varepsilon}} \left[\frac{\varepsilon(1+\mu)}{\mu(\varepsilon-1)(1-h)} \right]^{\frac{\mu}{\mu+\varepsilon}}$$

whose ratio is equal to one. At equilibrium, these two rates and subsequently the real ones are equal and (10) is satisfied when:

$$p = \frac{\mu(\varepsilon-1)(1-h) - \varepsilon(1+\mu)}{\mu(1-h) + \varepsilon(1+\mu h)} = -1$$

which disinflation is exactly what the policymaker wants to fight and induces the policy of $|\rho| > [\rho_D h + \rho_L(1-h)]/(1-h)^2$. The equilibrium is presumably recessionary and the policymaker disturbs it towards the full-employment one.

The transition may not be smooth, because if not anything else, it influences elasticities ε and μ . Consider, for instance, the following version of the Kaldor model:

$$L = Ar_L^{-\varepsilon} = I = \Delta K \quad (11)$$

$$D = \Gamma r_D^\mu = S \quad (12)$$

$$\Delta Y = q(I - S) \quad (13)$$

where I and S are investment and saving, respectively, ΔY and ΔK are the change in total output and physical capital, and q is a speed of adjustment coefficient. Inserting (11) and (12) in (13) and utilizing (3) yields:

$$\Delta Y = q\{Ar_L^{-\varepsilon} + \Gamma[r(1-h)^2 + \lambda r_L]^\mu\} \quad (13')$$

from which one obtains:

$$\frac{\partial \Delta Y}{\partial \varepsilon} = -\frac{qA \ln r_L}{r_L^\varepsilon} > 0$$

given that $0 < r_L < 1$ and hence, $\ln r_L < 0$,

and

$$\frac{\partial \Delta Y}{\partial \mu} = q\Gamma[r(1-h)^2 + \lambda r_L]^\mu \ln[r(1-h)^2 + \lambda r_L] > 0$$

An increase in either elasticity raises the rate of output change, which increase is expected to be the case when moving away from a contraction. Moreover, note that $\partial \Delta Y / \partial A$ and $\partial \Delta Y / \partial \Gamma$ are both positive, which implies that the policy authority may always use the regulatory environment surrounding deposits and lending to accelerate output growth.

3. Concluding remarks

The negative interbank lending rate is indeed a “good” policy means against prolonged contraction. Under adverse economic circumstances, Acharya and Merrouche (2012) find that bank liquidity affects overnight inter-bank rates, in both secured and unsecured markets; it is an effect that is absent under normal circumstances. And, precautionary hoardings by some settlement banks raise lending rates, engendering the spread of systemic risk operating through interbank rates unless this rate is lowered by the policymaker; much

more so when “a crisis causes a disparity in the liquidity held among banks” (Freixas et al. 2011, p. 2656). Nevertheless, “institutional features interacting with negative rates... make negative interest rate policy unconventional” (Kimball, 2015, R5), which is what the proposed manipulation of parameters A and Γ above, is supposed to address.

Finally, the full-reserve character of a negative interbank rate should be emphasized. As Soldatos and Varelas (2014) have shown, the purpose of a 100% reserve ratio is to nullify commercial bank seigniorage, and to the extent this seigniorage is identified with positive bank profit, there can be other means to zero bank profit beyond the full reserve rule. This paper adds the negative interbank rate to those means. Indeed, to fight a prolonged recession, the instability added by the financial system in general has to be taken away, this was the primary reason the full-reserve rule was proposed, and this is to what a negative interbank rate aims *inter alia*. Nevertheless, neither the negative interbank rate nor full-reserve banking are panacea against instability once the matter of maturity mismatching of liabilities and assets (borrowing short and lending long) is addressed as the Austrian Business Cycles Theory does (see e.g. Bagus, 2010).

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Informatic system for identifying and evaluation of the environmental aspects and waste products management

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Abstract. *In this paper, the authors present the instruments provided by a software package that is dedicated for the identification and evaluation of the management of environmental aspects and waste. The solution proposed, modeled as a cycle, can be adapted to any company in the manufacturing sector and involves the elaboration of a procedure for environment-related aspects, the implementation of software, training of personnel, identification, evaluation and monitoring of the significant environmental issues, preoccupation for future improvement.*

Keywords: environment, waste, factor, software, evaluation.

JEL Classification: Q51, Q56.

1. Introduction and Literature review

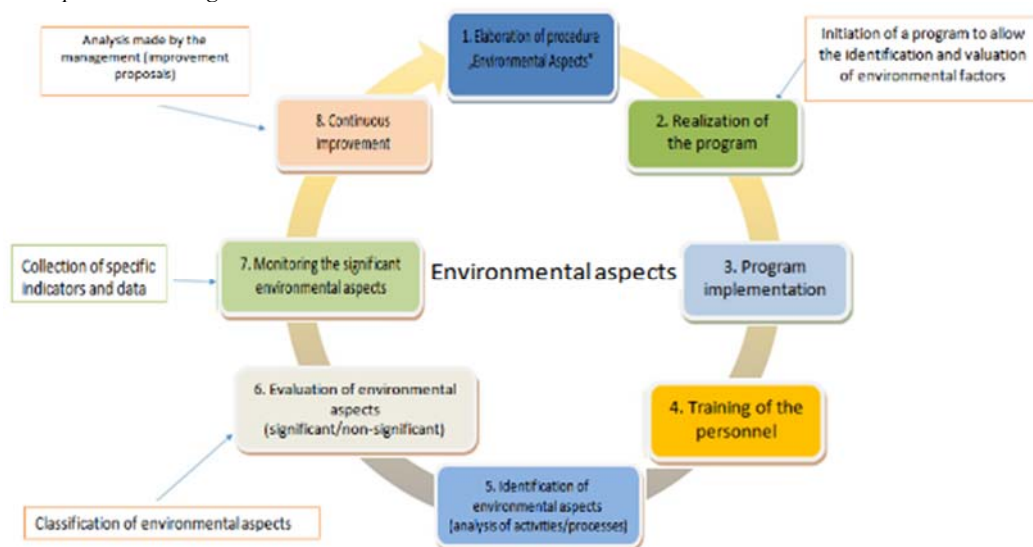
The evaluation of the impact on the environment (EIM) is a process by which there is identified and foreseen the effects that a proposed social and economic activity proposed to be promoted (initiated, designed, realized and put in order) might produce on the environment, on the human health and his benefit.

The most efficient way by which it might be prevent the apparition of new waste products useless quantities is the *decreasing at source*, thus it became the most used method for the waste products managements. The products recycling (Masing, 1988), the separation and their sale decrease the quantity of waste products that have to be stored in cesspool.

The identification and the evaluation of the environmental aspects represent an instrument of the environmental management (Panaïtescu and Bucuroiu, 2014a, 2014b, Petrescu and Bucuroiu, 2014, Petrescu et al., 2014). In this sense, this stage has to be quantified in the activity of each company that has or might have, in the future, an impact on the environment.

The solution proposed as follows contributes to the improvement of the environmental system within any productive company.

Figure 1. Flux scheme of the program for the identification and evaluation of the environmental aspects and waste products management



The waste products management may be conceived based on the scheme presented in the Figure 1. Starting with this representation, in collaboration with SC WEB CONTUR SRL company, there was conceived a software program (<http://mediu.conturweb.ro>) in order to identify and evaluate the environmental aspects and the waste products management consisting of two sections:

- The first section allows the identification and the evaluation of the environmental aspects.

- The second one realizes a waste products management, according to HG 856/2002, adjusted in 2014.

The program named “conturweb environment” may be implemented in any company that desires to implement an environmental management system.

Masing (1988) represents a comprehensive manual on quality assurance. Anghelache (2011) approaches the management of environmental risk. Anghelache and Anghel (2016a, 2016b) present the statistical and econometric instruments that can be used for data analyses, Păunică et al. (2009) emphasize the usefulness of business intelligence techniques in the same scope. Panaitescu and Bucuroiu (2014a) analyze the composition of urban waste, they approach the urban areas belonging to the Romanian county of Prahova, another study by the authors outlines the pollutants affecting the surface and ground water in the residence city of the named county. Petrescu and Bucuroiu (2014) evaluate the possibility to reach lower emissions level through the working tanks inside fuel deposits. Petrescu, Panaitescu and Bucuroiu (2014) present the implementation of a software package in the wastewater treatment plants.

2. Identification and evaluation of the environmental aspects

The stage of identification and evaluation of the environmental aspects supposes to follow in an interactive form some steps that have to define the company organizational and productive profile, the maintaining of the environmental aspects (Figure 2) ascertained by the internal/external audits and the evaluation of the impact based on some pre-defined criteria (Table 1), in accordance with the following relation:

$$I = G + C + F + R + PI, \quad (1)$$

the notation signification being mentioned in Table 1.

Table 1. Criteria quotation grad

CRITERION	POINTS (P)		
	1 - 3	4 - 7	8 - 10
Gravity (G)	There is no risk	Risk for the environment	Risk for the human being and the environment
Quantity (C)	Reduced level	Average level	High level
Frequency (F)	Occasional	Average	Daily
Settlements (R)	Conformity, stable demands	Conformity, there might be perspective on the demands' toughness	Non – conformity
Interested parts (I)	There are no complaints or critics	Complaints or / and occasional critics	Complaints and systematic critics

Figure 2. The evaluation of the impact on the environmental factors and framing

N ☐	Deseuri textile	textile	da	nu	da	nu	nu	nu	da	6	M	<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	Zgomot	Emisii/Imisii	nu	da	nu	nu	nu	nu	da	3		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	Zgomot	Zgomot	nu	da	nu	nu	nu	da	7	M	<input type="text"/>	<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	emisii/imisii	Emisii/Imisii	nu	da	nu	nu	nu	nu	da	0		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	pulberi	alte deșeuri cu conținut de substanțe periculoase de la procesarea fizică și chimică a minereurilor metalifere	da	da	da	nu	nu	nu	da	3		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	hartie carton	deșeuri de la sortarea hârtiei și cartonului destinate reciclării	da	nu	da	nu	nu	nu	nu	4		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	Sticla	sticla	da	nu	da	nu	nu	nu	da	4		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	plastic	deșeuri de sticlă, altele decât cele specificate la 10 11 11	da	nu	da	nu	nu	nu	nu	4		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													
N ☐	Apa uzată	ape uzate menajere	da	nu	da	nu	nu	nu	nu	3		<input type="text"/>	<input type="text"/>
A ☐													
U ☐													

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:

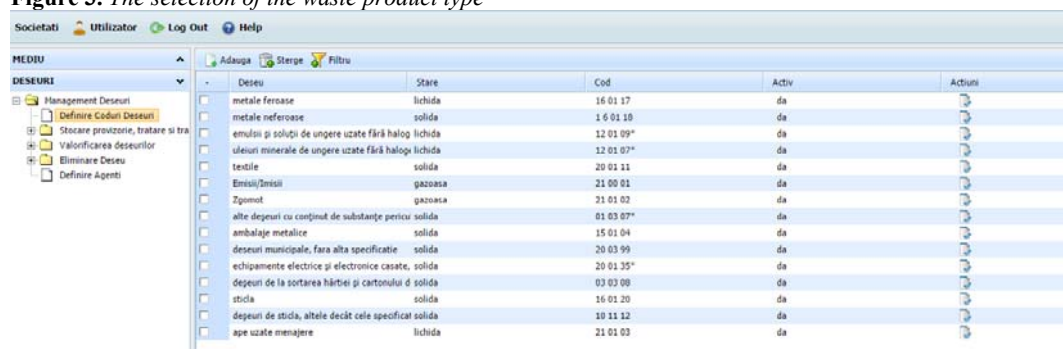
Deseuri textile – Textile waste; *Textile* – Textile; *Da* – Yes; *Nu* – No; *Emisii/Imisii* – Emissions/Ambient emissions; *Zgomot* – Noise; *Pulberi* – Powders; *Alte deseuri cu continut de substante periculoase de la procesarea fizica si chinica a minereurilor metalifere* – Other waste containing dangerous substances from the physical and chemical processing of metal ore; *Hartie carton* – Paper carton; *Deseuri de la sortarea hartiei si cartonului destinate reciclarii* – Waste from sorting paper and carton destined to recycling; *Sticla* – Glass; *Deseuri de sticla, altele decat cele specificate la 10 11 11* – Glass waste, other than those specified at 10 11 11; *Apa uzata* – Wastewater; *Ape uzate menajere* – Domestic wastewater.

The above figure describes the impact of the environmental pollution factors, the examples taken into account refer to textile waste, noise, powders, paper waste, glass, plastic and wastewaters. The interface includes and displays the description of each individual factor, useful in the construction of the profile.

3. The waste products management

The stage of the waste products management bases on the general structure resulted from the previous stage and supposes the précising of the data concerning the quantities of the waste products generated, valorized or eliminated (data, generating structure, quantities, stage, the agent/company/plant where there will be valorized/eliminated) (Figure 3 and Figure 4 are captures from the waste products management program).

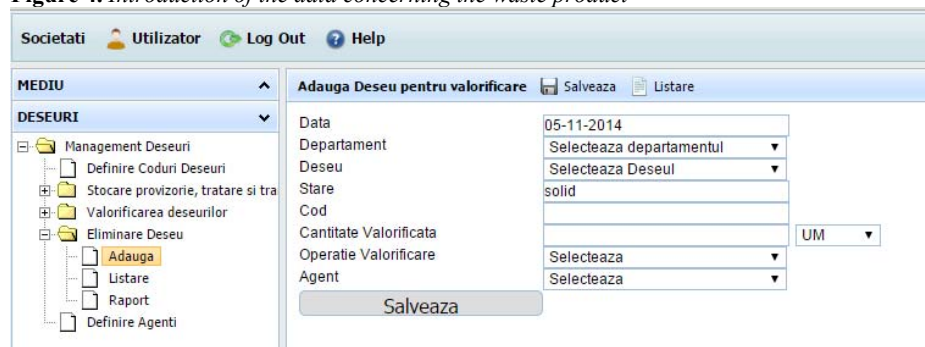
Figure 3. The selection of the waste product type



Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:
Societati – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Adauga* – Add; *Sterge* – Delete; *Filtru* – Filter; *Stare* – Status; *Cod* – Code; *Activ* – Active; *Actiuni* – Actions; *Lichida* – Liquid; *Solida* – Solid; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Valorificarea deseurilor* – Capitalization of waste; *Elimina deseuri* – Waste disposal; *Definire agenti* – Define agents; *Metale feroase* – ferrous metals, *Metale neferoase* – Non-ferrous metals, *Emulsii si solutii de ungere uzate fara halogen* – Emulsions and waste lubricant solutions without halogen; *Uleiuri minerale de ungere uzate fara halogen* – Waste lubricant mineral oils without halogen; *Textile* – Textiles; *Emisii/Imisii* – Emissions/ Ambient emissions; *Zgomot* – Noise; *Alte deseuri cu continut de substante periculoase* – Other waste containing dangerous substances; *Ambalaje metalice* – Metallic wrappings; *Deseuri municipale, fara alta specificatie* – Municipal waste, without other specification; *Echipamente electrice si electronice, casate* – Electrical and electronical equipments, cashiered; *Deseuri de la sortarea hartiei si cartonului* – Waste from sorting paper and carton; *Sticla* – Glass; *Deseuri de sticla, altele decat cele specificate* – Glass waste, other than specified; *Ape uzate menajere* – Domestic wastewater.

The interface in Figure 3 allows also the specification of the waste type, its physical state (solid, liquid, gas), the standard code and the active status.

Figure 4. Introduction of the data concerning the waste product



Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:
Societati – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Valorificarea deeurilor* – Capitalization of waste; *Eliminae deseul* – Waste disposal; *Adauga* – Add; *Listare* – Print; *Raport* – Report; *Definire agenti* – Define agents; *Adauga deseul pentru valorificare* – Add waste for capitalization; *Data* – Date; *Departament* – Department; *Selecteaza departamentul* – Select department; *Deseu* – Waste; *Selecteaza Deseul* – Select waste; *Stare* – State; *Cod* – Code; *Cantitate valorificata* – Capitalized quantity; *Operatie valorificare* – Capitalization operation; *Selecteaza* – Select; *Salveaza* – Save.

In the folder Waste Product Report there are stocked all information on stock, quantities valorized and eliminated quantities in real time (Figure 5).

Figure 5. The situation of the quantity of the waste products generated by tool section

Luna	Departament	Deseu	Cantitate_stocata	Tip stocare	Cantitate tratare	Mod tratare	Scop tratare	Mijloc transport	Destinatie	Actiuni
Octomb	Scule foraj extractie	metale feroase	100.00 kg	container fix	0.00 kg			auto nespecial	valorif pentru agenti e	

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:
Societati – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Adauga deseul* – Add waste; *Listare Deseuri* – List waste; *Raport deseul* – Waste report; *Valorificarea deeurilor* – Capitalization of waste; *Eliminae deseul* – Waste disposal; *Adauga* – Add; *Listare* – Print; *Raport* – Report; *Definire agenti* – Define agents; *Generare raport DESEURI pentru eliminare, stocare, transport* – Generate Waste Report for disposal, stowage, transport; *Luna* – Month; *Octombrie* – October; *Departament* – Department; *Scule foraj extractie* – Drill extraction tools; *Deseu* – Waste; *Metale neferoase* – Non-ferrous metals; *Cantitate_stocata* – Stowed quantity; *Tip stocare* – Stowage type; *Container fix* – Fixed container; *Cantitate tratare* – Treatment quantity; *Mod tratare* – Treating mode; *Scop tratare* – Treating purpose; *Mijloc transport* – Transportation mean; *Destinatie* – Destination; *Valorificare pentru* – Capitalization for; *Inregistrari de la ... la ...* – Records from ... to...; *Pagina* – Page; *...randuri pe pagina* – ... rows per page.

For the companies having a complex structure the waste products report may be made centralized, the program cumulating all the quantities of the waste products generated by the company structures, according as there are introduced in the system (Waste products evidence card – Figure 6, according to HG no. 856/2002).

Figure 6. Waste product evidence card

Anexa Nr.1: EVIDENȚA GESTIUNII DEȘEURILOR					
Agentul economic S.C. Confind S.R.L.					
Anul 2014					
Tipul de deșeu metale feroase cod 16 01 17 (conform codificării din Anexa Nr. 2)					
Starea fizică lichida					
Unitate de masura kg					

Generarea deșeurilor

NR. CRT	LUNA	Cantitate deseuri			
		Generata	Din care		
			Valorificata	Eliminata	Ramasa in stoc
1	Octombrie	100.00	20.00	56.00	24.00
1	Noiembrie	180.00	20.00	56.00	104.00
	Total AN	280.00	20.00	56.00	204

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:
Anexa nr. 1: EVIDENȚA GESTIUNII DEȘEURILOR – Annex no. 1: Evidence of waste management; *Agentul economic* – Economic agent; *Anul* – Year; *Tipul de deșeu metale feroase cod 16 01 17 (conform codificării din Anexa nr. 2)* – Waste type, ferrous metals code 16 01 17 (according to the codification in Annex no. 2); *Starea fizică lichida* – Physical state liquid; *Unitate de masura* – Measurement unit; *Generarea deșeurilor* – Waste generation; *Nr.crt.* – ID; *Luna* – Month; *Cantitate deseuri* – Waste quantity; *Generata* – Generated; *Din care* – Of which; *Valorificata* – Capitalized; *Eliminata* – Eliminated; *Ramasa in stoc* – Remaining; *Octombrie* – October; *Noiembrie* – November; *Total AN* – Total year.

The waste products management based on the utilization of this software program may have influence not only on the improvement of the environmental conditions taking into account the durable development, but also on the company economic activity.

An evaluation process of the environmental aspects with this program has the advantage of a correct monitoring of the activities (taking into consideration also the identified prevent measures), presenting thus all the options that have to be taken into account by the decisional factors. Another major advantage of the elaborated program is that it allows the decrease of the monitoring costs.

The correct evaluation of the organizational environmental performances leads to an evaluation of the global environmental system. This allows the identification of some alternative solutions in order to reduce the impact on it environmental significant aspects.

In order to evaluate the advantages and the disadvantages of the presented program “conturweb environment”, there will be made a comparison with the reporting imposed by the Environmental National Agency, according to the environmental authorizations.

On the agency site there are selected fields – waste products – questionnaires, according to Figure 7.

Figure 7. Questionnaire waste products evidence (Environmental National Agency)

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Chestionar* – Questionnaire; *Detinatorul echipamentelor/materialelor* – Owner of equipment/materials; *Domnul/Doamna* – Mr/Ms; *Detalii de contactare a detinatorului echipamentelor/materialelor* – Contact details of equipments and materials owner; *Adresa* – Address; *Telefon* – Phone; *Descrierea echipamentelor/materialelor* – Description of equipments/materials; *Descriere* – Description; *Echipamentele sau materialele sunt* – Equipments or materials are; *In prezent in functiune* – Presently operational; *Depozitate inainte de folosire* – Stowed before use; *Depozitate dupa folosire* – Stowed after use; *Altele (specificati)* – Other (specify); *Concentratie* – Concentration; *Concentratia compusului desemnat a fost masurata sau estimata* – The concentration of the designated compound has been measured or estimated; *Concentratia compusului desemnat* – The concentration of the designated compound; *Se completeaza numai de autoritatea publica teritoriala pentru protectia mediului* – To be completed only by the territorial environment protection public authority; *Numere de cod* – Code numbers; *Persoana care completeaza formularul, daca este alta decat detinatorul* – The person who fills the form, if is different from the owner; *Domnul/Doamna* – Mr/Ms; *Detalii de contactare a persoanei care completeaza, daca este alta decat detinatorul* – Contact details of the person who fills the form, if is different from the owner; *Locul unde se afla echipamentele/materialele* – The place where the equipment/materials are; *Persoana de contact* – Contact person; *Compusul desemnat* – Designated compound; *A fost identificat pozitiv sau numai dedus* – Has it been positively identified or only was deducted; *Numele compusului desemnat* – The name of the designated compound; *Volum* – Volume; *Volumul compusului desemnat a fost masurat sau estimat* – The volume of the designated compound has been measured or estimated; *Volumul compusului desemnat* – The volume of the designated compound; *Salvare chestionar* – Save questionnaire; *Salveaza si finalizeaza* – Save and end.

As it may be observed purchasing the report made by the Environmental National Agency there is not foreseen the monitoring of the waste products quantities that have direct implication of the environmental factors, but only some waste products types generated by the company/organization.

Conclusions

The waste products management method based on the utilization of a software system assure a correct and real monitoring of the activities that may generate environmental aspects (taking into account the identified preventing measures).

This program allows the reducing of the waste products administering costs and the conformity with the legislation in force.

The advantages of the “conturweb environment” program utilization are the following:

- it creates automatically forms that might be registered directly in the waste products national reports;
- it allows the evaluation according to the national legislation in force;
- it continuously evaluates the environmental performances;
- it reduces the waste products administering costs;
- it stocks the registrations;
- it systemizes the generated waste products and permanently evaluate it;
- it is easy to use it.

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Regulation versus regulated monopolization of a Cournot oligopoly with unknown cost

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Abstract. *This paper studies whether a Cournot oligopoly with unknown costs should be left unregulated, or regulated according to the optimal mechanism of Gradstein (1995), or first monopolized and then regulated according to the optimal mechanism of Baron and Myerson (1982). We show that the answer to this question depends on the number of the oligopolistic firms and the size of their fixed costs, as well as on the weight of the producer welfare in the social objective function.*

Keywords: Monopoly; Oligopoly; Cournot competition; Regulation; Asymmetric information.

JEL Classification: D82; L51.

1. Introduction

This paper attempts to answer whether a Cournot oligopoly with unknown costs should be left unregulated, or optimally regulated, or first monopolized and then optimally regulated. While this question is novel, the regulatory design problem when the regulator has incomplete information about the regulated industry has been extensively studied in the economics of regulation since the seminal work of Baron and Myerson (BM) (1982). The wisdom of BM, who dealt with the problem of regulating a natural monopoly with unknown costs, was simply to use the Revelation Principle (Dasgupta, Hammond and Maskin, 1979; Myerson, 1979; Harris and Townsend, 1981), by which they could restrict themselves to incentive-compatible revelation mechanisms, requiring the monopolistic firm to report its unknown cost information and ensuring that it has no incentive for misreporting. This approach allows one to directly calculate the informational rents that should be provided to the regulated firm as a reward for truthful revelation. By deriving the minimal subsidy that will generate these rents to the firm, one can also calculate the net gains of the producer and consumers. Aggregating these net gains by a (generalized) social welfare function, the objective of the regulator was reduced by BM to finding a quantity schedule (a function of cost reports), among several other schedules, that can maximize the expected value of the social welfare with respect to the regulator's beliefs about the private cost information of the regulated firm.

Many extensions of the BM's problem -to deal with regulating a monopolistic industry under various types of asymmetric information- were later studied by Sappington (1983), Baron and Besanko (1984), Riordian (1984), Rochet (1984), Laffont and Tirole (1986), and Lewis and Sappington (1988), among many others. A common feature of all these studies is that the optimal regulatory mechanism must offer to the regulated monopoly some information rents, which create a deadweight loss in welfare unless the social welfare function treats the producer and the consumer welfare equally. A remarkable work of Gradstein (1995) extended the regulatory mechanism design to the case of an oligopoly with asymmetric cost information and showed that the information rents that should be offered to the oligopolistic firms can be balanced to be zero. This exciting result implies that the marginal cost pricing can always be freely implemented irrespective of the definition of the social welfare. However, since these rents cannot be individually rational for some of the regulated firms, it is questionable whether a regulatory authority could force the oligopolistic firms to participate in the regulatory program proposed by Gradstein (1995).

As a partial remedy to the said problem, the transfers proposed by Gradstein (1995) can be balanced to be equal to the aggregate fixed costs of the oligopolistic industry, as we will propose in Section 2.2. This modification may ensure that the Gradstein's (1995) regulatory mechanism would satisfy an industry-wide rationality (or participation) constraint. Although such a modification is likely to increase the applicability of the Gradstein's (1995) optimal regulation program, it is not clear whether the outcome of that program would be welfare superior to the equilibrium outcome of an unregulated Cournot oligopoly. Definitely, consumers would benefit under the optimal regulation program from the increased output implied by the marginal cost pricing; but, they would also be

hurt by the subsidies they need to pay for financing the fixed costs of the regulated firms. This tradeoff, and consequently the ambiguity as to the desirability of oligopoly regulation, can in fact be felt by the whole society under a social welfare function where the welfare of producers has, in general, a lower weight than the welfare of consumers. Moreover, it is also ambiguous, in general, whether regulating an oligopoly according to the Gradstein's (1995) optimal regulation program would be more desirable - in terms of the induced social welfare - than simply monopolizing the oligopoly and regulating it afterwards according to the BM's (1982) optimal mechanism. This second ambiguity is simply caused by the following tradeoff faced by consumers: On the one hand, the regulated monopolization can be unattractive for consumers since the information rents that should be offered to the regulated monopoly as part of the incentive program can be very huge relative to the gross consumer surplus, unlike the informational rents in the case of oligopoly regulation which can be as low as the aggregate fixed costs of the industry. But, on the other hand, the regulated monopolization of an oligopolistic industry with N firms would also free consumers from the obligation to finance the fixed costs of $N-1$ firms who are not allowed to operate; hence the tradeoff. Calculating these two tradeoffs with the help of a formal model and investigating how they would be affected by the relevant parameters of the model, we aim to answer whether/when a Cournot oligopoly should be optimally regulated or first monopolized and afterwards optimally regulated.

The rest of the paper is organized as follows: Section 2 presents the model, Section 3 presents our results, and Section 4 concludes.

2. Model

We consider an oligopolistic market involving $N \geq 2$ symmetric firms with unknown costs. Firms are indexed by $i = 1, 2, \dots, N$. Firm i faces the cost function

$$C_i(q_i, \theta) = \begin{cases} K + \theta q_i & \text{if } q_i > 0, \\ 0 & \text{if } q_i = 0, \end{cases} \quad (1)$$

where K is the known fixed cost and θ is the marginal cost, which are the same for all firms. It is assumed that θ lies in a known interval $\Theta = [\theta_0, \theta_1]$, where $\theta_1 > \theta_0 \geq 0$. The total production in the market is denoted by Q , so $Q = \sum_i q_i$. The market faces an inverse demand function which is given by

$$P(Q) = \begin{cases} a - Q & \text{if } 0 \leq Q \leq a, \\ 0 & \text{if } Q > a, \end{cases} \quad (2)$$

where $a > \theta_1$ is a known constant. The gross value to consumers of a total quantity Q is denoted by $V(Q)$ where

$$V(Q) = \int_0^Q P(\tilde{Q}) d\tilde{Q}. \quad (3)$$

Then, the consumer surplus becomes $V(Q) - P(Q)Q$.

Everything about the described market other than θ is known to the regulator as well as to the firms, while θ is only known to the firms. However, the regulator has (commonly known) prior beliefs about θ , represented by the probability density function $f(\cdot)$, which is positive and continuous over Θ . Finally, $F(\cdot)$ denotes the corresponding cumulative distribution function.

2.1. Unregulated Cournot oligopoly

Here, we consider that the firms in the described oligopolistic industry compete à la Cournot (in quantities). Let $\pi_i(q_i, q_{-i}; \theta)$ denote the operational profits of firm i with the marginal cost θ when it produces q_i units of output while the quantity decisions of other firms are given by the list $q_{-i} = (q_1, \dots, q_{i-1}, q_{i+1}, \dots, q_N)$. Let $q = (q_i, q_{-i})$ be the quantity profile for the given industry. Then,

$$\pi_i(q; \theta) = P(Q)q_i - \theta q_i - K, \quad (4)$$

using $Q = \sum_i q_i$. We say that the quantity profile q^* is a Cournot (Nash) equilibrium if for all i it is true that

$$\pi_i(q_i^*, q_{-i}^*; \theta) \geq \pi_i(q_i, q_{-i}^*; \theta) \text{ for all } q_i \geq 0. \quad (5)$$

Proposition 1. When the oligopolistic firms' marginal cost is θ , the Cournot (Nash) equilibrium is given by the quantity profile $q^*(\theta)$ that satisfies

$$q_i^*(\theta) = \frac{a - \theta}{N + 1} \text{ for all } i. \quad (6)$$

Proof. See the Appendix.

Equation (6) implies the total quantity of output is $Q^*(\theta) = \sum_i q_i^*(\theta) = (a - \theta)N/(N + 1)$, while the price is $P(Q^*(\theta)) = a - (a - \theta)N/(N + 1)$ at the Cournot (Nash) equilibrium. The equilibrium profits of firm i would then become

$$\pi_i^C(q^*(\theta); \theta) = \frac{(a - \theta)^2}{(N + 1)^2} - K. \quad (7)$$

(The superscript C points to the unregulated Cournot oligopoly.) Correspondingly, the equilibrium profits for the industry, i.e., the producer welfare, would be

$$\pi^C(\theta, K, N) \equiv \sum_i \pi_i^C(q^*(\theta); \theta) = \frac{(a - \theta)^2 N}{(N + 1)^2} - NK. \quad (8)$$

On the other side, the equilibrium welfare of consumers is given by

$$CW^C(\theta, N) \equiv V(Q^*(\theta)) - P(Q^*(\theta))Q^*(\theta) = \frac{[Q^*(\theta)]^2}{2} = \frac{(a - \theta)^2 N^2}{2(N + 1)^2}. \quad (9)$$

Finally, we denote by $SW^C(\theta, \alpha, N)$ the equilibrium social welfare at the marginal cost level θ , which is the sum of $CW^C(\theta, N)$ and α fraction of $\pi^C(\theta, K, N)$, with $\alpha \in [0, 1]$. Formally,

$$\begin{aligned}
SW^C(\theta, \alpha, K, N) &\equiv CW^C(\theta, N) + \alpha \pi^C(\theta, K, N) = \frac{(a - \theta)^2 N^2}{2(N + 1)^2} + \alpha \frac{(a - \theta)^2 N}{(N + 1)^2} - \alpha NK \\
&= \frac{(a - \theta)^2}{2} \frac{N^2 + 2\alpha N}{(N + 1)^2} - \alpha NK.
\end{aligned} \tag{10}$$

2.2. Regulated oligopoly

Here, we will consider the optimal regulation of the oligopolistic industry described at the beginning of this section. To this end, we will focus on the optimal mechanism proposed by Gradstein (1995). This mechanism consists of transfer functions $T_i: [0, a] \rightarrow \mathfrak{R}$, $i = 1, \dots, N$, where $T_i(q)$ is the transfer received by firm i under the quantity profile q . Then, the net gain of firm i when regulated according to this mechanism will be the sum of its operational profits and the transfer it receives. Let $\pi_i^G(q; \theta)$ denote the net gain of firm i with the marginal cost θ when the output profile is q . (The superscript G points to the regulation of the oligopoly according to Gradstein's (1995) mechanism.) Then,

$$\pi_i^G(q; \theta) = P(Q)q_i - \theta q_i - K + T_i(q), \tag{11}$$

using $Q = \sum_i q_i$. Resultingly, the industry welfare at the quantity profile q would be

$$\pi^G(q; \theta) = \sum_i \pi_i^G(q; \theta) = P(Q)Q - \theta Q - NK + \sum_i T_i(q). \tag{12}$$

On the other side, the welfare of consumers under the given mechanism would be

$$CW^G(q; \theta) = V(Q) - P(Q)Q - \sum_i T_i(q). \tag{13}$$

Finally, we denote by $SW^G(q; \theta)$ the social welfare at the marginal cost level θ , which is the sum of $CW^G(q; \theta)$ and α fraction of $\pi^G(q; \theta)$, with $\alpha \in [0, 1]$. Formally,

$$\begin{aligned}
SW^G(q; \theta) &= CW^G(q; \theta) + \alpha \pi^G(q; \theta), \\
&= V(Q) - P(Q)Q - \sum_i T_i(q) + \alpha(P(Q)Q - \theta Q - NK + \sum_i T_i(q)), \\
&= V(Q) - \theta Q - (1 - \alpha)(P(Q)Q - \theta Q + \sum_i T_i(q)) - \alpha NK.
\end{aligned} \tag{14}$$

The mechanism $(T_i)_{i=1}^N$ satisfies the participation constraint for the oligopoly if

$$\pi^G(q; \theta) \geq 0, \tag{15}$$

for all $\theta \in \Theta$ and for all feasible profiles q . On the other hand, a mechanism $(T_i)_{i=1}^N$ and a quantity profile $q^S(\theta)$ maximize the social welfare $SW^G(q; \theta)$ only if the price is always equal to the marginal cost, i.e., $P(Q^S(\theta)) = \theta$, where $Q^S(\theta) = \sum_{i=1}^N q_i^S(\theta)$ for all $\theta \in \Theta$. Clearly, $q_i^S(\theta) = (a - \theta)/N$ and $Q^S(\theta) = a - \theta$ for all $\theta \in \Theta$. It then follows from (12) and $P(Q^S(\theta)) = \theta$ that the socially optimal quantity profile $q^S(\theta)$ satisfies the

participation constraint (15) if $\sum_i T_i(q^S(\theta)) \geq NK$. Since maximizing $SW^G(q; \theta)$ in (14) requires minimizing $\sum_i T_i(q(\theta))$, we must have $\sum_i T_i(q^S(\theta)) = NK$.

Because the marginal cost is only known to the firms, the regulator cannot directly enforce the socially optimal outcome at the given marginal cost. However, the regulator can implement this outcome by allowing the oligopolistic firms to play a Cournot game under a suitable chosen transfer mechanism $(T_i)_i^N$. In that game, firm i would maximize $\pi_i^G(q; \theta)$ given by (11). Let $q^*(\theta)$ denote the Cournot (Nash) equilibrium profile for that game. Then, for all i it must be true that

$$\pi_i^G(q_i^*(\theta), q_{-i}^*(\theta); \theta) \geq \pi_i^G(q_i, q_{-i}^*(\theta); \theta) \text{ for all } q_i \geq 0. \quad (16)$$

A mechanism $(T_i)_i^N$ is said to Nash implement the socially optimal outcome for the described oligopolistic industry if $q^*(\theta) = q^S(\theta)$ for all $\theta \in \Theta$. This mechanism also satisfies the participation constraint (15) if $\sum_i T_i(q^*(\theta)) = NK$ for all $\theta \in \Theta$. Using these definitions, we obtain the following result as a corollary to Proposition 1 of Gradstein (1995).

Proposition 2. *There exists a (transfer) mechanism that Nash implements the socially optimal outcome for the described oligopolistic industry and also satisfies the participation constraint (15).*

Proof. See the Appendix.

Note that at the socially optimal outcome, the social welfare reduces to

$$\begin{aligned} SW^G(\theta, \alpha, K, N) &\equiv SW^G(q^S(\theta); \theta) = V\left(\sum_i q_i^S(\theta)\right) - \theta \sum_i q_i^S(\theta) - NK, \\ &= \frac{[\sum_i q_i^S(\theta)]^2}{2} - NK, \\ &= \frac{(a - \theta)^2}{2} - NK. \end{aligned} \quad (17)$$

In the original mechanism of Gradstein (1995), the transfers are required to be balanced, i.e., $\sum_i T_i(q) = 0$ for all feasible profiles q , implying that the participation constraint for the oligopolistic firms are not taken into consideration. On the other hand, in our modified mechanism, the participation constraint can be satisfied at the industry level, i.e., $\sum_i \pi_i^G(q, \theta) = 0$, implying that some individual firms may obtain negative gains at the implemented social outcome while some others would obtain positive gains. In other words, it is not possible to ensure $\pi_i^G(q; \theta) \geq 0$ for each i (at all θ and q). Definitely, this is a serious weakness, casting doubts on the applicability of the presented implementation mechanism, i.e., the desirability of the oligopoly regulation, irrespective of the induced social welfare.

2.3. Regulated monopoly

Here, we consider that the oligopolistic industry is monopolized, with the regulator selecting one of the N symmetric firms (henceforth the monopolistic firm) as the sole producer. The monopolized market will then be subject to quantity and price regulation according to the direct-revelation mechanism proposed by BM (1982). This mechanism involves four functions (r, p, q, s) of the cost parameter. After the mechanism is announced, the monopolistic firm is asked to submit a cost report from the set Θ . If its report is $\hat{\theta}$, $r(\hat{\theta})$ is the probability that the monopolistic firm is allowed to produce, $p(\hat{\theta})$ and $q(\hat{\theta})$ are the price and quantity of the good respectively, and $s(\hat{\theta})$ is the subsidy received by the monopolistic firm. In that case, the welfare of the regulated firm would become

$$\pi(\hat{\theta}, \theta) = [p(\hat{\theta})q(\hat{\theta}) - C(q(\hat{\theta}), \theta)]r(\hat{\theta}) + s(\hat{\theta}). \quad (18)$$

A regulatory policy (r, p, q, s) is called by BM as *feasible* if it satisfies (19)-(22) for all $\theta \in \Theta$:

$$(i) \quad 0 \leq r(\theta) \leq 1 \quad (19)$$

$$(ii) \quad p(\theta) = P(q(\theta)) \quad (20)$$

$$(iii) \quad \pi(\theta, \theta) \geq \pi(\hat{\theta}, \theta), \text{ for all } \hat{\theta} \in \Theta \text{ (incentive - compat.)} \quad (21)$$

$$(iv) \quad \pi(\theta, \theta) \geq 0 \text{ (individual - rationality)} \quad (22)$$

Given a feasible regulatory policy (r, p, q, s) and any cost $\theta \in \Theta$, the consumer and the producer welfare would respectively become

$$CW(\theta) = [V(q(\theta)) - p(\theta)q(\theta)]r(\theta) - s(\theta), \quad (23)$$

$$\pi(\theta) \equiv \pi(\theta, \theta) = [p(\theta)q(\theta) - C(q(\theta), \theta)]r(\theta) + s(\theta). \quad (24)$$

The social welfare $SW(\theta, \alpha)$ is the sum of the consumer welfare and α fraction of the producer welfare, with $\alpha \in [0, 1]$. So,

$$\begin{aligned} SW(\theta, \alpha) &= CW(\theta) + \alpha \pi(\theta) \\ &= [V(q(\theta)) - C(q(\theta), \theta)]r(\theta) - (1 - \alpha) \pi(\theta). \end{aligned} \quad (25)$$

The regulator aims to choose a feasible mechanism (r, p, q, s) to

$$\text{maximize } \int_{\theta \in \Theta} SW(\theta, \alpha) f(\theta) d\theta \text{ subject to (19) - (22).} \quad (26)$$

Before presenting the optimal regulatory policy of BM, we introduce the following assumption. (This assumption, which simplifies the optimal regulatory policy and consequently our results in Section 3, was not needed by BM in their characterization result.)

Assumption 1. $F(\theta)/f(\theta)$ is nondecreasing on Θ .

The following result is a direct corollary to Proposition 1 of BM (1982).

Proposition 3. *Let Assumption 1 hold. Then, the solution to the problem in (26) is $(\bar{r}, \bar{p}, \bar{q}, \bar{s})$ satisfying equations (27)-(30) for all $\theta \in \Theta$:*

$$\bar{p}(\theta) = \theta + (1 - \alpha) \frac{F(\theta)}{f(\theta)} \quad (27)$$

$$P(\bar{q}(\theta)) = \bar{p}(\theta) \quad (28)$$

$$\bar{r}(\theta) = \begin{cases} 1 & \text{if } V(\bar{q}(\theta)) - \bar{p}(\theta)\bar{q}(\theta) \geq K \\ 0 & \text{otherwise} \end{cases} \quad (29)$$

$$\bar{s}(\theta) = [K + \theta\bar{q}(\theta) - \bar{p}(\theta)\bar{q}(\theta)]\bar{r}(\theta) + \int_{\theta}^{\theta_1} \bar{r}(\tilde{\theta})\bar{q}(\tilde{\theta})d\tilde{\theta} \quad (30)$$

Proof. See the Appendix.

Given (27)-(30), we can calculate the producer welfare, consumer welfare, and the social welfare as

$$\begin{aligned} \pi^{BM}(\theta, \alpha, K) &= \int_{\theta}^{\theta_1} \bar{r}(\tilde{\theta})\bar{q}(\tilde{\theta})d\tilde{\theta} \\ &= \int_{\theta}^{\theta_1} \bar{r}(\tilde{\theta}) \left(a - \tilde{\theta} - (1 - \alpha) \frac{F(\tilde{\theta})}{f(\tilde{\theta})} \right) d\tilde{\theta}, \end{aligned} \quad (31)$$

$$\begin{aligned} CW^{BM}(\theta, \alpha, K) &= [V(\bar{q}(\theta)) - K - \theta\bar{q}(\theta)]\bar{r}(\theta) - \pi^{BM}(\theta) \\ &= \frac{(a - \theta)\bar{q}(\theta)\bar{r}(\theta)}{2} - K\bar{r}(\theta) - \pi^{BM}(\theta), \end{aligned} \quad (32)$$

$$\begin{aligned} SW^{BM}(\theta, \alpha, K) &= [V(\bar{q}(\theta)) - K - \theta\bar{q}(\theta)]\bar{r}(\theta) - (1 - \alpha)\pi^{BM}(\theta) \\ &= \frac{(a - \theta)\bar{q}(\theta)}{2}\bar{r}(\theta) - K\bar{r}(\theta) - (1 - \alpha)\pi^{BM}(\theta), \end{aligned} \quad (33)$$

respectively. (Here, the superscript *BM* points to the regulation of the monopoly according to the BM mechanism.)

3. Results

For some of our results, we will need the following assumption.

Assumption 2. The demand parameter a satisfies

$$a > \sqrt{2K} + \theta_1 + \frac{1 - \alpha}{f(\theta_1)}. \quad (34)$$

When $\alpha = 1$ and $K = 0$, Assumption 2 reduces to $a > \theta_1$, which was already assumed in the description of the inverse demand curve in Section 2. Assumption 2, along with Assumption 1, will yield the following corollary (to Proposition 3), ensuring that the monopolistic firm will always be allowed to operate under the BM mechanism.

Corollary 1. *Let Assumptions 1 and 2 hold. Then the optimal mechanism in (27)-(30) implies $\bar{r}(\theta) = 1$ for all $\theta \in \Theta$.*

Proof. See the Appendix.

The below result shows that when the production requires fixed costs, one can always find a social welfare function with a sufficiently high weight for the producer welfare under which the regulation of the monopoly becomes, for the society, always superior to the regulated oligopoly, while the latter would become superior to the unregulated oligopoly.

Proposition 4. *Let Assumptions 1 and 2 hold. Then, for all $K > 0$ and integers $N \geq 2$, there exists $\bar{\alpha}(K, N) \in [0, 1)$ such that for all $\alpha \in [\bar{\alpha}(K, N), 1]$, we have*

$$SW^{BM}(\theta, \alpha, K) > SW^G(\theta, \alpha, K, N) > SW^C(\theta, \alpha, K, N) \text{ for all } \theta \in \Theta.$$

Proof. See the Appendix.

The above proposition partially changes when the fixed cost of production is zero. In that case, the highest social welfare can always be attained not only by the regulated monopolization of the oligopoly but also by the regulation of the oligopoly itself.

Proposition 5. *Let Assumptions 1 and 2 hold. Then, for all integers $N \geq 2$, there exists $\bar{\alpha}(N) \in [0, 1)$ such that for all $\alpha \in [\bar{\alpha}(N), 1]$, we have*

$$SW^{BM}(\theta, \alpha, 0) = SW^G(\theta, \alpha, 0, N) > SW^C(\theta, \alpha, 0, N) \text{ for all } \theta \in \Theta.$$

Proof. See the Appendix.

Propositions 4 and 5, both of which are valid when α is sufficiently close to 1, are silent for an arbitrary value of $\alpha \in [0, 1)$. However, we are able to show that for oligopolies with sufficiently high number of firms, a regulated monopoly is always socially more desirable than the regulated or unregulated oligopoly for any $\alpha \in [0, 1)$, provided that there are fixed costs of production.

Proposition 6. *Let Assumption 1 hold. Then, for all $\alpha \in [0, 1)$ and $K > 0$, there exists an integer $\bar{N}(\alpha, K) \geq 2$ such that for all integers $N \geq \bar{N}(\alpha, K)$, we have*

$$SW^{BM}(\theta, \alpha, K) > SW^C(\theta, \alpha, K, N) > SW^G(\theta, \alpha, K, N) \text{ for all } \theta \in \Theta.$$

Proof. See the Appendix.

One should note in the above proposition that the regulated oligopoly is not only inferior to the regulated monopoly but also to the unregulated oligopoly when the number of oligopolistic firms is sufficiently high. This is simply because of the participation constraint that requires consumers to finance the total fixed costs, NK , in the case of regulation. Since the weight of the consumer welfare is “one” in the social welfare function, the contribution of the total fixed costs to the social welfare becomes equal to $-NK$ in the case of a regulated oligopoly. On the other hand, the said contribution becomes $-\alpha NK$ in the case of an unregulated oligopoly, since the fixed costs are incurred by the oligopolistic firms and their welfare weight is α . The difference of these two

terms, $-(1 - \alpha)NK$, is always negative (unless $\alpha = 1$ or $K = 0$), making the regulated oligopoly inferior to the unregulated oligopoly for sufficiently high values of N . It follows that when α is different from 1 and when fixed costs are present in the production, the regulator should leave the oligopoly unregulated, unless, of course, her policy choices involve the regulated monopolization of the oligopoly, which happens to be the first-best policy option. As shown by the next result, Proposition 6 is no longer valid when there are restrictions on the size of the fixed costs.

Proposition 7. *Let Assumption 1 hold and consider any $\alpha \in [0,1)$. Then, (i) for all $N \geq 2$ there exists $K(\alpha, N) > 0$ such that $SW^G(\theta, \alpha, K, N) > SW^C(\theta, \alpha, K, N)$ for all $K \in [0, K(\alpha, N)]$ and $\theta \in \Theta$, and (ii) there exist $K(\alpha) > 0$ and integer $N(\alpha) \geq 2$ such that $SW^C(\theta, \alpha, K, N) > SW^{BM}(\theta, \alpha, K)$ for all $K \in [0, K(\alpha)]$, integers $N \geq N(\alpha)$, and $\theta \in \Theta$.*

Proof. See the Appendix.

Proposition 7 shows that in situations where the fixed costs of production are sufficiently small, regulating an oligopoly is always superior to not regulating it from the viewpoint of the society. Additionally, if in these situations the number of firms is sufficiently large, even the unregulated oligopoly becomes socially superior to the regulated monopoly.

4. Conclusion

In this paper, we have studied whether a Cournot oligopoly with unknown costs should be left unregulated, or optimally regulated, or first monopolized and then optimally regulated. For the given oligopolistic industry, we have first characterized the Cournot (Nash) equilibrium allocation of the quantity competition game (Proposition 1). Next we have presented the equilibrium allocation when the oligopoly is optimally regulated (Proposition 2) according to the mechanism of Gradstein (1995). As the final component of our model, we have also considered the situation when one of the oligopolistic firms is granted the monopoly right and optimally regulated (Proposition 3) according to the mechanism of BM (1982). Calculating the actual social welfare in each of these three cases, we have been able to show that when there are fixed costs in production and also the weight of the producer welfare in the social welfare function, i.e., the α parameter, takes a sufficiently high value in the unit interval, the realized social welfare is always higher for the optimally regulated monopoly than for the regulated oligopoly, while regulating the oligopoly becomes socially more desirable than not regulating it (Proposition 4). This result slightly changes when fixed costs are absent in production. In that case, the highest social welfare can always be attained not only with an optimally regulated monopoly but also with an optimally regulated oligopoly (Proposition 5).

Next, we have considered oligopolies with large number of firms (or simply large oligopolies), allowing us to make welfare comparisons for values of α not very close to one. We have showed that for any α less than one, there always exists a sufficiently large oligopoly such that the outcome obtained from the optimally regulated monopolization of this oligopoly is always (socially) welfare superior to the unregulated (Cournot) outcome, which, on the other hand, is always welfare superior to the regulated outcome of the same

oligopoly (Proposition 6). However, this result dramatically changes if there are size restrictions on the fixed costs. For situations where the fixed costs of production are sufficiently small, we find that optimally regulating a Cournot oligopoly is always superior to not regulating it from the viewpoint of the society (Proposition 7(i)). Additionally, if in these situations the number of firms is sufficiently large, even the unregulated oligopoly may become socially superior to the optimally regulated monopoly (Proposition 7(ii)).

To conclude, this study has revealed that whether and how to regulate an oligopolistic industry cannot be answered independently of the number of the oligopolistic firms and the size of their fixed costs, and the definition of the social welfare function, i.e., the relative weight of the producer welfare. The sum of information rents an optimal regulatory mechanism should offer to the regulated firms can be as low as the total fixed costs of production in the case of an oligopoly, rendering a regulated oligopoly socially more desirable than a regulated monopoly provided that these fixed costs are sufficiently small. Oppositely, in cases where the production processes require large fixed costs, the regulated monopolization of an oligopoly becomes socially superior to the regulation of the oligopoly if the social welfare function does not treat producers and consumers very asymmetrically or if the number of oligopolistic firms is sufficiently large.

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Appendix

Proof of Proposition 1. The problem of firm i , given that the rest of the firms choose quantities in q_{-i} , is given by

$$\max_{q_i \geq 0} \pi_i(q_i, q_{-i}; \theta) = \max_{q_i \geq 0} P(Q)q_i - \theta q_i - K. \quad (35)$$

The first-order condition for (35) is given by

$$q_i = \frac{a - \theta - \sum_{j \neq i} q_j}{2}. \quad (36)$$

The symmetry of the firms implies $q_j = q_i$ for all $j \neq i$, further implying $\sum_{j \neq i} q_j = (N - 1)q_i$. Inserting this into (36) yields (6). The second-order condition for maximization is satisfied since $\partial \pi_i(q_i, q_{-i}; \theta) / \partial q_i = -2$ at all (q_i, q_{-i}) . *Q.E.D.*

Proof of Proposition 2. In our model the inverse demand function is a polynomial of degree 1 and N is assumed to be at least 2. Proposition 1 of Gradstein (1995, p. 324) shows that if the inverse demand function is a polynomial of at most $(N - 1)$ th degree, then socially optimal outcome can be Nash implemented by a mechanism $T_i: [0, a] \rightarrow \mathfrak{R}$, $i = 1, \dots, N$ such that $\sum_i T_i(q) = 0$ for all feasible profiles q . Let $(T_i)_i^N$ be such a mechanism, and consider the modified mechanism $T_i^*: [0, a] \rightarrow \mathfrak{R}$, $i = 1, \dots, N$ such that $T_i^*(q) = K + T_i(q)$ for all feasible profiles q . It is clear that the modified mechanism Nash implements the socially optimal outcome and also satisfies the participation constraint (15). *Q.E.D.*

Proof of Proposition 3. Due to Assumption 1, $\bar{p}(\theta)$ is nondecreasing in θ and therefore $\bar{q}(\theta)$ and $\bar{r}(\theta)$ are nonincreasing in θ . Thus, the proposition is a direct corollary to Proposition 1 of BM (1982, pp. 920-921). *Q.E.D.*

Proof of Corollary 1. Note that Assumption 2 can be rewritten as $a > \sqrt{2K} + \theta_1 + (1 - \alpha)F(\theta_1)/f(\theta_1)$, since $F(\theta_1) = 1$. Then Assumptions 1 and 2 together would imply that for all $\theta \in \Theta$ we have $a > \sqrt{2K} + \theta + (1 - \alpha)F(\theta)/f(\theta) = \sqrt{2K} + \bar{p}(\theta)$, further implying $\bar{q}(\theta) = a - \bar{p}(\theta) > \sqrt{2K}$ or $\bar{q}(\theta)^2/2 > K$. Since $V(\bar{q}(\theta)) - \bar{p}(\theta)\bar{q}(\theta) = \bar{q}(\theta)^2/2$, equation (29) implies that $\bar{r}(\theta) = 1$ for all $\theta \in \Theta$. *Q.E.D.*

Proof of Proposition 4. Since Assumption 1 holds, the optimal mechanism regulating a monopoly is given by (27)-(30). Now let $\alpha = 1$ and consider any $K > 0$, $\theta \in \Theta$ and integer $N \geq 2$. Equation (10) implies

$$SW^C(\theta, 1, K, N) = \frac{(a - \theta)^2 (N^2 + 2N)}{2(N + 1)^2} - NK, \quad (37)$$

whereas equation (17) implies

$$SW^G(\theta, 1, K, N) = \frac{(a - \theta)^2}{2} - NK. \quad (38)$$

On the other hand, it follows from equation (33) that

$$SW^{BM}(\theta, 1, K) = \frac{(a - \theta)^2}{2} - K, \quad (39)$$

since $\alpha = 1$ implies $\bar{q}(\theta) = a - \theta$ and Corollary 1 implies (thanks to Assumptions 1 and 2) $\bar{r}(\theta) = 1$ for all $\theta \in \Theta$. Apparently, $SW^{BM}(\theta, 1, K) > SW^G(\theta, 1, K, N) > SW^C(\theta, 1, K, N)$. Since $SW^{BM}(\theta, \alpha, K)$, $SW^G(\theta, \alpha, K, N)$, and $SW^C(\theta, \alpha, K, N)$ are all continuous w.r.t. α , there exists $\bar{\alpha}(K, N) \in [0, 1)$ such that for all $\alpha \in [\bar{\alpha}(K, N), 1]$, we have $SW^{BM}(\theta, \alpha, K) > SW^G(\theta, \alpha, K, N) > SW^C(\theta, \alpha, K, N)$ for all $\theta \in \Theta$. *Q.E.D.*

Proof of Proposition 5. Since Assumption 1 holds, the optimal mechanism regulating a monopoly is given by (27)-(30). Let $K = 0$, and pick any $\theta \in \Theta$ and integer $N \geq 2$. Also let $\alpha = 1$. Equation (10) implies

$$SW^C(\theta, 1, 0, N) = \frac{(a - \theta)^2}{2} \frac{(N^2 + 2N)}{(N + 1)^2}, \quad (40)$$

whereas equation (17) implies

$$SW^G(\theta, 1, 0, N) = \frac{(a - \theta)^2}{2}. \quad (41)$$

On the other hand, it follows from equation (33) that

$$SW^{BM}(\theta, 1, 0) = \frac{(a - \theta)^2}{2}, \quad (42)$$

since $\alpha = 1$ implies $\bar{q}(\theta) = a - \theta$ and Corollary 1 implies (thanks to Assumptions 1 and 2) $\bar{r}(\theta) = 1$ for all $\theta \in \Theta$. Apparently, $SW^{BM}(\theta, 1, 0) = SW^G(\theta, 1, 0, N) > SW^C(\theta, 1, 0, N)$. Since $SW^{BM}(\theta, \alpha, 0)$, $SW^G(\theta, \alpha, 0, N)$, and $SW^C(\theta, \alpha, 0, N)$ are all continuous w.r.t. α , there exists $\bar{\alpha}(N) \in [0, 1)$ such that for all $\alpha \in [\bar{\alpha}(N), 1]$, we have $SW^{BM}(\theta, \alpha, 0) = SW^G(\theta, \alpha, 0, N) > SW^C(\theta, \alpha, 0, N)$ for all $\theta \in \Theta$. *Q.E.D.*

Proof of Proposition 6. Since Assumption 1 holds, the optimal mechanism regulating a monopoly is given by (27)-(30). Now, pick any $\alpha \in [0, 1)$ and $K > 0$. Equation (10) implies

$$\lim_{N \rightarrow \infty} SW^C(\theta, \alpha, K, N) = \lim_{N \rightarrow \infty} \frac{(a - \theta)^2}{2} \frac{(N^2 + 2\alpha N)}{(N + 1)^2} - \alpha NK = -\infty. \quad (43)$$

On the other hand, $SW^{BM}(\theta, \alpha, K)$ is always finite. Thus, there exists an integer $\bar{N}_1(\alpha, K) \geq 2$ such that for all integers $N \geq \bar{N}_1(\alpha, K)$, we have $SW^{BM}(\theta, \alpha, K) > SW^C(\theta, \alpha, K, N)$ for all $\theta \in \Theta$. Also note that subtracting (10) from (17) yields

$$\begin{aligned} SW^G(\theta, \alpha, K, N) - SW^C(\theta, \alpha, K, N) \\ = \frac{(a - \theta)^2}{2} \frac{[1 + 2(1 - \alpha)N]}{(N + 1)^2} - (1 - \alpha)NK. \end{aligned} \quad (44)$$

It follows that

$$\lim_{N \rightarrow \infty} [SW^G(\theta, \alpha, K, N) - SW^C(\theta, \alpha, K, N)] = -\infty, \quad (45)$$

implying that there exists an integer $\bar{N}_2(\alpha, K) \geq 2$ such that for all integers $N \geq \bar{N}_2(\alpha, K)$, we have $SW^C(\theta, \alpha, K, N) > SW^G(\theta, \alpha, K, N)$ for all $\theta \in \Theta$. Let $N(\alpha, K) = \max \{ \bar{N}_1(\alpha, K), \bar{N}_2(\alpha, K) \}$. So,

$SW^{BM}(\theta, \alpha, K) > SW^C(\theta, \alpha, K, N) > SW^G(\theta, \alpha, K, N)$ for all $\theta \in \Theta$ if $N \geq \bar{N}(\alpha, K)$. *Q. E. D.*

Proof of Proposition 7. Consider any $\alpha \in [0, 1)$.

Part (i): Inserting $K = 0$ into (10) and (17), we obtain

$$SW^C(\theta, \alpha, 0, N) = \frac{(a - \theta)^2}{2} \frac{N^2 + 2\alpha N}{(N + 1)^2}, \quad (46)$$

and

$$SW^G(\theta, \alpha, 0, N) = \frac{(a - \theta)^2}{2}, \quad (47)$$

respectively. Evidently, $SW^G(\theta, \alpha, 0, N) > SW^C(\theta, \alpha, 0, N)$ for all integers $N \geq 2$ and $\theta \in \Theta$. Since $SW^C(\theta, \alpha, K, N)$ and $SW^G(\theta, \alpha, K, N)$ are continuous w.r.t. K , we conclude that for all $N \geq 2$ there exists $K(\alpha, N) > 0$ such that $SW^G(\theta, \alpha, K, N) > SW^C(\theta, \alpha, K, N)$ for all $K \in [0, K(\alpha, N)]$ and $\theta \in \Theta$.

Part (ii): Since Assumption 1 holds, the optimal mechanism regulating a monopoly is given by (27)-(30). We insert $K = 0$ to (33) to get

$$SW^{BM}(\theta, \alpha, 0) = \frac{(a - \theta)\bar{q}(\theta)}{2} - (1 - \alpha)\pi^{BM}(\theta), \quad (48)$$

since $K = 0$ implies $\bar{r}(\theta) = 1$ for all $\theta \in \Theta$. Note also that

$$\lim_{N \rightarrow \infty} SW^C(\theta, \alpha, 0, N) = \frac{(a - \theta)^2}{2}, \quad (49)$$

which is higher than $SW^{BM}(\theta, \alpha, 0)$, for all $\theta \in \Theta$ and $\alpha \in [0, 1)$, since $\bar{q}(\theta_0) = a - \theta_0$ and $\bar{q}(\theta) < a - \theta$ for all $\theta \in (\theta_0, \theta_1]$, and $\pi^{BM}(\theta) > 0$ for all $\theta \in [\theta_0, \theta_1)$ and $\pi^{BM}(\theta_1) = 0$. Therefore, there exists an integer $\bar{N}(\alpha) \geq 2$ such that for all integers $N \geq \bar{N}(\alpha)$, we have $\lim_{N \rightarrow \infty} SW^C(\theta, \alpha, 0, N) > SW^{BM}(\theta, \alpha, 0)$ for all $\theta \in \Theta$. Because $SW^C(\theta, \alpha, K, N)$ and $SW^{BM}(\theta, \alpha, K, N)$ are continuous w.r.t. K , there exist $K(\alpha) > 0$ and an integer $N(\alpha) \geq 2$ such that $SW^C(\theta, \alpha, K, N) > SW^{BM}(\theta, \alpha, K)$ for all $K \in [0, K(\alpha)]$, integers $N \geq N(\alpha)$, and $\theta \in \Theta$. *Q. E. D.*

Banking Union framework and the stability of the European Banking sector

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Abstract. *In the past few years, the ECB faced many challenges in conducting the monetary policy in Eurozone. The sovereign debt crisis revealed the economic growth divergence between center and periphery in the European model. The creation of the Eurozone increased the correlation link between the banking sector and the public debt. The European authorities' role is to break down the doom loop between public debt and banks. During the sovereign debt crisis ECB exceeded its monetary policy objective of price stability through diverse operations assimilated by the markets as debt monetization. The Banking Union framework should approach three sensitive points related to fiscal sustainability, an integrated financial system and an EMU shock absorption mechanism.*

Keywords: Banking Union, debt monetization, price stability, public debt, financial shock.

JEL Classification: E44, E58.

Introduction

The sovereign debt crisis emphasized the lack of coordination between monetary and fiscal policies in the Eurozone. In order to restore credibility in the financial system ECB exceeded its limits and approached unconventional monetary policies. The tight link between public debt and the banking sector fueled the negative reaction from the financial markets. The crisis eroded the confidence in the Eurozone framework and proved that the deficit of political legitimacy in many sectors is a potential threat for EU. The creation of the Banking Union and the new financial framework in EU is destined to change the perception of the financial markets. The huge influence of the banking sector in the financing of the non-financial firms in EU created vulnerabilities for the national economies. Due to the uncertainties and the lack of stability in the financial system, the development of the private sector and implicitly, the economic growth of national economies in Eurozone were affected.

Analysis

The task of the ECB is dominated by three major constraints: national fiscal policies, exogenous or endogenous financial shocks and regional divergences. The main task of the ECB is written in article 127 (1) of the Treaty of the Functioning of the European Union: *“The primary objective of the European System of Central Banks (...) shall be to maintain price stability”*. In fulfilling this task of preserving price stability, it has full independence from EU institutions, bodies or agencies and from national governments of states members as exposed by Talani (2009).

ECB behavior during the crisis exceeded its primary objective and through its operations contributed in absorbing the shocks suffered by the banking sector through their public bonds exposure. Its monetary policy ventured into unknown territory and was often criticized by economists. In order to secure this policy ECB referred to Article 127 (1) *“without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union”*.

The monetary policies were dominated by unconventional features:

- Quantitative Easing Programmes - targeted credit easing through asset purchases, the Eurosystem bought covered bonds of over 100 billion euros during 2009-2012.
- Longer Term Refinancing Operations (LTROs) with maturities up to three years, from which the banking sector from Eurozone borrowed almost 1 trillion euros.
- Emergency Liquidity Assistance (ELA) - an emergency liquidity line, provided by national central banks to solvent banks that in exceptional moments do not have high quality collateral to access normal Eurosystem operations. It was commonly used during Greek, Cyprus and Ireland crises in order to stabilize their national banking sector and it was latter criticized by outsiders because of the lack of transparency in these operations.

- Collateral policy - several times during the sovereign debt crisis ECB changed its collateral framework changing the assets eligibility in order to ease possible shortcomings derived from collateral shortage.

During this period ECB designed two government purchasing Programmes, the Securities Market Programme (May 2010 - September 2012) and Outright Monetary Transactions (after September 2012). Their common goal was to sterilize the monetary liquidity and restore the transmission channels of monetary policy. The OMT is unlimited in principle, the limitations deriving strictly from the outstanding stock of eligible bonds with maturities between one and three years. *ELA provided banks a carry trade opportunity and created additional profits for the financial institutions, while realizing a back-door financing of public debt* (Veron, 2013).

Through this mechanism, banks borrowed cheaply from ECB in order to purchase government bonds with higher interest rates. Even if the OMT purchases were carried on the secondary markets a lot of economists saw this as a debt monetization procedure. A lot of investors purchased bonds on the primary market, acting as an intermediate for ECB secondary market purchases. The abrupt interruption of these operations could endanger the health of the European banking sector, while the uninterrupted continuation of this mechanism could diminish the ECB credibility.

In normal times central banks rarely adopt these sort of unconventional policies due to the theoretical issue of moral hazard (Darvas and Merler, 2013). The direct correlation between the sovereign debt problem and the liquidity of the European banking sector created the premises for this monetary policy approach. The composition of Tier1 Capital in the most important financial institutions in Eurozone was and is still dominated by public bonds. The European statistics reveal that Center and Northern European states increased their exposure on southern countries after 1999, and mainly after the convergence of the inflation rates in Euro Area as emphasized by Eichengreen (2010). The removal of exchange rate risk led to cross-border positions between financial investors in the core countries and borrowers in the periphery.

The creation of the Banking Union should diminish the link between the banking sector and sovereign debt. Without the fulfillment of this goal the stability of the financial system in Europe is in doubt and a negative reaction of the financial markets could anytime trigger another shock. This interdependence led to a fragmentation of the single market and raised doubts over the evolution of the European model. Faced with global competition, the European banking system needs a new framework based on strong pillars to ensure financial stability in the Eurozone.

The vicious circle between sovereign debt of the Member States and the European banking system stability must be restored on new principles able to ensure progress towards an integrated single market. The regulatory framework of the Eurozone Member States must guarantee against the following risks: asymmetric economic

shocks, the divergence pattern of economic growth between center and periphery, a stable banking sector able to surpass recessions or global shocks. The interdependence between Member States and the new directions of international banking regulations could cause systemic risks in the European model in the absence of a functional coordination mechanism. In this context, the lack of a stable regulatory framework can cause fragmentation of the single market and reverse the evolution towards a less integrated banking sector in Europe.

The new lawmaking process of the European financial system comprises the following three steps:

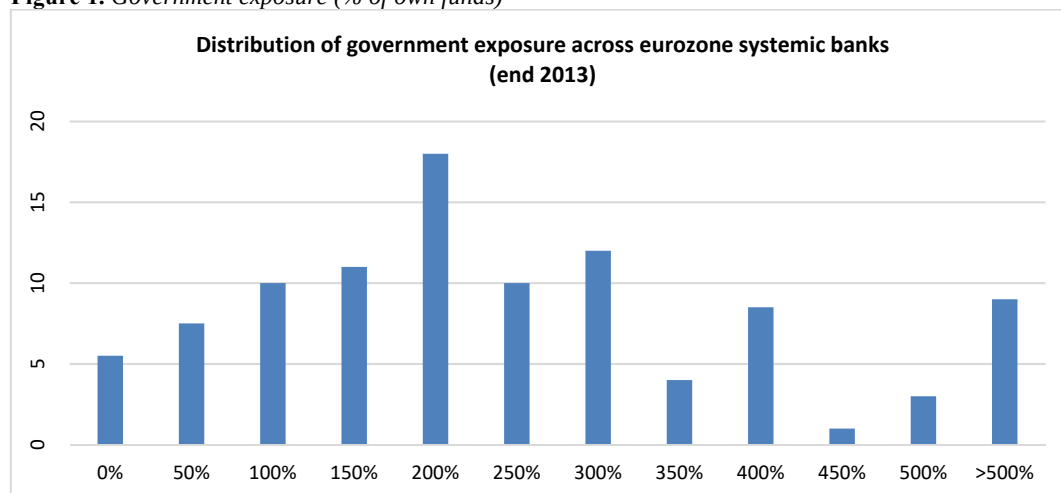
- ensuring financial stability and interdependence while breaching the link between European banks and sovereign debt;
- expanding the regulatory framework of the financial system through the implementation of structural policies at national level;
- establishing a single mechanism able to surpass endogenous and exogenous shocks in the euro area.

The creation of the Banking Union should tackle at least two particular issues according to Daniel Gros (2016):

- *Banks hold too much debt of their own sovereign. A sovereign default would bankrupt the banks in the country, a case illustrated by Greece.*
- *Deposit insurance has been left in national hands with only a national back-up. But if there is a national crisis the government might not be able to provide a credible backstop for deposits (Ireland).*

Banking regulation should be redesigned in order to apply a common rule for sovereign bonds compared to other debtors. The general purpose of this rule is evident, the insolvency of one debtor should not endanger the entire capital of a bank.

Figure 1. Government exposure (% of own funds)



Source: De Groen, 2015.

The histogram shows the total exposure to governments as a share of the total own funds across different own funds bins. According to de Groen (2015) *“18% of the banks had exposures to governments between 150% and 200% of their own funds”*. The data and distribution was set on 109 Eurozone banking institutions and subsidiaries on non-EU banks that were stress-tested by EBA. The entire group of large financial institutions selected held at the start of 2014 almost 2.5 trillion Euros sovereign debt. The calculations reveal that this figures represent twice the total sum of their own funds.

Definitely, a large exposure rule should be applied to government debt in the Euro Area, breaking the vicious link between sovereign debt and banking sector. The national deposit insurance funds cannot cope with large financial institutions balance sheets. The Ireland crisis clearly emphasized this problem, so the Banking Union should approach the subject of resolution funding from an entire system level. European authorities should advance this problem from a common perspective raising the issue from national to the European level. As Daniel Gros and Schoenmaker (2014) emphasized *“nation states are usually able to deal with small shocks themselves, but they need support when the shock is so large that access to the capital market is impaired”*.

As I described (Hrebenciuc, 2010) *“The eternal issue of the states with large structural budgetary issues that cannot be automatically regulated and in which the automated stabilizers have a significant role continued to exercise a high amount of pressure. It seems that the situation is also suffering due to an endless string of factors, with negative influence over the entire development”*.

The economic development of the European model depends largely on the role and functioning of the financial system in a globalized world. Effective national economic policies and economic convergence toward the center of the model cannot be achieved without the existence of financial stability in the banking sector. One of the main problems regarding ECB authority at the EU level was the lack of supervision over the banks during the crisis. The monetary policy was at times less powerful, due to the fact that banks were under the supervision of national authorities, while the ECB had no clue over the health of their balance sheets. The 2007 example of the collapse of Northern Rock showed how the lack of coordination between different authorities emphasized the limits of a lender of last resort not involved in supervision.

The vicious circle made up of sovereign debt and the stability of the financial institution has created a regulatory vacuum in the Eurozone. In this context, decision makers have mapped the configuration of a new legislative framework to ensure credibility in the system. As revealed by Veron (2013) after November 2014 ECB formally started to over-see the Eurozone banking system, following the decision to create a single supervision entity at Euro Area level in 2012.

The new configuration includes a set of measures focused on three main areas:

- Banking Union - the Single Supervisory Mechanism, National deposit guarantee schemes, the Single Resolution Mechanism, direct recapitalization through the European Stability Mechanism.
- Fiscal Union - 'Six Pack' Treaty on stability, coordination and governance 'package two'.
- Economic Union Frame - ex-ante coordination of reforms of economic policy (TSCG, art11), understandings contractual inserted in the European semester aimed at absorbing asymmetric shocks.

The Banking Union framework should provide a higher banking integration inside the Eurozone. This will translate in a convergence of interest rate in the banking sector in Euro Area. Studies reveal that the convergence is less powerful in retail banking due to the high degree of heterogeneity in demand for retail credit products. Because of the preference for debt versus equity financing in different states, ECB should not expect the convergence of bank loans interest rates. At this moment, the overall picture that emerges is one of limited bank integration in Europe and incomplete bank integration within states in Europe.

ECB (2009) studies revealed a higher integration in euro money markets after the creation of Eurozone. The elimination of exchange rate cost facilitated the comparability between rates of returns of banks in the Euro Area countries. The perception that banking sector is integrated if there is a common ROA (Return on Assets) to which all banks converge seems to function for US, but not in Europe.

The US banking sector is reasonably well integrated, while the European banking sector is far from reaching this point near soon. R. Gropp and A. Kashyap (2010) revealed that: *“non-listed banks have still prominent market shares in both US and Europe, while the percentage of European bank assets residing in listed banks is 53 percent and 47 percent in US. In the United States, listed and unlisted bank profits converge to the same target level, while in Europe only the listed banks appear to be governed by a common ROA”*.

The economic and financial integration has led several countries (ex. Ireland) to specialize in the production of financial services. This phenomenon led to a growing shadow banking system that erupted in the public debt crisis and required large public capital infusions for its survival. In 2008 at the height of the financial crisis the Euro Area member states devoted almost 1.5 trillion euros in order to recapitalize their banking systems (Wallace, 2016). The instability of the financial sector in Europe would cause great imbalances, according to the figures published in 2014 by Association of Financial Markets in Europe, banks provided almost 70% of debt financing for non-financial firms. The health of the banking sector greatly influences the real economy of the Euro Area. The low economic growth of the core countries after 2010 partly aroused from the capital problems in the financial system.

Conclusion

The recent crisis has emphasized that Eurozone government debt is not immune to default. The new legislative framework should relieve public debt restructuring with private sector burden sharing. Given the fact that many large financial institutions in Europe contain government bonds in their Tier1 capital, the large exposure rule would be a first step in breaking the tight link between public debt and banking sector. This problem could be resolved through ECB operations of asset purchases along with the introduction of large exposure requirement. The entire problem should be supervised at European level in order to mitigate the possible negative shocks. Any future crisis is hard to manage because of Euro Area different practices with regard to deposit insurance and bankruptcy procedures.

The designing of a new financial framework for Eurozone is directly influenced by the political legitimacy deficit. The behavior of some member states unable to ensure their national fiscal sustainability and proceed to real structural reforms negatively affects the whole process designed at EU level. EU policies should direct the banking sector to a US style system, in which state level public debt is small, there is no federal financial bail-out and the central bank does not purchase public bonds. US banks do not hold a large amount of state debt and an eventual crisis in the state government funding does not affect the financial stability of the banking system.

The new financial framework in Europe should distance ECB from any sort of conflict of interest or back door debt monetization. The public debt crisis revealed major differences in the transmission of monetary policy across the members of the Euro Area. The scope of the Banking Union creation is to acquire a balance between the banking sector stability and sovereign debt problems in EU.

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