Macroeconomics and Monetary Economics

Supporting Herbal Agriculture Market in Romania - Desideratum or Reality

Ionica Oncioiu[1]

Abstract: Currently, Medicinal & Aromatic Plants (MAPs) sector are growing fast. This article is a trial of designing the challenges and future directions of medicinal herbal market in Romania, taking into consideration the medicinal plants market and individual exploitations. Data was collected from Romanian Medicinal and Aromatic Plants Growers, Manufacturers and Users Association using pretested questionnaire. Data were entered, cleaned and analysed by SPSS version 17. T-test, ANOVA and Regression analysis were carried out and the association was considered significant at p-value less than 0.05. A total of 220 respondents participated in the study, making a response rate of 88%. Our results indicate that the negotiation power of the legal person buyers is significantly bigger than that of the medicinal herbs individual producers and that this type of buyer benefits by significantly diminished prices. The study showed that a more positive attitude of consumers towards medicinal plants products will further strengthen the purchasing intentions, while the status of a bio consumers' consumption will not affect any change on their willingness to purchase medicinal herbs products.

Keywords: consumer behaviour; aromatic plants; herbal medicine; agricultural production

JEL Classification: D49

Introduction

In today's context, of great changes and mutations, both economic and especially natural bio-resources, it is important to know and to be conscious of products with medicinal properties origin (Bečvářová, 2005; Fowler, 2006). All of these phenomena work in favour of those at the heart of the natural medicine pyramid: plant-growers with therapeutic properties (Craig, 1999; Jamroz & Kamel, 2002). Although, with the development of chemistry, a number of synthetic drugs have been introduced into therapeutics, pharmaceutical and pharmacodynamics research states that plant-derived drugs are more biologically accessible products than

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human metabolism than synthetic drugs that sometimes produce harmful side effects (Mentreddy, 2007; Prakash, 2015).

A large number of medicinal and aromatic plant species, spice herbs and fruits are collected from the wild in Romania. As Romania ranks 6th in the number of medicinal herbs on the territory of the country, with more than 800 species, the businesses based on their cultivation have increased over the past two years by 40% (Sammons et al., 2016). Currently, Romania has become in the last years the main supplier of herbs for the countries of Europe, but also for America or Canada (exports increased by about 40% in 2016 compared to 2014). Traditionally, some large Romanian manufacturers secured supplies of raw materials by raising these on their own plantations.

An important statement of agricultural enterprises is that the organizations have a problem of anticipation and adaptation to what happens in their environment of existence and functionality (Horalíková & Zuzák, 2005; Houghton & Mukherjee, 2009; Carrubba & Scalenghe, 2012). By the same token, in the near future, trade structures in Romania will change again. PLAFAR's domination of the Romanian medicinal herbal market has declined continuously over the last couple of years, and there is an increasing number of small and medium-sized private companies competing on the market (e.g. PlantExtrakt). In 2016, Sommer (2016) reiterate the idea that some of the private companies do not contract their own collectors, but buy medicinal and aromatic plant raw material from intermediate traders or small companies.

From the point of view of the competition rules, the behaviour of individual producers of medicinal herbs has certain special characteristics such as: individual herb exploitations are characterized by a low financial power, which increases the degree of dependence on other market participants by implicitly reducing their possibilities of action; the existence of a significant difference between the negotiating power of the purchasers of legal medicinal products and that of the producers of individual medicinal products; in the primary market of medicinal products marketing, the representatives of the demand are traders and processors, whereas in the later stage of the marketing of these products the demand is expressed exclusively by the processors; it is worth noting that there is a link to the direct proportionality between the surface between the cultivated area and the distance to which the producers are willing to sell their production.

The market of medicinal herbal in Romania comes with several issues to be solved: better collaboration between authorities; more efficient policies for official control because of very complex matrices of medicinal herbs, more reliable and efficient laboratory methods of testing are necessary.

This article brings a new look to the actual empirical studies that try to demonstrate the connection between the organization of the medicinal plants sector, the

functioning and the mechanisms of this sector. This investigation provide an image of the competition mechanisms and the econometric estimations create a working instrument for the future analyses of the medicinal plants market for medicinal herbs producers, retailers and distributors.

On the other side, the main aim of this study is to deepen and discover a reality which is more or less known at the level of common sense. The novel European concept "integrated benefit – risk assessment" as well as the American concept of "multidisciplinary approach of food fraud" European Community regulations and national legal framework regarding to herbal products have been developed for the safety of citizens and public health. In order to not mislead consumers, by regulations on labelling, manufacturers of herbal food supplements and other final products from plants classified by law as a foodstuff must not attribute them the action to prevent, treat or cure a human disease or refer to such properties (Novak, 2014).

More importantly, the results of the present study suggest that the more positive attitude of consumers towards medicinal plants products will further strengthen the purchasing intentions while the status of a bio consumers' consumption will not affect any change their willingness to purchase medicinal herbs products.

The rest of the article is organised as follows: Section 2 details the materials and methods development; in Section 3 we present our results and discusses our findings; Section 4 provides concludes and suggests same recommendations as possible ways to improve practical implications.

Materials and Methods

The survey was performed during the first trimester of 2017. The sample was established on the basis of the data provided by Romanian Medicinal and Aromatic Plants Growers, Manufacturers and Users Association (http://ropam.org.ro/). The study utilized data collected through questionnaires adapted from previous studies (Harnischfeger, 2000; Kennedy, 2008; Ranjbar, 2014). The questionnaires were forwarded to 250 medicinal herbs producers, retailers, distributors, receiving back a number of 220 responses (88%).

The questionnaire has four sections. Sections A and B of the questionnaire measured information on the different stages of the medicinal plant production process. Section C evaluated attitudes and purchase intentions of medicinal herbs products. Section D contained items regarding information on sales, transport and storage of medicinal plants. All items were measured on a seven-point Likert-scale with one representing "I totally disagree" to seven representing "I totally agree". We computed the sample size by the formula for simple random sampling technique using the proportion ($p = 0.5$) that provides the maximum sample size, at

95% level of significance, and margin of error (d) of 0.05. Data were entered, cleaned and analysed by SPSS version 17. T-test, ANOVA and Regression analysis were carried out and the association was considered significant at p-value less than 0.05. A total of 220 respondents participated in the study, making a response rate of 88%. The analysis of the responses provided Cronbach's alpha test result of 70 percent, indicating good reliability of the questionnaire.

Results and Discussion

A total of 220 respondents participated in the study, making a response rate of 88%. The age between 31 - 45 years old with 61.4% had most frequency among age group. The most respondents had the knowledge about medicinal plants and were able to correctly describe them, whilst 32% did not. The analysis showed that there was a statistically significant difference between those in medicinal herbs producers group and in the medicinal herbs retailers and distributors ($p < 0.001$). However, there was no statistically significant difference between the two groups in relation to their tendency towards Medicinal & Aromatic Plants cultivation or purchase (Table 1 and Table 2).

Table 1. Description figures about tendency towards Medicinal & Aromatic Plants cultivation or purchase

P values	F	Average of squares	Degree of freedom	variables
<0.001	24.25	410.53	1	knowledge
<0.001	170.69	1804.82	1	trust
0.024	3.57	51.27	1	accessibility
0.06	1.42	26.37	1	price

Table 2. ANOVA between independents variables and tendency towards Medicinal & Aromatic Plants cultivation or purchase

P values	**Medicinal herbs producers**		**Medicinal herbs retailers and distributors**		Tendency towards Medicinal & Aromatic Plants cultivation or purchase
	percent	frequency	percent	frequency	
<0.001	0.83	1	0	0	Weak tendency
	31.67	38	45	45	Middle tendency
	67.50	81	55	55	Strong tendency
	100	120	100	100	Total

There was a statistically significant relationship between knowledge and tendency towards Medicinal & Aromatic Plants cultivation or purchase (β = -0.87; p = <0.001).The findings from the ANOVA analysis showed that the participant's knowledge had a statistically significant effect on the tendency towards Medicinal & Aromatic Plants cultivation or purchase. The negative coefficient indicates that as knowledge increases, the tendency towards Medicinal & Aromatic Plants cultivation or purchase decreases. As trust increases, the tendency towards Medicinal & Aromatic Plants cultivation or purchase increase and this could be expressed mathematically as $y = 10.54 + 1.42x$, where x represents trust of the participant; also there was a weak relationship between accessibility and tendency towards Medicinal & Aromatic Plants cultivation or purchase (β = -0.019; p = 0.024). The negative coefficient indicated inverse relationship between two variables (Table 3).

Table 3. Regression coefficients model for independent variables

P values	t	coefficients	β	
		Standard errors		
<0.001	98.41	0.229	12.15	constant
<0.001	-6.61	0.132	-0.87	knowledge
<0.001	28.16	0.206	10.54	constant
<0.001	17.63	0.081	1.42	trust
0.001	26.95	0.486	12.007	constant
0.024	-21.35	0.094	-0.019	accessibility

Therefore, the present analysis shows that the negotiation power of the legal person buyers is significantly bigger than that of the medicinal herbs individual producers and that this type of buyer benefits by significantly diminished prices.

This superior negotiation power can be the result of a superior economic efficiency, which does not justify the public authorities' intervention. Thus, the intervention could generate inefficiencies and could lead to price increase for end-user.

Conclusions

The herbal agriculture producers and processors generally agree that marketing opportunities do exist but there are many problems to be solved and increased government support is clearly needed.

Romania has a great potential in the field of aromatic and medicinal herbs but also in their processing because it is one of the first countries in the EU, in terms of the dynamics of market development and consumption of herbal food supplements. Both in the case of the medicinal herbs bread field and in the case of the medicinal herbs depositing services field, the price forms freely on the market, as a result of the interaction between supply and demand, without the direct intervention of the state in the price forming mechanism.

However, between 2015 and 2016, on the medicinal herbs depositing services field, there were two public interventions in price forming, interventions facilitated by the mechanism of subsidizing the costs corresponding to medicinal herbs depositing. Our opinion is that these public interventions can cause the alignment of the supply bearers' prices, reason for which we consider that the fact that these interventions were not resumed (in the same form) after 2016, is a positive fact.

Major economies of scale are being marketed on the medicinal plants market, and economic operators that integrate several types of sector-specific activities benefit from significant competitive advantages due to this diversification of activity. In terms of tariffs on this market, the analysed period seems to be characterized by a slight upward trend.

The novelty of the research is its application allows determining the complex average annual and maximum future demand of specific types of medicinal plants with limited official statistics. As the result of the approbation of the econometric estimations, the medicinal herbal market of Romanian has been calculated and the results show that there is the more positive attitude of consumers towards medicinal herbal products.

Medicinal plants are, have been, and will continue to be, an increasingly sought-after topic, which translates into a real business opportunity for those who are prepared to accept the challenges of such a business. For Romanians especially because of life conditions and environment, the challenges and future directions of medicinal herbal market in Romania was sustained by a primordial pattern and continue searches.

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Re-examining Exchange Rate Regimes and Inflation Nexus: An ARDL Analysis for Nigerian Case

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Abstract: This paper seeks to re-examine the effect of exchange rate regimes on inflation in Nigeria. This is pertinent because exchange rate has remained devastated in Nigeria while the problem of high inflation lingers. Contrary to most studies on Nigeria, we tested the stability of our inflation model. We used the Autoregressive Distributed Lag (ARDL) approach for our analysis. The result shows that the past one year value of exchange rate has a negative and significant impact on the current inflation rate. Inflation rate increased more during the fixed exchange regime compared to the floating exchange rate regime. During the floating exchange rate regime, as the exchange rate increases, the inflation rate decreases and vice versa. The implication is that the floating exchange rate regime policy is preferable for combating increases in inflation rate compared to the fixed exchange rate. In addition, the lags of money supply have a direct relationship with inflation rate. The past two years value of interest rate also has a direct relationship with inflation rate. It is necessary that future studies on Nigeria consider wider spectrums of exchange rate regimes than ours.

Keywords: exchange rate regimes; inflation; autoregressive distributed lag

JEL Classifications: C31; E63; F31

1. Introduction

Exploring how the different exchange rate regimes adopted by different countries relate with their inflation rates has remained an interesting puzzle in the macroeconomic literature.[4] This is particularly the case in most developing countries, especially in Africa, where exchange rate has remained devastated while the problem of high inflation lingers. It is no longer news in Nigeria that the

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[4] See (Thygesen, 1978; Guisinger & Singer, 2010; Obansa, Okoroafor, Aluko & Eze, 2013).

country has experimented different policies within the ambient of fixed and exchange rate systems over the years. Of course, the objective of doing so have been to make prices stable and achieve other macroeconomic goals (Inyiama & Ekwe, 2014). We know from the Bible that unstable persons are limited in achievements, no wonder Nigeria has not been able to bring back its exchange rate

to what it was in the 1960s and I970s.[1]

In Nigeria at present, people do not value the Naira compare to the powerful currencies such as pounds sterling, euro and dollars. The Naira virtually loses respect in the minds and hands of Nigerians whenever its value is lower than that of another currency. Depreciation of the Naira is worsen by a situation where most citizens are losing hope in the country. Therefore, a right exchange rate policy that would stabilize the exchange as well other macroeconomic factors including inflation is necessary to restore the hope of the citizens. Failure to do so may portend a greater damage to the Nigerian economy even more than what Singer Prebisch termed perpetual deterioration of developing countries due to high proportion of commodity goods in the trade baskets. Up to 1979, exchange rate was stable in Nigeria.[2] Therefore, at different times, researchers have criticized the Structural Adjustment Programme (SAP) because it did more harm to the economy of Nigeria than good. The progressive depreciation of the Naira began during the SAP era.

Although, inflation has a long history of instability in Nigeria due to wrong policy prescriptions and its implementations as well as constant fall in the value of the Naira, maintaining a moderate inflation rate has been an arduous task to the Central Bank of Nigeria since the SAP period (Afolabi & Efunwoye, 1995). It has been noted that Nigeria majorly practiced the fixed exchange system prior to the SAP but since then the flexible exchange rate system is practiced in most of the later years.

Further studies on the connection between exchange rate system practiced and inflation control in Nigeria is quite necessary given that both variables have performed woefully in the country over the years. This paper, therefore, answers the following questions: (i) is there any long run relationship between the fixed-cum-flexible exchange rate regimes and inflation rates in Nigeria? (ii) is the inflation function for Nigeria stable over time? (iii) what are the determinants of inflation rate in Nigeria?.

We organize the paper into five sections. Following the introduction in this section is the literature review in part two. The methodology and discussion of findings are

[1] See (Gbosi, 2005).
[2] See (Ewa, 2011).

in sections three and four, respectively. The fifth section gives the conclusion and recommendations.

2. Literature Review

The initiation of the debate on whether it is the fixed or flexible exchange rate that is more inclined to reduction in inflation rate can be traced to the work of Fleming (1962) and Mundell (1963). These scholars argued that lowering of inflation is achieved more with fixed exchange rate than the flexible counterpart. Similarly, Chhibber (1991) concludes that devaluation of currency, which is a fixed exchange rate policy, is potent in influencing the government budgets as well as monetary policy including the inflation rate. Ghanem (2012) whose study was on the Middle East and North Africa (MENA) noted that the type of fixed exchange rate that lowers inflation is the credible one but Ghosh, Qureshi & Tsangarides (2014) submitted that the fixed exchange rate that is credible is the de jure type. However, Guisinger & Singer (2010) submitted that a de facto fixed exchange rate system would result to lower inflation if governments back up their actions with official pronouncements. Sticking to such pronouncements will make governments to be credible. A fixed (also called pegged) or flexible (also known as floating or fluctuating) exchange rate is de jure if the central bank communicates what it is doing concerning the exchange rate to the public. The reverse is the de facto such that the central bank can even do contrary to what it claims regarding its approach in handling the exchange rate issue. The study by Alesina & Wagner (2006) suggests that countries with poor institutional quality have problem with maintaining fixed exchange rate system. On the contrary, according to the study, countries with relative higher institutional quality manage their exchange rate more than what they announced.

The study by Ghanem (2012) also found that the flexible exchange rate reduces inflation more than the fixed counterpart does. Nevertheless, many countries dread to float their exchange rate such that they frequently renege (Calvo & Reinhart, 2002). Besides, the manner a country floats its exchange rate matters for its capability to borrow globally in its own currency, which has implications on its inflation rate.[1] Elbadawi (1990) found that flexible exchange rate policy involving depreciation of the currency of Uganda especially as observed in the parallel market contributed most significantly to explaining inflation variations in the country. Mainwhile, Owosekun (1975) submitted that flexible exchange rate system is less prone to imported inflation compared to the fixed exchange rate system, hence flexible exchange rate will produce a lower inflation rate in Nigeria compared to a fixed exchange rate system. This is supported by the study by Moser

[1] See (Hausmann, Panizza & Stein, 2001).

(1995) which showed increased inflation rate in Nigeria due to exchange rate devaluation policy in the fixed exchange rate regime. In addendum, Oyejide (1989) showed that exchange rate devaluation increases the cost of importation thereby fueling the price of imported inputs including final commodities, hence causing increase in inflation rate through the cost-push channel. However, inflation will modestly persist if there is an accommodation of exchange rate.[1]

The study by Ghosh et al. (2014) has revealed that low inflation is highly achievable when central banks adopt both de facto and de jure fixed exchange rate than if they use only de factor fixed method. On the other hand, Bohl, Michaelis & Siklos (2016) pointed out that in raising countries' outputs, the fixed exchange rate works best for the emerging market economies while in the G20 countries; the flexible exchange system does better. This finding is useful in the foregoing discourse since economic literature and empirics have largely established a trade-off between output and inflation.[2]

There are expansive literature on what causes changes in the inflation rates across different countries of the world including Nigeria. Country specific studies have largely used the cointegration multivariate procedures.[3] Most of the studies have found that exchange rate is one of those variables explaining changes in the inflation rate. For example, the study by Honohan & Lane (2003) on the Eurozone shows that inflation rate is explained by changes in the nominal effective exchange rate over the period 1999-2001. Similarly, in another study by same Honohan & Lane (2004), exchange rate plays a pertinent role in determining inflation rate in the EMU in both the period of depreciation of the Euro in 1999-2001 and era of appreciation of the Euro in 2002-2003. In addition, from the result of Aigbokhan (1991), the Mexican inflation in 1980s and 1990s was primarily determined by the extent to which the country's real exchange rate fluctuates. Further, Chhibber (1991) reveals that exchange rate, real income, increase in money supply, unit labour cost, foreign price and interest rate are critical in determining inflation rate in Zimbabwe. In a similar study on the Ghanaian economy, Chhibber & Shafik (1990) show that the country's inflation rate is chiefly caused by increase in the supply of money whereas factors like official exchange rate and real wages do not significantly impact on the inflation rates, although the parallel exchange rate poses significant positive impact on the inflation rates. In the same way, the study by Opolot & Mpagi (2017) reveals that among other variables including monetary aggregates, foreign prices and changes in real GDP, exchange rate poses a positive impact on inflation rate in Uganda. Also, the work by Hossain & Mitra (2017) reveals a short-run uni-directional flow from exchange rate, interest rate, economic

[1] See (Kool & Lammertsma, 2005).
[2] See (Lohi, 2014; Hayat, Balli & Rehman, 2017).
[3] See (Aliyu & Englama, 2009; Oluba, 2008).

growth and trade openness to inflation. Laying credence to the autoregressive lag tendencies, Lagoa (2017) shows that among other variables, changes in inflation is largely accounted for by the movements in exchange rate and differences in inflation. We note that the debates on which of the exchange rate regimes lowers inflation as well as factors determining inflation both in the short run and long-run remain unsettled, hence calling for further studies.

3. Methodology

The first step in this section is to test the nature of the variables using the popular augmented Dickey Fuller (ADF) stationary test. Although new stationarity tests developed by Ng & Perron (2001) and improved by the work of Perron & Qu (2007) which are Dickey Fuller Generalized Least Squares (DFGLS) and Modified Philips Perron (MPP) have been said to be powerful and have better size compared with ADF and Philips-Perron (PP) test.[1] However, Zapata et al. (2011) has shown that the ADF like the PP test has shown similar result with the DFGLS. Since our sample is not less than thirty, hence not small, the ADF equation is still relevant. Therefore, we specify the ADF equation as follows in equation (1).

$$\Delta y_t = a_0 + a_2 t + \theta y_{t-1} + \sum_{l-1}^{m} \beta_1 \Delta y_{t-1} + \varepsilon_t \ldots\ldots\ldots (1)$$

Equation (1) represents a model of first difference of series y (Δy_t) with a_0 constant term, $a_2 t$ linear trend, θy_{t-1} lag of y, $\sum_{l-1}^{m} \beta_1 \Delta y_{t-1}$ lag difference of y and ε_t stochastic term. In the absence of deterministic part in the model, a_0 and $a_2 t$ disappear.

Given that the variables are a mixture of first difference and level series, the Autoregressive Distributed Lag (ARDL) is the appropriate methodology (see Pesaran, Shin & Smith, 2001). The ARDL is potent for long-run analysis.

Given a general ARDL model in equation (2)

$$ARDL\left(y, x_{1,} x_{2,} \ldots\ldots , x_k\right) \bmod el \ldots\ldots\ldots\ldots \quad (2)$$

Where y is the dependent variable and $x_{1,} x_{2,} \ldots\ldots , x_k$ are the regressors or explanatory variables. Our dependent variable is the inflation rate (INFR) while the regressors are broad money supply (MS), exchange rate (EXCR), government expenditure (GEXP), interest rate which is represented by monetary policy rate (INTR) and dummy for the exchange rate regimes (ERR- 1 for fixed regime and 0

[1] See (Zapata, Maradiaga & Pujula, 2011).

for floating regime). The choice of variables into our model draws from the work of Imimole & Enoma (2011), Bashir, Nawaz, Yasin, Khursheed, Kan, & Qureshi (2011), Ghanem (2012), Lim & Sek (2015), Hossain & Mitra (2017) and Opolot & Mpagi (2017). Both the dependent and the independent variables were logged, hence the coefficients are elasticities. We collected the data on all the variables from the Central Bank of Nigeria Statistical Bulletin, 2015 edition and they were logged so that they could behave well in the analysis. The stability of the inflation rate was tested using the Cumulative Sum (CUSUM) technique.

Emanating from equation (2), we write the equation (3)

$$A(L)y_t = c + \beta_1(L)x_{1t} + \beta_2(L)x_{2t} + ... + \beta_k(\mathrm{L})_{\mathrm{kt}} + \varepsilon_t \quad (3)$$

Where A stands for autoregressive, L stands for lag(s), β's are the regression coefficients and ε_t remains the stochastic term. An $A(L)=1$ implies absence of lag(s) of y_t in an ARDL model, hence regarded as a distributed lag model. Also, in equation (3), y_t and x_t are believed to be stationary while ε_t is a white noise. This means that ε_t has a mean of zero, constant variance and zero autocorrelation. The choice of lags will depend on the number of variables in the equation to avoid the problem of over-parameterization and micronumerousity. However, the allowance of lags into an ARDL model improves the explanatory power of the model. As usual, econometricians often derive a dynamic error correction model (ECM) from the ARDL using transformations that are simply linear (see Bannerjee & Mestre, 1998). The ECM shows the extent to which deviations from the long-run are corrected in the short-run and must be correctly signed with a negative value. We state a general ECM in equation (4)

$$\Delta y_t = c + \beta_0 \Delta x_t - (1-\alpha_1)y_{t-1} + (\beta_0 + \beta_1)x_{t-1} + \varepsilon_t ..... \quad (4)$$

This equation connotes that the change in current value of y is an addition of two parts. First is the one that is proportional to the current value of x and the second is the deviation of y_{t-1} from the equilibrium value which tallies with x_{t-1}.

4. Empirical Results and Discussion

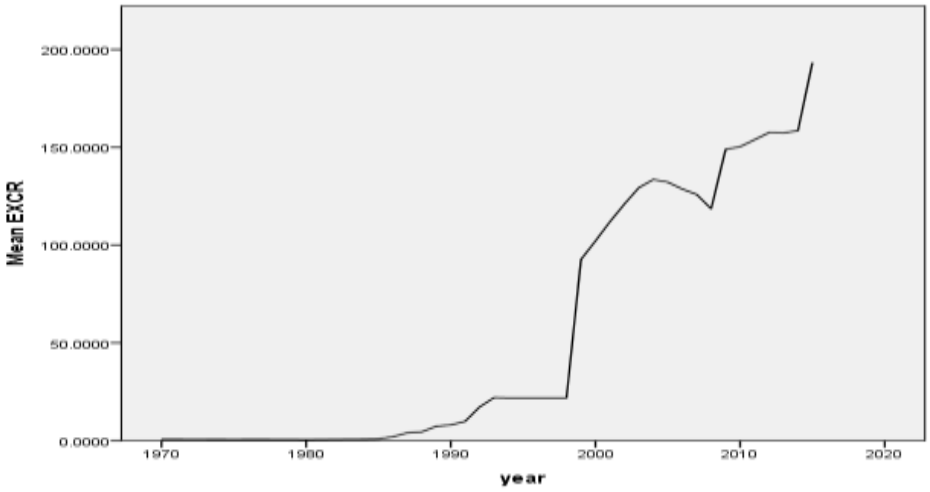

Figure 1. Exchange Rate Movement in Nigeria (1970-2015)

Beginning with the preliminary discussion, the graphical representation of the exchange rate in Nigeria in figure 1 shows that exchange rate was fixed and constant in the periods before 1986 (Structural Adjustment Programme year) while in the subsequent periods, there was a continuous increase in the exchange rate.

On the other hand, the graphical representation of the inflation rate in figure 2 shows an oscillating movement in the inflation rate. This suggests that the inflation rate should not have a unit root problem. That is, it should be stationary at level when tested.

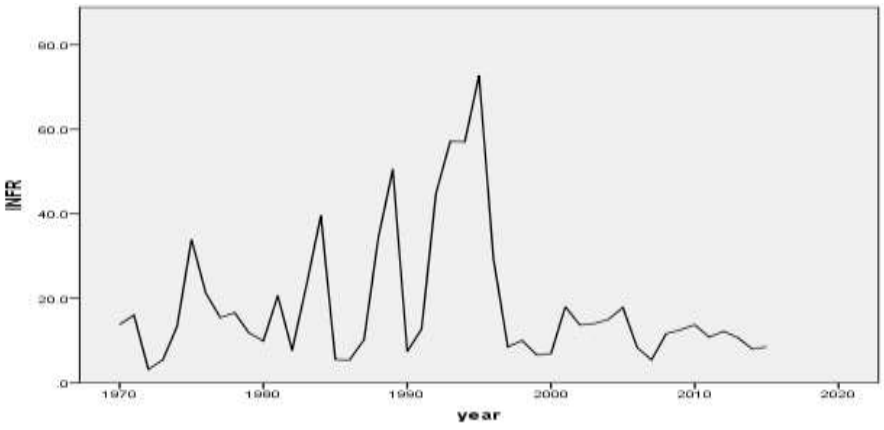

Figure 2. Inflation Rate Movement in Nigeria (1970-2015)

The result of the stationarity of the variables using the ADF procedure in Table 1 indicates that the variables are largely first difference series except inflation rate that is stationary at level for model with intercept as well as trend and intercept.

Table 1. Unit Root Test Using Augmented Dickey Fuller Procedure

Variables	Level				First difference				Order of integration
	Intercept	Trend and intercept	No intercept and trend	Lag	intercept	Trend and intercept	No intercept and trend	Lag	
LnInfr	-3.9719*	-3.9566**	-0.3735	0,0,2	-7.5633*	-7.5653*	-7.6596*	1,1,1	Mostly I(0)
LnExcr	-0.2460	-1.6172	1.8529	0,0,0	-5.3728*	-5.3084*	-4.6415	0,0,0	I(1)
LnIntr	-1.7437	-1.4953	0.1036	0,0,0	-7.7139*	-6.4356*	-7.7666	0,1,0	I(1)
LnMs	-1.5124	-2.2507	1.9357	0,1,1	-5.2055*	-5.4522*	-2.7719	0,0,0	I(1)
LnGexp	-1.7841	-0.9541	1.5462	0,0,0	-7.2114*	-7.6557*	-3.6105*	0,0,1	I(1)

Source: Computed from E-views 7

*, ** and *** denotes significance at 1%, 5% and 10% levels respectively.

This result justifies the use of an ARDL model which requires a combination of I(0) and I(1) variables. Therefore, the next step involves estimating an ARDL model to determine the cointegrating relationship among the variables. Subsequently, the results are presented in Table 2.

Table 2. Parsimonious OLS estimates of the ARDL model

C	4.672572	0.699485	6.680022	0.0000
D (LN_INFR (-2))	-0.547894	0.089672	-6.110004	0.0000
D (LN_INFR (-3))	-0.327263	0.075532	-4.332782	0.0002
D (LN_EXCR (-1))	-0.518282	0.202305	-2.561885	0.0163
D (LN_INTR (-2))	1.723800	0.305144	5.649131	0.0000
D (LN_MS (-2))	2.526894	0.316819	7.975836	0.0000
D (LN_MS (-3))	1.241540	0.329874	3.763680	0.0008
D (LN_MS (-4))	0.521003	0.290805	1.791591	0.0844
ERR (Dummy)	-1.874292	0.383430	-4.888224	0.0000
R-squared	0.899152	Mean dependent var		-0.011220
Adjusted R-squared	0.850596	S.D. dependent var		0.726465
S.E. of regression	0.280799	Akaike info criterion		0.562835
Sum squared resid	2.128896	Schwarz criterion		1.147957
Log likelihood	2.461877	Hannan-Quinn criter.		0.775904
F-statistic	18.51776	Durbin-Watson stat		2.360414
Prob(F-statistic)	0.000000			

Source: Computed from E-views 7

Table 2 shows the parsimonious model of the ARDL which is obtained after considering the appropriateness of lag based on the Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion as well as correcting for serial correlation. Based on the parsimonious specification, the coefficient of determination (R^2) shows that the model is good or its explanatory power is in order. The Durbin-Watson (DW) value of 2.3604 suggests the model does not suffer from serial correlation and the F-test shows there are no omissions of relevant variables in the model. In essence, there is no mis-specification problem.

The bound test with the aid of Wald test and the Pesaran Table in Tables 3 and 4, respectively, show whether or not there is co-integration or long-run relationship among the variables in the model.

Table 3. Wald Test

Test Statistic	Value	Df	Probability
F-statistic	3.045924	(3, 10)	0.0791
Chi-square	9.137771	3	0.0275

Source: Computed from E-views 7

Table 4. Pesaran Table

Critical·value¤	Lower·Bound·Value¤	Upper·Bound·Value¤
1%¤	3.74¤	5.06¤
5%¤	3.539¤	4.667¤
10%¤	2.45¤	3.52¤

Source: Pesaran et al. (2001), Table CI (iii), Case 111: Unrestricted intercept and no trend.

The F-statistic (3.0459) in Table 3 falls below the lower bound (3.539) on the Pesaran table at 5% level of significance indicating no long-run association among the variables. This means that these variables will not likely co-move in the long-run. Therefore, there is no need for conducting the error correction mechanism for the model.

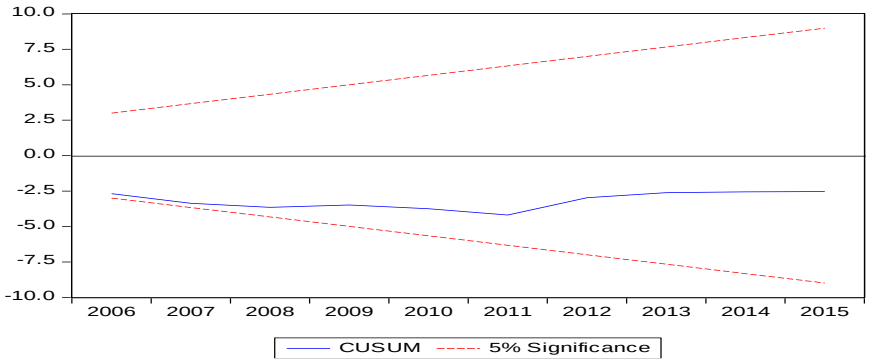

Figure 3. CUSUM Test for Stability of the Inflation Model

Figure 4. Recursive Residual Test of Stability of the Inflation Model

The graph of the recursive residual in figure 4 shows that the residuals either go outside the ±2 standard error bounds or becomes close to the bounds. This can be seen between 2006 and 2015 which corresponds to the period of massive deregulation and liberalization of the financial system in terms of interest rate and entry into the system so that SMEs can flourish and contribute meaningfully to the GDP growth of Nigeria. From the plot of the CUSUM test in figure 3, the red lines indicate both upper and lower benchmark at 5% significance level while the blue lines represent the CUSUM or recursive residuals. The graph indicates that the process is in control as the CUSUM or recursive residuals are neither greater than nor less than the benchmark. Since the measurement (CUSUM or recursive residuals) falls within the benchmark, we infer that the inflation model is stable. This result is similar to the study by Hossain & Mitra (2017) on the United States.

The relationship between the second and third lags of inflation and the current inflation is negative and significant at the 5 percent level. This suggests that the past two and three years values of inflation rate are important determinants of the current inflation rate in Nigeria. By implication, inflation rate exhibits a snowballing impact in Nigeria. This result is similar to that of Lagoa (2017) that shows that differences in inflation overtime has a great impact on the current inflation rate.

Similarly, the current and past two and three years values of money supply has a direct relationship with inflation rate. The positive sign displayed by money supply meets the theoretic and a priori expectation since increase in money supply when money demand is unchanged causes increase in the general price level thereby reduces the real value of money. This finding is similar the long-run result by Bashir et al. (2011) but contradict the study by Lim & Sek (2015) who reported a short-run negative nexus between money supply and inflation. Although such outcome between money supply and inflation is unpopular in the literature.

The past two years value of interest rate has a direct relationship with inflation rate. This does not conform to economic theory since increase in interest rate often reduces money supply, hence reduces inflation. However, if Nigeria's interest rate increases relative to the interest rate of other countries rates, all things equal, this will make investors to gain from the higher Naira rates by switching from their currency to Naira-denominated securities. The net result is an increase in inflation of the Naira if government does not intervene. Our result is somehow similar to that of Inyiama & Ekwe (2014) and Hossain & Mitra (2017) that show a uni-directional causality from interest rate to inflation in Nigeria and United States, respectively. Also, the past one year value of exchange rate has a negative and significant impact on the current inflation rate. This implies that a depreciation of the Naira leads to a reduction in the rate of inflation. This is a-theoretic because depreciation of the currency is expected to boost net export if the country is a net export State thereby increases aggregate demand and fuels inflation if it is not controlled. The findings of Opolot & Mpagi (2017) as well as Inyiama & Ekwe (2014) are contrary to ours. The latter found a slight significant positive impact of exchange rate on inflation in Nigeria, although they also found no causality between inflation and exchange rate in the country. However, such a finding is cumbersome. Mainwhile, similar to the work of Lagoa (2017) on the Euro zone, Imimole & Enoma (2011) found exchange rate among other variables including money supply and GDP as the pertinent factors determining inflation in Nigeria. Such finding is not specific compared with our result. It is also pertinent to note that ERR switches from 1 to 0 and the coefficient of ERR is -1.8743. This means that the percentage impact of *ERR* on inflation rate is 100 [$exp(-c)$ - 1], that is, 100[exp(-4.7)-1]. This indicates a 99 percent negative impact on the inflation rate as ERR moves from 1 (fixed regime) to 0 (floating regime). In other words, within the floating exchange rate regime, as the exchange rate increases, the inflation rate decreases and vice versa. This suggests that the floating exchange rate regime policy is preferable for controlling rising inflation rate compared to the fixed exchange rate. This reinforces the position of most authors in the literature including the IMF.[1]

[1] For instance, see (Owosekun, 1975; Elbadawi, 1990; Ghanem, 2012).

5. Conclusion and Recommendations

This paper has examined exchange rate regimes and inflation in Nigeria. We used the Autoregressive Distributed Lag Bounds test cointegration technique. The system of exchange rate in Nigeria has oscillated between the flexible and fixed counterpart. The paper therefore used a dummy variable to show the difference between the two regimes and its effects on inflation in the country. This study has reinforced that monetary policy remains effective in the short-run since a co-integration nexus in the model was not found. It has re-established that flexible exchange system rate remains a better option for increasing the value of the Naira provided institutional challenges are holistically dealt with. We do not object to using variants or a mix of the flexible exchange system provided a correct dose of the policy is prescribed. However, we support the de jure type of the flexible exchange rate and are against the de facto. Mainwhile, the Central Bank of Nigeria must be credible and the independence of the Bank must be achieved. It is imperatives that future studies on Nigeria consider wider spectrum of the exchange rate regimes. In specific terms, we make the following recommendations. First, the government of Nigeria must continue to ensure that it achieves exchange and interest rates stability in order to stem inflationary tendencies. Second, to curb inflation, there is the need for high transparency in monetary policy implementations. Third, the policy linkage between monetary policy instruments in the country should remain very strong in the short–run. Fourth, achievement of price stability can be enhanced if the exchange rate regimes are explicit and correctly identified by the public. In all, there should be effective structural reforms in place in order to reap the benefits of right policies implemented in Nigeria.

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Education and Wage Inequalities under a Counterfactual Scenario of Minimum Wage

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Abstract: The main purpose of this paper consists in quantifying the impact of a minimum wage adjustment upon wage inequality in Romania. In general, rigorous minimum wage impact assessment upon wage distribution is quite difficult to conduct mainly because of data access limitations to longitudinal information available at individuals' level. In this paper an innovative approach is proposed for building a counterfactual scenario through the use of quarterly survey micro-data provided by the National Institute of Statistics. The period analysed in this paper regards the time-interval Q2 2014-Q3 2014. There are several reasons for this choice. First, it concerns data availability restrictions and second, the need to identify two consecutive periods corresponding to a window-frame right before a minimum wage adjustment and immediately after it took place. In order to check the impact on gender wage inequalities, a 1:1 matching procedure was applied for the construction of two distinct gender groups of individuals that were similar in observable characteristics. Both socio-demographic and economic factors are considered. When comparing the changes registered right after the minimum wage adjustment, we noticed a reduction in gender wage inequalities, as males' chances to earn more in comparison to females drop.

Keywords: wage inequalities; minimum wage; counterfactual scenario; education; wage distribution.

JEL Classification: J31; C82

1. Introduction

The main aim of this paper consists in assessing the impact of a minimum wage adjustment upon wage inequality in Romania. In general, minimum wage impact assessment on wage distribution is a rather difficult and challenging process, firstly because of data availability limitations regarding gross wage information at individuals' level in a longitudinal perspective. Secondly, there are methodological restrictions when conducting rigorous impact assessment on wage inequalities,

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such as the need for complex micro-simulations analysis under the assumption of a counterfactual scenario.

The main benefits of a counterfactual scenario analysis consist in the fact that it produces an estimation of what the net impact of a minimum wage adjustment would be noticed in the wage distribution, based on a comparison between the individuals' new wage level registered after the adjustment took place and the level of wages the individuals would have registered in the absence of the change in the minimum wage. Such a counterfactual outcome of what would have happened in the absence of the change in minimum wage is, however, never observed. So, specific statistical methods have to be applied in order to estimate the hypothetic situation.

In this paper we propose an innovative approach for building a counterfactual scenario through the use of quarterly survey micro-data. The Romanian Labour Force Survey (LFS) database provided by the National Institute of Statistics was used in the current study in order to investigate the impact of minimum wage adjustments on wage inequalities.

The period analysed in this paper regards the time-interval Q2 2014-Q3 2014. There are several reasons for this choice. First, there was the restriction on data availability, and second, we needed to find two consecutive quarters corresponding to a window-frame right before and immediately after a minimum wage adjustment. Actually, in case of the year 2014, there were two adjustments registered in the minimum wage level, as follows: a first change occurred in the beginning of 2014 when the gross minimum wage rate increased from 800 to 850 lei, while the second adjustment took place in July 2014, when the minimum wage increased up to the level of 900 lei.

Since the counterfactual scenario requires an assumption about what would have happened in the absence of the wage policy, we decided to rely on the available quarterly micro-data corresponding to the period Q2 2014 (right before the second change in minimum wage) and Q3 2014 (right after the change took place). Although there are several potential approaches on how to build the counterfactual scenario, because of the short time-horizon considered in this paper, we formulated the assumption that wages would have kept unchanged in the third quarter as compared to the previous one in the absence of the change in the minimum wage. The counterfactual assumption makes sense as empirical evidence show that, in general, on a short-term quarterly base and for the case of Romania, there is a rather high degree of stability in the wage distribution.[1].

In order to check the impact on gender wage inequalities in a robust manner, a 1:1 matching procedure was applied and two distinct gender groups of individuals

[1] See (Popescu & Miliaru, 2017).

similar in observable characteristics were built. Several socio-demographic and economic factors were considered in the analysis. The database has limited information on individuals' wages as it comprises only the net wage decile to which employees belong, instead of providing the effective net/gross wage at micro level. Under such data availability restrictions, the methodological approach for assessing minimum wage impact was limited to the estimation of an ordered logit model under a counterfactual scenario.

When comparing the changes registered right after the minimum wage adjustment, we noticed a reduction in gender wage inequalities, as the chances of males to earn more and move to higher wage decile than females drop by almost 46 percentage points. Our findings also suggest that educational attainment plays an important role in increasing the chances for higher wages, especially for the case of females.

2. Short Literature Review

Regarding the main factors that can explain wage inequalities through the use of micro-data, the Mincer model (1974) can be considered an effective tool that also captures the rate of return on education and work experience. It explains not only how wages depend on attributes such as years of schooling and work experience, but also on the rate of return on education – seen as an interest rate for investing in human capital. Several studies followed Mincer's approach (Ashenfelter & Rouse, 1998), while more recent studies have updated the list of attributes that could explain wage inequalities (Vasilescu et al., 2010).

The estimation of the effects of minimum wage adjustments on wage distribution has been approached in a number of distinct manners, that where based on one common element. It all involved estimating a counterfactual distribution, based on a hypothesis on what would have happened to the wage distribution in the absence of the policy change. In the difference-in-differences (DID) approach, for example, it involves a comparison between the treatment and the control group, followed by a comparison of pre- and post-treatment. The post-change counterfactual distribution of the treatment group is then estimated under certain assumptions using the treatment group pre-change distribution and the pre- and post-change distributions for the control group (Athey & Imbens, 2006).

According to international practice, there are several counterfactual approaches available, based on how the scenario assumptions are formulated. For instance, the simplest counterfactual scenario implies that, in the absence of a minimum wage increase, there would be no change in wages. The hypothesis is rather restrictive, as variations in wage distributions occur over a period of time, even in the absence of minimum wage adjustments. However, in our case study, the hypothesis could

work quite well as the time interval between the two moments (pre and post-change) is extremely short, being limited to one quarter.

Another possible counterfactual scenario could be based on a comparison of two parts of the same wage distribution (Stewart, 2011). The equivalent identification hypothesis used in this case assumes that the minimum wage policy only affects one part of the distribution, while leaving the other part of the distribution unaffected. This assumption could work as the net impact of the wage policy can be computed as a pre- and post- difference between a group of individuals that were affected by the policy and a control group that was not affected by the policy change, which may be true in some empirical situations for distinct parts of the same wage distribution. This hypothesis could be plausible especially because the employees at the top of the distribution tend not to be affected by the minimum wage increases. More precisely, most empirical studies have shown that employees above the median level tend not to feel the economic effects of the minimum wage increases.

Another counterfactual scenario assumes that in the absence of a change in the minimum wage, all wages would increase in line with the median level of wage earnings. Such a scenario was proposed by Lee (1999) and later used in many empirical studies (Autor et al., 2016; Teulings, 2003).

In general, there are two types of methodological approaches in estimating wage inequalities. On the one hand, there are OLS regressions applied for quantifying average wage inequalities, while on the other hand there are quantile regressions which can allow for unobservable factors to also be considered when explaining each individual's position in the wage distribution.

For instance, Pereira & Martins (2004) applied quantile regressions to study the impact of education on wage inequality in 16 countries during 1993-1995 and concluded that in most countries the dispersion of wage inequalities increases with schooling. In another study, Fournier & Koske (2012) quantified the effects of the following factors on a group of 32 countries through the use of quartile regressions: gender, age, number of hours worked and the highest degree of education obtained. Their findings suggested that women have less employment opportunities than men, and those who work earn less than men. Besides that, they brought empirical evidence to support the fact that policies aiming to increase graduation rate for upper secondary education tend to reduce wage inequalities.

Considering the empirically based international literature in the field, we conclude that finding proper means to estimate the ex-post impact of the minimum wage policy and to explain the role of the main determinants of wage inequalities could provide valuable support to policy makers in their attempt to reduce wage inequalities.

3. Research Methodological Framework

This chapter presents the research methodological framework, structured as it follows. We begin by presenting the main particularities of the micro-dataset and then we describe the statistical methodology used to assess the minimum wage impact on wage inequalities.

3.1. Datasets

For this study we used the LFS database provided by the Romanian National Institute of Statistics. The database provides national representative data collected on quarterly bases in households, at individual level. Information on both socio-demographic and economic characteristics concerning occupational status, work, occupation, main and secondary activity and hours worked of each individual aged over 15 were available.

Our study was conducted over the period Q2 2014 – Q3 2014 and focused only on employees. Therefore, all unemployed persons, as well as self-employed persons were excluded from the initial database. The sample used in our analysis comprised in the end a number of 15631 individuals for the second quarter and 15718 for third quarter of 2014.

Due to database specificity and econometric reasons the following information at individual level was considered in our analysis through the form of categorical variables, as presented in Table 1.

The data preparation implied building dummy variables for each variable's category. Thus, four dummy variables were generated for the age variable and the middle age group (*45-64 years*) was considered as a reference base and was therefore excluded from the estimation.

Table 1. Information available at individual level used in the study

Types of information	Individual characteristics	Sub-categories
Socio-demographic characteristics	Age	*age15-24, age25-44, age45-64, age over 65*
	Level of education	*EDUC0* for no education, *EDUC1* for primary or lower secondary education, *EDUC2* for upper secondary or non-tertiary secondary education *EDUC3* for higher education
	Gender	*Male* or *Female*
Economic variables	Economic sectors	*Industry, Constructions, Private services, Public services* and *Other sectors*

Source: Authors own computations using LFS database

Other four dummy variables were built in order to define the level of education, while the dummy variable corresponding to higher education (i.e. ISCED 5-8) was considered as reference base. The gender variable was assumed to take value 1 in case of *Males* and 0 in case of *Females*, while the dummy variables for the economic sectors implied a regrouping of the initial economic sectors into the following variables: *Industry*, *Constructions*, *Private services* (including Wholesale and retail trade, Transportation and storage, Accommodation and food service activities, Information and communication, Financial and insurance activities, Real estate activities, Professional, scientific and technical activities, Administrative and support service activities), *Public services* (including Public administration and defence, Education, Human health and social work activities, Arts, entertainment and recreation), and *other sectors* (including the rest of economic sectors) which was considered as reference base.

3.2. The Research Methodology

In this paper we propose an innovative approach for building a counterfactual scenario through the use of quarterly micro-data for the period Q2 2014 (right before a change in minimum wage) and Q3 2014 (right after the change took place). The counterfactual scenario was built on the assumption that wages would have kept unchanged in the third quarter as compared to the previous one in the absence of the change in the minimum wage.

In order to check the impact of minimum wage on gender wage inequalities we applied a 1:1 matching procedure that resulted into two distinct gender groups of individuals, similar in observable characteristics but with the difference that one group is made up entirely by males and a control group made up by females. For that, a probit model was first estimated using as covariates the variables described in section 3.1 and as dependent variable the gender binary one. The model also generated propensity scores for each individual that were later used in the matching algorithm.

The 1:1 matching procedure assumed applying a Nearest Neighbour matching algorithm (NN) which selects the comparison units with the propensity scores closest to a specific treated unit (Roman & Popescu, 2015). The same matching procedure was applied at both moments (Q2 and Q3 2014) so to consider both the pre- and the post-policy change moments.

Next, because the LFS database only provides information on the decile each employee's net earnings belong to, none of the most common empirically tested methodologies on distributional impact analysis could be applied. So, instead of using the classical OLS or the quartile regression methods, a distinct approach was proposed based on ordered logit models estimation.

In the logit model framework the estimates are based on a maximum likelihood function in order to determine the conditional probability of an individual to belong to a category (Y takes values 0 or 1) according to certain independent variables x_1, x_2,...,x_k. The logit model has the following general form:

$$ln\Omega(x) = \beta_0 + \sum_{j=1}^{k} \beta_i x_{i,j}.$$

where $\Omega(x) = \frac{Pr(y=1|x)}{Pr(y=0|x)} = \frac{Pr(y=1|x)}{1-Pr(y=1|x)}$ and $\Pr(y=1|x) = x\beta + \varepsilon$ is a linear probability model, for which we restricted the probabilities to the interval [0,1] and obtained $\Omega(x)$.

In the case of an ordered logit model, the probability of an individual to belong to a category versus a smaller or a larger category is estimated, since the values of the dependent variable are ordered: $\Omega_{\leq m|>m}(x) = \frac{Pr(y \leq m|x)}{Pr(y > m|x)}$. Thus, in an ordered logit model the dependent variable is assumed to be equally spaced, while the ordering makes sense (i.e. it verifies the hypothesis of proportional chances).

4. Main Findings

As briefly presented in the previous section, the first step conducted in order to apply the impact assessment methodology consisted in estimating a probit model for each of the two moments considered: right before the change in minimum wage (Q2, 2014) and respectively, right after the change took place (Q3, 2014). The dependent variable consisted in the gender binary variable that took value 1 for Males and 0 for Females.

This step was required in order to estimate the propensity scores for each individual at both moments of time considered. The main results of the estimations are summarized in table 2.

According to the odds ratio resulted from the two probit models estimated on the entire initial data sample, we can draw a general profile of the male employees which tend to work especially in Constructions as compared to other economic sectors and have higher chances to have other than higher education level. On the other hand, females seem to have higher chances to work in the Industry sector, in private or public services as compared to other sectors.

Table 2. Probit models estimations explaining wage inequalities

	Q2 2014			**Q3 2014**		
Treatment: Male	*Coef.*	*Std. Err.*	*Odds ratio*	*Coef.*	*Std. Err.*	*Odds ratio*
Industry	-0.22	0.02	*0.80*	-0.18	0.02	*0.84*
Construction	0.17	0.03	*1.19*	0.23	0.02	*1.26*
Private servicies	-0.28	0.02	*0.76*	-0.24	0.02	*0.78*
Public Services	-0.42	0.02	*0.66*	-0.38	0.02	*0.68*
EDUC0	-0.10	0.17	*0.90*	0.09	0.26	*1.10*
EDUC1	0.03	0.02	*1.04*	0.04	0.02	*1.04*
EDUC2	0.03	0.01	*1.03*	0.03	0.01	*1.03*
age15_24	-0.03	0.02	*0.97*	0.00	0.02	*1.00*
age25_44	-0.05	0.01	*0.95*	-0.04	0.01	*0.96*
age65+	0.30	0.06	*1.35*	0.16	0.08	*1.17*
No. obs.=	15631			15718		
Pseudo R2=	0.0646			0.067		
LR chi2(10)=	1388.72			1448.1		
Prob>chi2=	0.00			0.00		

Source: Authors' own computations

Based on the Probit model, the propensity scores for each individual of the two groups of males and females were generated and then plotted in order to see the degree of similarities between the two groups (males versus females). One can clearly see that there is no symmetrical correspondence of the propensity scores distributions between the treated and the untreated groups, meaning that a matching technique is required in order to obtain a more similar distribution. The distributions of the propensity scores before matching are plotted in figure 1.

In order to apply the matching algorithms, the balancing property of the model was first tested and confirmed (Becker & Ichino, 2002). Using the *psmatch2* command in STATA 14 the common support was automatically included, in order to identify the range of probability that contains the observations with enough common features to be taken into consideration. A 1:1 matching procedure was applied and resulted into two distinct gender groups of individuals similar in observable characteristics but with the difference that one group is made up entirely by males and a control group made up by females.

Then two ordered logit models were estimated corresponding to the two quarters under analysis (see Table 3). Although the Pseudo R^2 test values are rather small in both cases, we accept such biases due to the current data limitations. The dependent variable considered was a categorical one, taking values from 1 to 10 according to the correspondent decile.

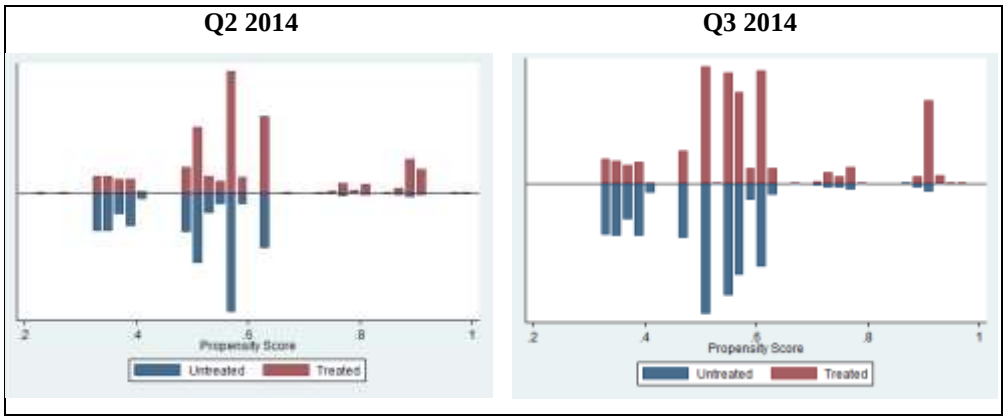

Figure 1. The propensity scores of the treated and the control groups before matching
Source: Authors' own computations

Based on these models we were able to estimate the importance of several wage determinants upon the individuals odds of getting higher earnings and moving towards a higher wage decile.

Table 3. Ordered logit model estimations explaining wage inequalities

	Q2 2014		Q3 2014	
Dependent: Wage decile	*Odds ratio*	*Std. Err.*	*Odds ratio*	*Std. Err.*
Male	***2.41***	0.07	***1.95***	0.06
Industry	0.50	0.10	0.44	0.07
Construction	0.56	0.14	0.81	0.19
Private Services	0.39	0.08	0.35	0.06
Public Services	0.49	0.10	0.44	0.07
EDUC0	0.06	0.04	0.00	0.00
EDUC1	0.10	0.01	0.11	0.01
EDUC2	0.26	0.01	0.27	0.01
age15_24	0.47	0.04	0.41	0.03
age25_44	0.84	0.03	0.85	0.03
age65+	0.33	0.24	1.17	0.50
No. obs.=	13978		14050	
Pseudo R2=	0.04		0.0353	
LR chi2(10)=	2713.15		2281.26	
Prob. > chi2=	0.00		0.00	

Source: Authors' own computations

Regarding the wage inequalities issues, the most notable finding suggest that the chances of male employees to earn more and move forward to a higher wage decile drop from 2.41 to 1.95 times higher than female employees, during the two

analysed quarters. These results indicate that the minimum wage impact on gender wage inequalities corresponds to a reduction with almost 46 percentage points in males' chances to earn more than females.

Among the socio-demographic characteristics that could explain wage differentials, it seems that the level of education plays an important role in increasing the chances of an individual to earn more. The findings suggest that individuals with low or medium level of education have lower chances to earn more as compared with those with higher education. The logistic output confirms the human capital theory sustaining that education contributes to higher labour remuneration. In this case the lowest chances in having higher earnings correspond to those with no education (EDUC0), followed by the graduates of primary or lower secondary education level (EDUC1) and up to the graduates of secondary or non-tertiary secondary education (EDUC2), for which chances are approximately 74% less than that of highly educated employees.

5. Conclusions

The main purpose of this paper consisted in quantifying the impact of a minimum wage adjustment upon wage inequality in Romania. In general, rigorous minimum wage impact assessment upon wage distribution is quite difficult to conduct mainly because of data access limitations in a longitudinal framework at individuals level.

In this paper an innovative approach was proposed for building a counterfactual scenario through the use of quarterly survey micro-data provided by the National Institute of Statistics. The period analysed in this paper regards the time-interval Q2 2014-Q3 2014. The reasons for this choice was based, on the one hand, in data availability restrictions and on the other hand, in the necessity to identify two consecutive periods corresponding to a window-frame right before a minimum wage adjustment and immediately after it took place. In order to check the impact on gender wage inequalities in a robust manner, a 1:1 matching procedure was applied and two distinct gender groups of individuals that are similar in observable characteristics were built. Both socio-demographic and economic factors are considered. When comparing the changes registered right after the minimum wage adjustment, we noticed a reduction in gender wage inequalities, as males chances to earn more and move forward to higher wage deciles than females drop with almost 46 percentage points. Our findings also suggest that the level of education plays an important role in employees chances of getting higher wages, especially for the case of females.

As a limitation to the study we are aware of the fact that because of data unavailability we had to study the minimum wage impact on wage inequalities using information on wage decile groups instead of the effective gross wage levels.

Thus, our findings could only partially explain the changes in wage inequalities, by assessing how the individuals' chances of earning more and move forward to a higher wage decile can differ between males and females under a minimum wage counterfactual scenario. Further research on the matter is therefore required, through the use of other micro-databases that could allow applying micro-simulations on individuals' gross/net wages in order to estimate the distributional effect of a minimum wage adjustment as well as its other economic and social implications.

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Monetary Policy Efficiency and Inclusive Growth in Nigeria: A Dea Approach

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Abstract: The study examined the efficiency of monetary policy in Nigeria for the period 1980-2015 based on annual data sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues) and World Bank Data Base. The result obtained through DEA show that monetary policy in Nigeria requires some allowable adjustments before efficiency can be achieved and thus, impact on inclusive growth. The result of SVAR framework indicate that the shock from money supply and financial openness substantially impact on inclusive growth. The study therefore recommends that government should adopt an efficient monetary policy instruments that would make monetary policy to reach optimum and impact significantly on the economy.

Keywords: DEA; SVAR; inclusive growth; monetary policy

JEL Classification: C67; O47; E52

1. Introduction

This current study attempts to evaluate the efficiency of monetary policy in Nigeria. We intend to know the efficiency scores for the input-output relationship of monetary policy instruments, what the implication is and what policy options are available to the policymaker. The study is country specific in nature as it focuses mainly on the Nigerian economy.

Much empirical works have been directed at investigating the impact of monetary policy on macroeconomic fundamentals as well as objectives; with a special focus on price stability and output growth. Interestingly, however, macroeconomic objectives are set of contradicting goals that has to be harmonized for the interest of all. Evidently, Okun's (1972) law focused on the trade-off between economic growth and employment generation; the Phillip curve analyse the short-run trade-

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off between inflation and unemployment. The exogenous nature of monetary policy presupposes that a quantum deplored towards the state of the economy should be effective. Hence, no research effort has been dissipated to set a policy rule for the overall interest of all economic agents in the economy.

Consequently, this study is novel in two major ways. It is the first to obtain composite scores for monetary policy instruments as against the use of respective instrument which usually render empirical investigations contradictory and sometimes, inconclusive. Secondly, it is the first study to address welfare component of growth known as inclusive growth. In this study, we seek to capture all monetary policy instruments as input variables and consider it impacts on inclusive growth; as an output variable. The merit of using inclusive growth as an output variable is that both the direct and indirect transmissions with which monetary policies impact on the growth process of the economy would have been captured. In addition to this introductory section, this study is further discussed under five other sections. Section two will focus on literature review; Section three sets the methodology; Section four focus on result and Section five, being the last, concludes and proffer possible policy suggestions.

2. Theoretical and Empirical Reviews

From a theoretical standpoint, the rational expectations hypothesis, the non-neutrality thesis, the Taylor's rule, liquidity trap theory and the transmission channels form the basis with which the efficiency of monetary policy has been studied. The rational expectation theory presupposes that the expectation of economic agents and current variables are the major factors influencing the workings of the economy; including that of monetary policy. The non-neutrality thesis is a contradiction to the Classical neutrality of money which suggests that temporary nominal wage and price rigidities are the basis for the non-neutrality of monetary policy in the short-run. Taylor (1995) opined that these two assumptions ensure that monetary policy can be considered efficient; at least in the short run. The Taylor rule describes the relationship between the interest rate and inflation and output. The rule suggests that an increase or decrease in the real interest rate depends on the deviation of output and potential output and deviation in actual inflation from the target inflation. The theory of transmission channels tries to explain the relationship between the monetary policy and final targets of the Central Bank and, thus, how it affects the real economy (Calvo, 1978).

Specifically, there appears no clear cut link between monetary policy efficiency and inclusive growth due to some understandable reasons. Basically, inclusive growth is a new phenomenon in the economic growth paradigm and theoretical development in their area is still very latent. However, the theoretical inference that

linked monetary policy to inclusive growth is anchored on the long-term effects of monetary policy. It was the extension to the neoclassical growth model popularized by Solow (1956) and later the development of endogenous growth models that have helped to clarify the mechanism by which money creation and inflation expectation; both being monetary policy instrument, are likely to influence long-term economic growth; which provide only a heuristic intuition for the concept of inclusive growth. More so, inclusive growth is considered to be broad-based and sustainable in nature (Ianchovichina & Lundstrom, 2009; Ianchovichina & Gable, 2011). While the neoclassical propositions align with the classical neutrality hypothesis; both in the short and long-term, most of the models emphasized that monetary policy that would positively affect any variable, such as the household savings rate, would have a real effect on economic growth. We seek a reformulation of the Sidrauski (1967) extension that includes money and inflation that if monetary policy could impact on productive employment, then, the link between monetary policy efficiency and inclusive growth can be established. For the endogenous growth theory, the household framework was decomposed from that of the firm in order to adequately trace the dimension with which money impacts on the economy.[1]

Carlos (2010) examined monetary policy and real currency appreciation. The study is based on behavioral equilibrium exchange rate model. The findings show that controlling for the influence of real side determinants, the peso-dollar interest differential had a statistically and economically significant long-run effect on the peso's real exchange rate.

Mohsen & Charikleia (2006) examined how stable is the demand for money in Greece. They proved that after incorporating CUSUM and CUSUMQ tests into cointegration analysis, the results show that even though M1 and M2 monetary aggregates are cointegrated with income and interest rate, the M2 money demand function is unstable while M1 is stable.

Young & Gwi (2016) explore the possible sources of the well documented uncovered interest parity (UIP) violation in the foreign exchange market i.e structural changes in monetary reactions to inflationary pressure in the conventional approaches to nominal exchange rate and how this small but important change has an effect on the empirical implications of UIP condition. They discovered that passive monetary reaction implying less frequent intervention by monetary authority tends to be more consistent with the UIP relation.

Marshal & David (1998) found out that optimal monetary policy is fully characterized in terms of an alternatives set of parameter restrictions. Optimal monetary feedback completely stabilizes deviations in commodity output by

[1]See (Andrade & Faria, 1994).

eliminating the influence of those current innovations but which agents cannot directly observed from the rational expectations of agents.

Pierdzoch (2003) examined the non-seperable consumption-labor choice and the international transmission of monetary policy shock. The findings revealed that the impact of monetary policy shocks on the current account is shut off by assuming that the preferences of households exhibit a particular non-separability between consumption and labor supply.

Kwang (2015) explained the delayed effect of monetary policy, the role of inventories and factor hoarding. The author accounted for some extraneous factors like high levels of dollarization, weak financial sectors, underdeveloped capital market and low monetization of economies. The study confirmed the importance of exchange rate pass through in transition economies with high dollarization. The findings also provided an empirical case for deepening the local financial sectors to improve the efficiency of monetary policy and to improve resilience to external and other shocks.

Rokon (2012) examined the effects of monetary policy shocks in Bangladesh. The study revealed that the liquidity effect and exchange rate effect of the monetary policy shock are realized immediately, while industrial production responds with a lag over half end the inflation rate responds with a lag of more than one year and monetary policy shocks are not the dominant source of industrial production fluctuation in Bangladesh.

Ghartay & Amonde (2013) using analytical narrative vector error correction model (AN-VECM) with cointegration as the identifying restriction. They discovered that in all cases, the impulse-response functions indicate that the MPI yields slightly superior results in both AN-VECMs and a positive shock in the MPI produce price and exchange rate results which are consistent with a priori expectations from economic theory, and mixed liquidity effect and real output results.

Karras (1999) examined monetary policy and the exchange rate: the role of openness. The findings revealed that monetary policy and exchange rate impact negatively on economy openness. Therefore, the more open the economy, the smaller the (short run) depreciation effects of a given increase in the money growth rate in the (long run. Rosaria, Alberto & Dreste (2008) examined making monetary policy more effective for the Democratic Republic of Congo (DRC). The paper looked at the challenges of conducting monetary policy in a context of high dollarization of the banking system and weak institution in DRC. The study covered the period 2002 – 2012 with six defining variables such as the monetary base (M1), nominal exchange rate, the Central Bank's policy interest rate, the CPI and food and oil prices while the methodology adopted is two-staged approach of identifying key determinants of inflation and estimating policy response function to inflation shocks within the ECM framework. The main conclusion from the

analysis showed that high dollarization of the economy was reflected in the long-run relationship estimated and that the Central Bank has been responsive to inflation shocks; using the policy rates to stem price increases. However, the analysis suggested that the instrument, if effective, takes at least six to eight months to have an impact on inflation. But the transmission mechanism was not clear as the pass through from the policy rate to other interest rates was weak.

Bilson (1978) investigate on whether the US monetary policy has tracked the efficient interest rate. The study proposed an alternative view of the real factors driving interest rate decisions as against the convention of setting short-term interest rate in response to inflation and some measure of the output gap. The study showed that rules in which the policy instrument tracks the efficient interest rate as the main measure of real economic developments fit the data better than equivalent specifications that respond to the output gap. Using a structural model within a New Keynesian DSGE framework of the Bayesian variants, the authors estimated its parameters and compared the fit of many alternative specification and found that policy that tracks the efficient interest rate is a more robust measure to track real economic development as against equivalent specifications that respond to the output gap; thus, proving the consistent superiority of the Wicksell rule over the Taylor rules.

Dolezal (2011) investigated the efficiency of monetary transmission mechanism in Croatia. The paper analysed the efficiency of monetary policy transmission through channels of exchange rate, money stock and interest rate on real economic activity and prices. The technique of analysis used is the Vector Error Correction (VEC) model and Johansen cointegration. The results indicated a long-run relation between monetary policy measures on one side and real economic activity and price levels on the other. The strongest long-run channel of monetary transmission is exchange rate channel while the money stock is strictly weaker. The results also showed an impact of the interest rate channel.

Barro & Gordon (1983) investigated the main impact of monetary policy on the economy and assessed the efficiency of the strategy of monetary policy in terms of attaining the specific macroeconomic goals. The author estimated the relationships between key macroeconomic variables representing monetary instruments and policy goals within the VECM framework. The study found, inter alia, that the main effect of monetary policy on the economy is its influence on nominal variables and inflation rather than on real output. Also, the author found that just a little deviation in the money supply can have very distorting effect on the exchange rate and inflation. Monetary authorities is seen to have little control over the monetary aggregates; hence, monetary aggregates and not be considered optimal monetary instruments.

Ramayandi (2009) assessed monetary policy efficiency in the ASEAN-5 countries. The study derived utility consistent social loss function as a metric for welfare to assess monetary policy efficiency in a small open economy model. An optimal monetary policy that minimizes the social loss function was solved using information on structural parameters estimated for a model that represents each of the selected ASEAN-5 countries. The results are largely consistent with the common wisdom in the literature, where policies based on credible commitment gave the best welfare outcome. The paper further examined the welfare implications of the currently adopted simple monetary policy feedback rule for each of the simple economies. The study suggested the possibility that monetary authorities in the sample countries may be optimizing over an objective function that differ from the social welfare function derived.

Cecchetti, Flores-Lagunes & Krause (2006) conducted a cross-country analysis of whether monetary policy has become more efficient. The study proposed a general method with basic structural model for analyzing changes in macroeconomic performance and identifying the relative contributions of improvements in the efficiency of monetary policy and changes in the variability of aggregate supply shocks. The authors applied their technique to a cross-section of 24 industrialised and developing countries for comparison of macroeconomic performance between the two periods of 1980s and 1990s and found that monetary policy became more efficient in the 1990s for 21 of the 24 countries. The results obtained showed that more efficient policy has been the driving force behind improved macroeconomic performance. This was found to also offset an increased variability of supply shocks in some countries.

The gaps in the literature are of both conceptual and methodological. Usually, both inflation and output stability has remained the two major indicators for capturing macroeconomic performance in the literature. However, our study focused largely on inclusive growth; as a more far-reaching and holistic measure with which to test the classical dichotomy hypothesis; and by extension, how monetary policy has been efficient in driving the economy. Different from inflation and output, inclusive growth is a long-term sustained economic growth that is broad-based across sectors and inclusive of a large part of a country's labour force, thereby, reducing unemployment significantly (Groepe, 2012). Methodologically, we employed the use of the Data Envelopment Analysis (DEA) as the most robust technique for investigating efficiency through an input-output framework. We considered this better than the estimation of efficiency frontier through minimization of the social welfare function but rather as an optimization process of the various monetary policy input to generate a given output.

3. Methodology

3.1. Theoretical Framework and Model Specification

The theoretical framework for this study is the reformulated neoclassical growth model. We seek a reformulation of the Sidrauski (1967) extension that includes money and inflation which state that if monetary policy could impact on productive employment, then, the link between monetary policy efficiency and inclusive growth can be established. In the literature, productive employment is the major variable that has been established to provide opportunities for economic agents to contribute to the growth process and share from the growth outcomes respectively.[1] Sidrauski (1967) employed systems of equations and set of assumptions and established that in a growth model in which utility maximizing families are the basic economic unit of the system, the long-run capital stock of the economy is independent of the rate of monetary expansion.

With two additional assumptions that money supply expands at a constant rate over time and that in a steady state, real money balances is also constant over time, Orphanide & Wieland (1999) extended this model and reached the conclusion that money is non-neutral and that a monetary policy that has the nominal interest falling over-time may sustain higher output and consumption forever. We reformulate the Orphanide & Wieland (1999) extension that the Sidrauski (1967) growth model considered economic agents with productive opportunities as the basic economic units of the system; then, the long-run capital stock of the economy would largely depend on the rate of monetary expansion as the economy would be imbued with absorptive capacity to utilize this monetary expansion and not result in increasing price level; hence a more efficient allocation of resources that continually reduce the cost of capital; albeit interest rate, overtime.

The Sidrauski (1967) model is specified as a representative agent model that solves:

$$\max_{(c_t, m_t)} \int_0^{\infty} e^{-pt} u(c_t, m_t) dt, s.t. \tag{1}$$

$$a_t = f(k_t) - \delta k_t - \pi_t m_t + v_t - c_{t,} \tag{2}$$

$$\lim_{t \to \infty} e^{-pt} a_t \geq 0. \tag{3}$$

Where; c_t is consumption, m_t is the real money balances, k_t is capital, $a_t = k_t + m_t$ is the asset, π_t is the rate of inflation, v_t is lump-sum government transfers, p is the

[1] See (Lledo & Garcia-Verdu, 2011).

rate of time preference while δ is the rate of depreciation. From the foregoing and in tandem with the inclusive growth determinants of Anand et. al., (2013), the functional form relationship of monetary policy efficiency and inclusive growth is therefore specified as;

$$GPPE = f(MPE, GFCF, GOVCONS, GNI\_1, TOP, FOP, INF) \quad (4)$$

Equation (4) above yield the empirical model of the form;

$$GPPE_t = \alpha_0 + \beta_1 MPE_t + \beta_2 GFCF_t + \beta_3 GOVCONS_t + \beta_4 GNI\_1_t + \beta_5 TOP_t + \beta_6 FOP_t + \beta_7 INF_t + \varepsilon_t \quad (5)$$

Where; GPPE is the real growth per person employed, MPE is the efficiency score of monetary policy obtained through the DEA process, GFCF is the gross fixed capital formation, GOVCONS is the government consumption, GNI_1 is the lagged of gross national income, TOP is trade openness and FOP is financial openness while INF is the rate of inflation. The scope of analysis for this study span 1980-2013 and data are obtained from the World Development Indicator (WDI, 2014); the Central Bank of Nigeria Statistical Bulletin (various issues). This period is found suitable for our study as it is considered long enough to trace the interaction between monetary policy efficiency and inclusive growth in Nigeria.

4. Results and Discussion

In this section, a systematic procedure would be followed to investigate the relationship between monetary policy efficiency and inclusive growth in Nigeria. To begin with, descriptive statistics of the variable included in our model were obtained in order to ascertain the statistical properties of the series under consideration. Following this, the efficiency scores of money policy input-output interactions was estimated. Essentially, the open market instruments of treasury bills and treasury certificates were taken as the input variables while interest rate and monetary base would serve as the output variables. The choice of both the treasury bills and treasury certificates is that these two tools remain the major potent monetary policy instruments for controlling the supply of money in Nigeria.[1] Also, the use of interest and the monetary base as output variables is informed by the submission that the interest rates is the major tool for stimulating the growth process of an economy.[2] The input-output relationship is the basic kernel of the Data Envelopment Analysis approach where we seek to examine how the input variables have assisted in ascertaining the response of the output variable(s). The idea here is that for monetary policy to be effective, it has to be able to stabilize price and stimulate growth in the economy through some

[1] See (CBN, 2016).
[2] See (Krause, 2004).

intermediate variables. For robustness sake, the study proceeded to employ the use of Structural Vector Autoregression (SVAR) model to trace the transmission mechanism of money policy to inclusive growth in Nigeria. Some diagnostics are carried out too.

Table 1. Descriptive Statistics

	GDPPE	MS	FOP	GFCF	GNI_1	GOVCONS	INF	TOP	FDI_GDP
Mean	4125.387	2939.505	0.195100	1017417.	218384.2	1069699.	20.57419	9.399343	3.241133
Maximum	6772.000	15158.62	0.345959	5137368.	341967.8	4955029.	72.80000	36.09101	10.83256
Minimum	2956.000	15.78674	0.000000	8799.480	156921.1	8064.390	5.400000	0.072361	0.663717
Std. Dev.	1214.334	4614.600	0.131976	1551160.	57054.61	1625416.	17.88925	10.50802	2.295737
Skewness	0.907833	1.542400	-0.591133	1.563988	0.927834	1.477438	1.451459	1.016701	1.686571
Kurtosis	2.326640	3.935675	1.637646	4.043780	2.496733	3.635546	4.074543	3.000939	5.858903
Jarque-BBera	4.843825	13.42232	4.202779	14.04522	4.775008	11.79965	12.37620	5.340688	25.25391
Probability	0.088752	0.001217	0.122286	0.000891	0.091859	0.002740	0.002054	0.069228	0.000003

Source: E-views Output

The figures in Table 2 detailed the statistical properties of the variables included in the model of estimation. The standard deviation shows that there has been marked dispersion away from the expected values for inclusive growth indicator (proxied as GDPPE), money supply (proxied as MS), gross fixed capital formation (proxied as GFCF), the previous level of income per capita; indicated as lagged gross national income (proxied as GNI_1) and government involvement which is indicated as government final consumption (proxied as GOVCONS). The implication is that investment in the Nigeria economy has been more than the absorptive capacity while government involvement in the workings of the Nigerian economy has exceeded its required level for the proper functioning of the economy. The supply of money has been counter-productive and created some disturbances towards price stability and stimulation of growth. The level of financial openness (proxied as FOP) and closely followed by that of foreign direct investment (proxied as FDI) has been the least dispersed with 0.13 and 2.30 standard deviation. The openness on trade (proxied as TOP) and the price level in the economy (proxied as INF) are also fairly dispersed from their expected values with 10.5 and 17.9 standard deviation values respectively. This suggests that these variables tarry with their expected values and could not be seen to be distorting. Except for the FOP, which is negatively skewed, all the variables are all positively skewed. The implication is that the dispersion from the expected value of the FOP is the only detrimental of all while others are only distorting. The Kurtosis show that only the openness on trade (proxied as TOP) is the only normally distributed series with 3.0 value; as expected of the benchmark for normal distribution. Other variables are either platykurtic or leptokurtic in nature. These variables either have a value for kurtosis below the benchmark or above the benchmark of 3.0. Specifically, only three variables; GDPPE, FOP and GNI_1 that are platykurtic with 2.3, 1.6 and 2.5 values respectively. However, a former test for normality through the use of the Jarcque-bera test indicate that both the mesokurtic and

platykurtic series are normally distributed as these variables (TOP, GDPPE, FOP and GNI_1) have Jarcque-bera probabilities that are greater than 0.05.

Data Envelopment Analysis of Monetary Policy Efficiency

Table 2. DEA Report

Microsoft Excel 12.0 Answer Report					
Worksheet: [Monetary_Policy_Efficiency.xls]					
Report Created: 9/11/2015 5:27:48 AM					
Target Cell (Min)					
Cell	Name	Original Value	Final Value		
$D$41	(Nbillion) LHS	433.9325	3.87564E-08		
Adjustable Cells					
Cell	Name	Original Value	Final Value		
$F$2	Weight (λ)	1	6.23661E-09		
$F$3	Weight (λ)	1	0		
$F$4	Weight (λ)	1	0		
$F$5	Weight (λ)	1	0		
$F$6	Weight (λ)	1	0		
$F$7	Weight (λ)	1	0		
$F$8	Weight (λ)	1	0		
$F$9	Weight (λ)	1	0		
$F$10	Weight (λ)	1	0		
$F$11	Weight (λ)	1	0		
$F$12	Weight (λ)	1	0		
$F$13	Weight (λ)	1	0		
$F$14	Weight (λ)	1	0		
$F$15	Weight (λ)	1	0		
$F$16	Weight (λ)	1	0		
$F$17	Weight (λ)	1	0		
$F$18	Weight (λ)	1	0		
$F$19	Weight (λ)	1	0		
$F$20	Weight (λ)	1	0		
$F$21	Weight (λ)	1	0		
$F$22	Weight (λ)	1	0		

$F$23	Weight (λ)	1	0		
$F$24	Weight (λ)	1	0		
$F$25	Weight (λ)	1	0		
$F$26	Weight (λ)	1	0		
$F$27	Weight (λ)	1	0		
$F$28	Weight (λ)	1	0		
$F$29	Weight (λ)	1	0		
$F$30	Weight (λ)	1	1.3623E-10		
$F$31	Weight (λ)	1	0		
$F$32	Weight (λ)	1	0		
$F$33	Weight (λ)	1	0		
$F$34	Weight (λ)	1	0		
$F$35	Weight (λ)	1	0		
$F$36	Efficiency Weight (λ)	3.12023E-12	1.57943E-09		
Constraints					
Cell	**Name**	**Cell Value**	**Formula**	**Status**	**Slack**
$D$42	(Nbillion) LHS	6.61713E-07	$D$42>=$F$42	Binding	0
$D$40	(Nbillion) LHS	5.40915E-09	$D$40<=$F$40	Binding	0
$D$39	(Nbillion) LHS	6.42911E-08	$D$39<=$F$39	Binding	0
$D$41	(Nbillion) LHS	3.87564E-08	$D$41>=$F$41	Binding	0
$D$43	Σλ LHS	4	$D$43>=$F$43	Not Binding	4

Source: Microsoft Excel Solver Output

The Data Envelopment Analysis (DEA) report detailed in Table 2 above suggests that monetary policy has not been efficient; either with respect to each of the years or generally. Originally, we expect that the efficiency score estimated through this DEA model approach unity (i.e. 1). However, the results obtained showed that it rather tends towards zero (0). The implication is that monetary policy instruments in Nigeria has not been able to hit it target over time and holistically. This result tends to indicated that money is neutral and that money does not really matter for inclusive growth in the economy. However, the scenario analysis in the table below (see Table 3) suggests that money can be made efficient; requiring some adjustment in order to stabilize price and stimulate inclusive growth of the Nigerian economy. There are allowable increase and allowable decreases for money policy to reach its optimum in order to engender inclusive growth in the country. The allowable increase appears to be tendered at a particular amount of 1E+30 while those of the allowable decreases vary over time. The shadow price shows the cost of obtaining additional one unit of a scarce resource; in the case policy instrument.

For a resource to have a shadow price, it must be truly binding; implying that all have been deployed towards optimum efficiency. Treasury bill, interest rate and monetary base are the variable that demands that additional policy deployment will require additional cost to bear on the economy; with the one with the highest cost being the rate of interest (see Table 3).

Table 3. Sensitivity Analysis

Microsoft Excel 12.0 Sensitivity Report						
Worksheet: [Monetary_Policy_Efficiency.xls]Efficiency_2006						
Report Created: 9/11/2015 5:29:21 AM						
Adjustable Cells						
		Final	Reduced	Objective	Allowable	Allowable
Cell	Name	Value	Cost	Coefficient	Increase	Decrease
$F$2	Weight (λ)	5.68348E-09	0	6	34.80256469	5.963783673
$F$3	Weight (λ)	0	5.109915105	6	1E+30	5.109915105
$F$4	Weight (λ)	0	9.312910823	8	1E+30	9.312910823
$F$5	Weight (λ)	0	13.10388459	8	1E+30	13.10388459
$F$6	Weight (λ)	0	15.12387939	10	1E+30	15.12387939
$F$7	Weight (λ)	0	16.57227337	10	1E+30	16.57227337
$F$8	Weight (λ)	0	16.60499616	10	1E+30	16.60499616
$F$9	Weight (λ)	0	25.18519461	12.75	1E+30	25.18519461
$F$10	Weight (λ)	0	35.32980323	18.5	1E+30	35.32980323
$F$11	Weight (λ)	0	22.8778252	18.5	1E+30	22.8778252
$F$12	Weight (λ)	0	22.98162033	14.5	1E+30	22.98162033
$F$13	Weight (λ)	0	54.99838069	17.5	1E+30	54.99838069
$F$14	Weight (λ)	0	101.7449226	26	1E+30	101.7449226
$F$15	Weight (λ)	0	97.3369132	13.5	1E+30	97.3369132
$F$16	Weight (λ)	0	92.11959608	13.5	1E+30	92.11959608
$F$17	Weight (λ)	0	88.82022078	13.5	1E+30	88.82022078
$F$18	Weight (λ)	0	86.1362547	13.5	1E+30	86.1362547
$F$19	Weight (λ)	0	207.5320637	13.5	1E+30	207.5320637
$F$20	Weight (λ)	0	202.3853246	14.31	1E+30	202.3853246
$F$21	Weight (λ)	0	343.1260322	18	1E+30	343.1260322

$F$22	Weight (λ)	0	427.9695457	13.5	1E+30	427.9695457
$F$23	Weight (λ)	0	535.7224961	14.31	1E+30	535.7224961
$F$24	Weight (λ)	0	680.6232367	19	1E+30	680.6232367
$F$25	Weight (λ)	0	748.6551765	15.75	1E+30	748.6551765
$F$26	Weight (λ)	0	787.1613619	15	1E+30	787.1613619
$F$27	Weight (λ)	0	728.7294931	13	1E+30	728.7294931
$F$28	Weight (λ)	0	508.8184967	12.25	1E+30	508.8184967
$F$29	Weight (λ)	0	288.6078976	9	1E+30	288.6078976
$F$30	Weight (λ)	1.33516E-10	0	9.8125	341.9570014	451.350635
$F$31	Weight (λ)	0	328.7667952	7.4375	1E+30	328.7667952
$F$32	Weight (λ)	0	780.2803372	6.125	1E+30	780.2803372
$F$33	Weight (λ)	0	1134.675082	9.1875	1E+30	1134.675082
$F$34	Weight (λ)	0	1486.659899	12	1E+30	1486.659899
$F$35	Weight (λ)	0	2015.054982	12	1E+30	2015.054982
$F$36	Efficiency Weight (λ)	1.44647E-09	0	0	1E+30	24.126

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
$D$42	(Nbillion) LHS	6.48527E-07	0.103031489	0	1E+30	0
$D$40	(Nbillion) LHS	5.30135E-09	0	0	1E+30	0
$D$39	(Nbillion) LHS	6.30099E-08	-1.06044677	0	0	1E+30
$D$41	(Nbillion) LHS	3.5411E-08	1	0	1E+30	0
$D$43	Σλ LHS	4	0	0	4	1E+30

5. Conclusion and Recommendation

This study investigates the efficiency of monetary policy in Nigeria through the use of the Data Envelopment Analysis (DEA) approach. Through this method, we obtain efficiency scores for the input-output relationship of monetary policy instruments for each of the year and for the whole years. Using scenario analyses through sensitivity analysis, we determine the allowable reductions and additions to this instruments that would make monetary policy to reach optimum and impact meaningfully on the economy. It is important to note that the input variables are the treasury bills and treasury certificates while interest rate and monetary base constitute the output variables. The study further proceeded to examine the impact that monetary policy has on inclusive growth in the country using a Structural Vector Auto-Regression (SVAR) model. Also, the actual inflation rate was fitted to its targeted rate for the period under investigation for robustness sake. The striking finding for this study is that even though it has not been efficient, monetary policy in Nigeria requires some allowable adjustments before efficiency can be attained and, thus, impact on inclusive growth. More so, the results obtained through the

SVAR framework indicate that the shocks from money supply and financial openness substantially impact on inclusive growth. It sums up to mean that, even though non-neutral, monetary policy has not been efficient in driving inclusive growth in Nigeria.

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The Impact of Financial Education on Banking Behavior

Sorina Botiş[1]

Abstract: The purpose of the article is to highlight the increasing importance of financial education or its absence, on the behavior and decisions of consumers in a more sophisticated banking market, being offered a variety of complex financial instruments for borrowing and saving, credit cards, mortgage loans, insurance, investment and retirement saving etc., with a large range of options. The financially educated consumers, well informed and familiarized with financial instruments, are able to make responsible choices, otherwise risking isolation and financial exclusion. The article presents a comparative study, based on statistical data, between countries within the European Union, including Romania, from the point of view of the financial inclusion index, the access of the population to financial services, the proportion of the adult population using banking products and services such as bank accounts, credit cards, debit cards, saving products, the proportion of borrowers by the type of the credit, the role of financial institutions in providing financial education, the level of education and the access to it.

Keywords: financial behavior; banking system; financial instruments; banking products; financial exclusion

JEL Classification: G21; G23; G40; I22

1. Introduction

Financial education is becoming increasingly important for individual's financial well-being, even more in emerging economies where the financially educated consumers can adapt more easily to the variety of financial services offered by a growing banking market.

According to the Organisation for Economic Co-operation and Development (OECD), the financial education is a process that includes elements of information (facts, data, and specific knowledge), instructions (skills, training, and abilities to understand financial terms and concepts), advice (counsel about generic financial issues and products). (OECD, 2005)

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The term of financial education is different from the notion of financial literacy, which is focused on understanding and general knowledge, and also from the financial ability which covers, besides the cognitive views, the behavior, decisions and practical skills.

So, according to the above-mentioned definition, we can say that the financial education is the most complex notion, more extensive, including both financial literacy and financial ability.

In this context, well-informed customers and familiarized with the financial instruments, are able to make responsible choices, otherwise risking isolation and financial exclusion. (Kempson et al., 2007)

2. Research Aims and Methodology

The purpose of this research is to show how the lack of financial knowledge and an improper financial education influences people's decisions on lending, saving, and also on the usage of simple banking products.

The objectives pursued during the research, answer the following questions:

- What does the financial education mean?;

- To what extent does the financial education influence the access to banking products and services?;

- On what position is Romania situated, in relation to the Euro area and other Central and Eastern European countries, in terms of financial inclusion indices?;

- What are the causes of financial exclusion in Romania?.

In trying to answer these questions, the proposed approach combines the descriptive research with the explanatory research by obtaining information and evaluating them.

The research methods used are both quantitative and qualitative methods.

Through deductive reasoning, which resembles a top-down approach, the study begins with the presentation of the general characteristics of financial education, continues with observations based on statistical data collected and processed during the period between 2007 and 2017, for the unit involved- the population accessing banking products in Romania and ends with checking the research validity and the possibility of generalizing the results obtained. It also presents the cause-effect relationship between financial education and the assumption of risks associated with decisions in the banking financial sphere.

The tool used in the qualitative approach is the opinion poll. It refers to the opinion of the adult population in Romania regarding the importance of financial education, who should provide it, and what is the age at which basic concepts should be introduced in education.

The characteristics and attributes specific to the unit involved relate to education-measured in school years; age-measured in years of fulfillment; the area where they live - rural environment /urban environment.

The novelty of this approach is the multitude of statistical data collected, processed and analyzed, which allows the presentation of a comparative study between Romania, the Euro area and other European countries, from the point of view of the access to financial instruments specific to the banking sector in terms of importance and the level of development of financial education.

3. Level of Financial Education in Romania, Financial Inclusion and the Access of the Population to Banking Products and Services

Financial behavior implies an attitude formed and adapted to the specific way of life within the today's society, acquired through financial education, a financial intelligence and last but not least, through financial discipline. (Hollinger, 2007)

Financial education involves the formation of habits arising from financial practice, of essential skills in the understanding of financial issues, which allows the assumption of financial responsibilities, financial modeling, giving up the old habits and automatism that reduces the consumers', investors' and small entrepreneurs' access to a variety of financial information in the banking field, designed to allow correct decisions regarding resource management, assuming the corresponding rights, obligations and risks.

In addition, to its role as the main financier of the economy, banks also have prerogatives related to the increasing level of financial education, ensuring and maintaining the stability of the banking system through the promotion of fair and balanced relationships with banking clientele, rebuilding the trust in the banking system.

A poor financial education attracts restrictions regarding the consumers' freedom of choice, the impossibility of an informed decision to purchase the offered banking products and services, the ignorance of the contractual rights related to the purchased product or service, deficiencies in communication with the banks, low financial capability, and finally financial exclusion with repercussions on the economic and social integration capacity.

At a global level, the access to quality public and social services is essential for daily life, economic and social wellbeing. Efficiency and sustainability are essential to make sure the beneficiaries receive the best possible services, corruption is minimized and the local economy can benefit. (Dincă et al., 2016)

Even though taxes did not influence directly the financial crisis, some aspects of the tax system had a certain impact on raising the risk assumed and the degree of indebtedness of banks, households, and companies. (Ulici-Ciupuc et al., 2013)

Financial exclusion (without taking into account the voluntary financial exclusion), lack of access to financing for personal consumption, personal development, the development of a business, the exclusion from basic financial services necessary for any household (current account for receipts and payments, saving products suitable for small amounts, money transfer facilities, insurance products-life and non-life, small loans and overdrafts for personal purposes of production or other type-assimilated to the concept of microcredit), lack of access to financial counseling services, have as main causes the lack of saving skills, lack of personal assets, lack of access to financial education, low income, unemployment, residence in a rural area or in a geographical area with a high risk of poverty, old age, lack of access to information.

In this respect, banks are developing new models of banking communication, increased transparency, developing long-term financial education programs, taking measures to reduce costs and strengthen financial discipline, measures aimed at training and attracting responsible consumers, properly and systematically informed, adequately protected, changing the mentality of keeping cash savings at home with effect on the increase of redistributed sources of credit in the economy, essential for economic development and, implicitly, for ensuring the stability of the banking system.

The achievement of a mutual advantageous partnership based on trust between the banks and their customers, requires the banks' compliance with certain principles of conduct based on financial values such as professionalism, transparency and honesty, freedom of choice and understanding, and for the both sides , principles based on integrity, accountability, respect and reciprocity, both in terms of benefits and obligations.

In the segment of individuals, financial education in banking, starts with the understanding and the acquirance of a specific terminology related to retail banking (current account, bank deposit, maturity, interest rate, credit, capitalization, debit card, credit card etc.), with the understanding of the banking system structure and the different categories of banks of which it is composed, of banking products and services market, the main characteristics of the goods and services on offer, the terms and conditions provided in the specific contracts, the way how the offer of

banks is structured, specific aspects of current banking activity (advice, information, promotion, transaction accounts, savings, credit, etc.).

Within the European Union, Romania has the lowest index of financial inclusion - 0.554 compared to Bulgaria with 0.567, Poland 0.747, Hungary 0.876, Slovenia 1.000, etc. Romania also occupies the last position in terms of the population access to financial services, 40% of the adult population not having access to it. In this percentage falls, in particular, the population with low level of education (primary education or less) - 34.4%, rural population-56.4%, although it has noted a consistent increase with 50% in only three years of the access to financial institutions in rural areas.

The adult population which uses products and banking services, represented in 2016, only a percentage of 60%, compared to 99.4% in Austria, Germany, and France with 99.2% and 98.7%, according to the statistics of the European Banking Authority (EBA).

One of the main causes of poor financial inclusion in Romania is, alongside the individual poverty at the level of communities (11% of people which are living in urban areas, and 38% of those living in rural areas, are exposed to the risk of poverty), the low level of financial education.

In terms of financial education in Romania, according to a study, conducted by Standard & Poor's, over global financial education, our country stands on the last position in the European Union and ranks 124 from 140 countries worldwide, while only 22 % of population has a minimum of financial knowledge, the European average being 52%.

According to the Romanian Commercial Bank (RCB) survey's, *"Romanians and Financial Education,"* released in October 2016 together with Unlock Market Research, 85% of financial education is done within the family, 9% through the school, and only 6% in the banking system. Although according to the same study, 42% of the Romanians considered that financial education should be provided by banks, finance specialists and other financial institutions, and only 18% expect that financial education should be taught in school, results that contradict the similar RAB survey (Romanian Association of Banks), according to which the financial education responsibility belongs to a larger proportion (79%) to the school, mainly to high school and college.

The RCB's report highlights the way in which the population perceives the importance, the role, and purpose of financial education. So a 75% of the adult population understands, through financial education, that the access to credits must be conditioned by the possibility of their repayment, 66% to not spend more than it earns, 61% relate to financial education through the need to prioritize spending, only 1 of 5 Romanians having a savings' account or a term deposit.

According to the Global Findex Database 2015 (Global Financial Inclusion Database), Romania is the country with the least access to the bank accounts among EU member countries.

Only 60.8% of the population over 15 years old from Romania holds a bank account, the average in the Euro area being 94.8%. The proportion is lower even than in Bulgaria, with a share of 63% of the adult population that has a bank account, 72% - Hungary and Poland with 78%. (International Monetary Fund Report, 2015)

Card market analysis shows a similar situation, Romania having one of the lowest rates of usage of these payment instruments in the European Union. Thus, the percentage of the adult population holding a debit card is in Romania of 45.8% (1275 debit cards/1000 adults, which are used mostly for salaries and less as an instrument of payment; the proportion of cash withdrawals from ATMs being of 75.3%), 81.1% - the Euro area average, 59.9%-Hungary (1577 debit cards/1000 adults), 57.8% and 55.9%-Serbia-Bulgaria (1833 debit cards/1000 adults). Credit card holders in Romania are at the rate of 16.6% (255credit cards/1000 adults), 41.9% - the Euro area average, 11.8% - Hungary (294 credit cards/1000 adults), 15.2% - 12.2%, Serbia-Bulgaria (284 credit cards/1000 adults). (Ray, 2015)

Only 13.3% of the adult population had chosen as a form of saving, in the last year, the bank deposit, in relation to the Euro area average of 47.6 percent, while loans have been accessed by Romanians at the proportion of 45% compared to 35.4% in the Euro area.

The number of persons indebted to banks and non-banking financial institutions is about 4 million, the sources of loans financing coming mainly from over 10 million depositors. (Folcuț, 2015) The ratio between borrowers and depositors being 2 to 5.

As it is presented in Table 1, Romania is the country which, compared to the Euro area average and with other region's countries (Bulgaria, Hungary, Serbia), has the highest share of borrowers. Thus, 45.7% of Romanians have borrowed money in 2014, well above the Euro area average of 35.4%, the other countries having a percentage below this average.

Also, Romania is the country with the largest share of citizens who have to borrow money for education or health expenses (5.4% of the population), the Euro area average being 4%. The share of those loans in rural areas being 5.5%, while the Euro area average is 3.3%. The percentage of loans for medical needs is 13.3%, the average of the Euro area being 3.7%, 5.0%, Bulgaria, 4.1% and 3.7% in Serbia and Hungary.

At the same time, only 2% of the population lends money to start or develop a business or a farm, compared to 2.8% in the Euro area.

The proportion of loans from informal sources, including pawn shops and money lenders, representing 1.6% of total loans (0.0% in Serbia), an increase of over 9 times in the period 2011-2014, of the frequency with which Romanians borrow from such sources.

Table 1. The Proportion of Borrowers From Different Sources

	Rom.	Euro area av.	Bulgaria	Serbia	Hungary
Loans in the last year (+15 years)	**45,7%**	**35,4%**	**33,1%**	**32,1%**	**31,7%**
Loan from a financial institution; % of total (+15 years)	11,8%	15,8%	13,3%	8,5%	8,7%
Loans from informal sources– family, friends, pawn shops, etc; % of total (+15 years)	1,6%	0,4%	1,6%	0,0%	0,7%
Loan for education or school fees	5,4%	4,0%	2,1%	2,6%	2,0%
Loan for health/medical reasons	13,3%	3,7%	5,0%	4,1%	3,7%
Loan to start or develop a business or a farm	2%	2,8%	1,6%	2,3%	1,1%

Source: Global Findex Database 2015 (Global Financial Inclusion Database) http://databank.worldbank.org/data/reports.aspx?source=1228

It can be said that all these evolutions are the consequence of poverty and financial exclusion, Romania having one of the highest values of the risk of poverty and social exclusion indicator (37.3% compared to the EU average of 23.7% in 2015).

On this background, more than half (55%) of the new loans granted in the last year to the private non-financial sector were oriented to the population sector, increasing by 20% compared to the previous year, as a result of a low interest rate and a significant increase in income for certain categories of employees.

Figure 1 shows the destination of credits granted to the population of Romania between December 2007 and December 2016. There is an increase in loans to the population, with the exception of a slightly decreasing trend in 2013 and 2014; in their portfolio, depending on the destination, housing loans rising by 8% in 2016 (NBR, 2017), to the detriment of consumer credit, mainly due to banks' lending restrictions and the fact that this type of credit raises the highest risks of excessive indebtedness.

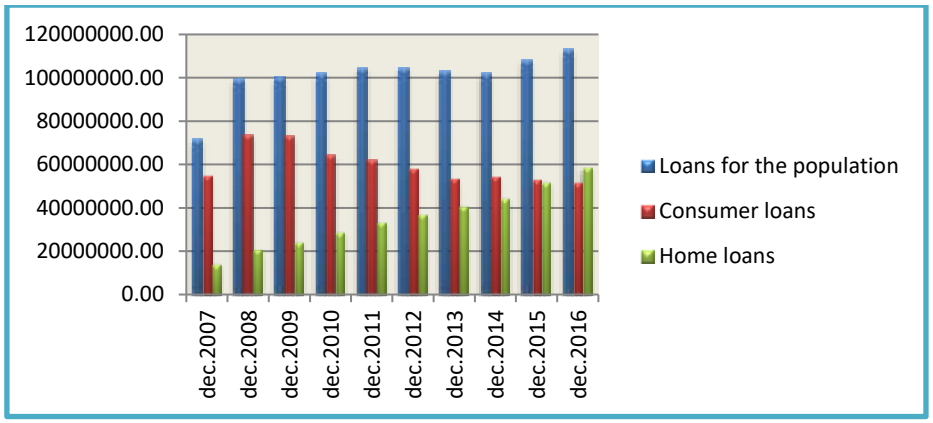
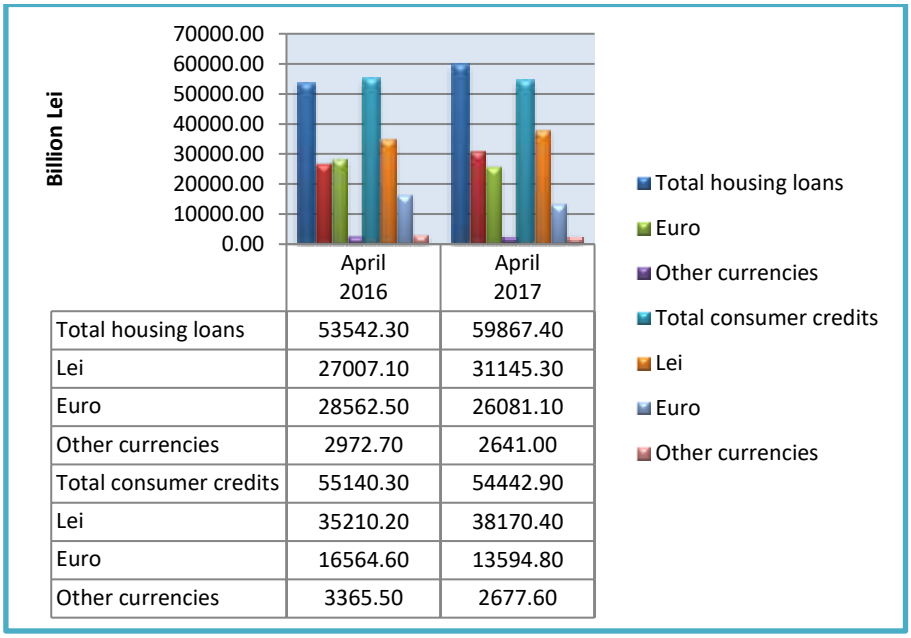


Figure 1. The destination of credits granted to the Romanian population December 2007 - December 2016

Source: Author – representation of the data from Statistical Data, available at www.bnro.ro

The statistical data provided by the World Bank (processed in Figure 2), reveals that in April 2017, 52,03% from the total housing loans were granted in lei, 43,56% in euro and 4,41% in other currencies. The credits for consumption were granted in the proportion of 70.11% in lei, 24.97% in euro and 4.92% in other currencies. The amount of overdue loans had risen in January to 8.08 billion lei, increased by 1% compared with the previous month, of which over 3 billion lei were in the national currency, 3.45 billion lei equivalent in euros, 1.58 billion lei the equivalent in other currencies and 5.5 billion lei equivalent in American dollars.



	April 2016	April 2017
Total housing loans	53542.30	59867.40
Lei	27007.10	31145.30
Euro	28562.50	26081.10
Other currencies	2972.70	2641.00
Total consumer credits	55140.30	54442.90
Lei	35210.20	38170.40
Euro	16564.60	13594.80
Other currencies	3365.50	2677.60

Figure 2. The housing loans and consumer credits granted between April 2016 – April 2017, in lei, euro, and other currencies

Source: Author – representation of the data available at: http://databank.worldbank.org/data/reports.aspx?source=1228

The level of financial education, financial literacy and financial inclusion determines the attitude of the population for saving, the way it chooses to use the financial instruments offered by the market to achieve a higher return on savings, the purpose, and motivation for which they were established.

Only 13.3% of the adult population from Romania, has chosen, as a form of saving, in the last year, the bank deposit, in relation to the Euro area average of 47.6%, 14.3% of Bulgaria's adult population keeps their savings at the bank, in Serbia 8.7% and in Hungary 19.3% of the population over 15 years.

4. Conclusion

The main conclusions of the study can be summarized as it follows:

The value of the financial inclusion index places Romania on the last place among the European countries, the main causes of poor financial inclusion being individual and community poverty as well as the low level of financial education, Romania having one of the highest values of the risk of poverty and social exclusion indicator.

Romania ranks last in the EU in terms of the population access to financial services and instruments. The percentage of the adult population in Romania, using banking products and services, is lower by about 40% compared to Western European countries. Financial inclusion is quantified according to the proportion of the adult population holding a bank account; the percentage of the adult population holding a debit/credit card (Romania having one of the lowest rates of usage of these payment instruments in the European Union); percentage of the adult population holding a bank deposit, etc.

The level of financial education places Romania on the same position in the European Union, less than a quarter of the population having the minimal financial knowledge, 85% of financial education being developed within the family. The adult population mistakenly understands by financial education, first of all, that the access to credits must be conditioned by the possibility of reimbursement, and less in terms of the need to prioritize spending, with only 1 out of 5 Romanians holding a savings account or a sight deposit, and the ratio between borrowers and depositors is 2 to 5.

Only 13.3% of the adult population has chosen as a form of saving, in the last year, the bank deposit, in relation to the Euro area average of 47.6%, while loans have been accessed by Romanians at the proportion of 45% compared to 35.4%, in the Euro area.

Romania is the country that has the largest share of borrowers compared to the Euro area average and to the countries in the region. They have, as a priority destination, the coverage of education or medical needs and only 2% of the population borrows money to start or develop a business. The proportion of loans from informal sources, including money lenders and pawn shops, is also worrisome.

The efforts at the international level is materialized in the development and implementation of national strategies for financial education, over 60 countries having such a strategy, of which 26 countries have or are in the process of developing a national strategy, 23 countries are implementing the national strategy while 11 countries are reviewing the first national strategy or are implementing a second revised one.

In Romania, there are implemented a number of programmes designed to contribute to the increase of the level of financial education, which is aimed primarily at younger generations.

Thus, financial education youth programmes, conducted by the Ministry of Education, National Bank of Romania (NBR) and the Financial Supervisory Authority (FSA), were awarded to Berlin, at the event's Global Inclusion Awards 2017, at Child and Youth Finance International (CYFI) Country Awar category.

However, Romania is not on the top of the statistics in the field, the conclusions of specialized studies in financial education highlighting the fact that there is still a low degree of consumer financial information and a reduced ability to make informed financial decisions and transforming them into a suitable financial behavior, adapted to the needs of their own.

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