

IMPACT OF UNDERGROUND ECONOMY UPON THE ROMANIAN ECONOMY

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Abstract: *The present article shows estimates the size of underground economy in Romania during 1999 - 2012 (as a percentage of real GDP), carried out by Schneider by means of the MIMIC method. Moreover, the data on 2011 referring to this phenomenon are compared to the data on 30 different states in Europe. In addition, in order to emphasize the difficulty of the scientific endeavour of evaluating the size of the underground economy and especially to see what the endeavour is basically about, the MIMIC methodology has been shaped which is the procedure most frequently used by Schneider in his latest surveys. Using a linear regression model in the end of this article helps accomplish a prognosis of the size of Romania's underground economy in 2013.*

Key words: *underground economy; fiscality; MIMIC; Schneider.*

JEL classification: *O17, K42, E6*

1. Introduction

There are several names of underground economy in specialty literature, such as: hidden economy, shadow economy, dual economy, parallel economy, gray economy, illegal economy, anti-economy etc. (Braşoveanu, 2010).

Furthermore, there are a lot of definitions given to underground economy but none is accepted unanimously. On one hand, definitions differ as a result of different methodologies used for its measurement and on the other hand there is a disagreement related to the definition of underground economy activities (Schneider and Enste, 2000).

According to a concise definition (Choi and Thum, 2005), underground economy is made up of activities that are not entered in governmental statistics. One commonly used working definition of the underground economy refers to all currently unregistered economic activities that contribute to the officially calculated (or observed) Gross National Product. (Schneider et al, 2010a). In another definition (Feige, 1994), underground economy includes activities that ensue from illegal goods and services transactions or from tax evasion crimes.

Schneider who uses the term of shadow economy to refer to underground economy has frequently estimated its annual size (as a percentage of gross domestic product) for various countries in the world, during various periods.

Underground economy has a negative impact upon tax revenues, gross domestic product and, implicitly, upon the economic growth. Evidently, the bigger the underground economy size, the stronger the impact. That is why the issue of what causes underground economy is becoming very important. The main determinant factors of underground economy (Schneider and Savasan, 2007b) are:

- pressure of fiscality and benefit obligations;
- pressure of state-imposed regulations;
- public sector services.

In other words, the Romanian underground economy is characterized by tax evasion, illegal employment, relationships with organized crime and terrorism, and involvement in almost all areas of economic crime (Ghişescu and Banciu, 2001).

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2. Sizes of Romania's Underground Economy

Underground economy is a wide-spread phenomenon, yet its amplitude all around the world greatly differs from a country to another which can be seen by analyzing the underground economy sizes measured as a percentage of the GDP in 31 European countries during 2011- 2012 (table 1 and graph 1).

Table no. 1. Underground economy as GDP percentage in 31 European countries between 2011- 2012

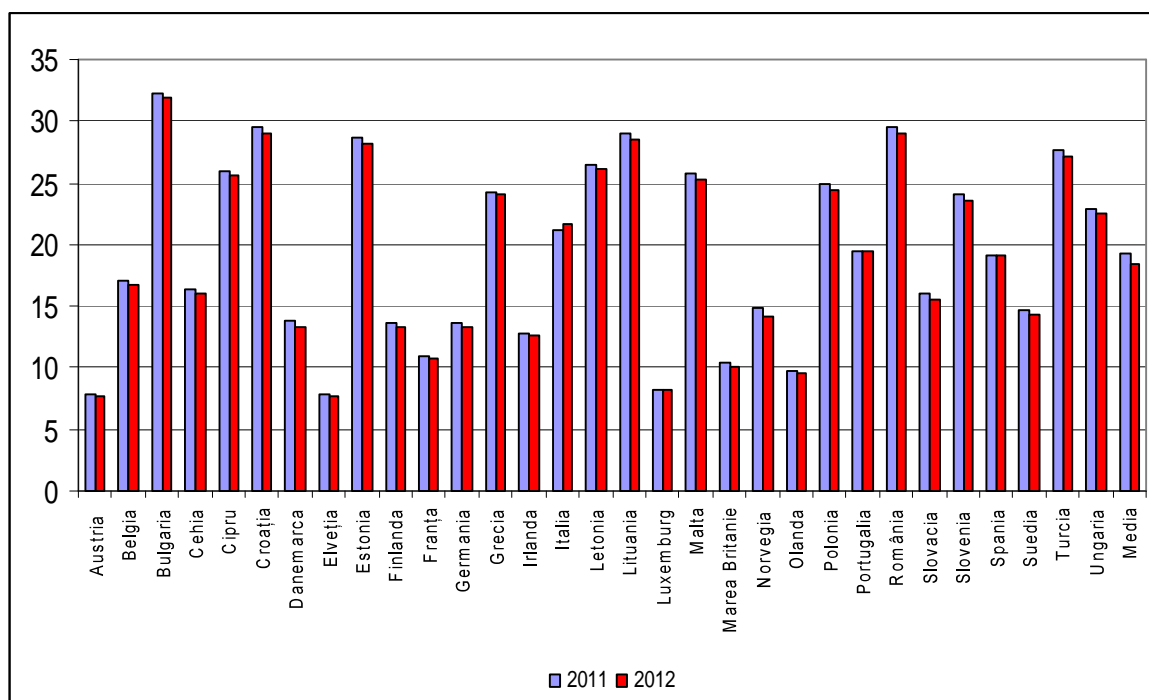
Country	Year	
	2011	2012
Austria	7.9	7.6
Belgium	17.1	16.8
Bulgaria	32.3	31.9
Czech Republic	16.4	16.0
Cyprus	26.0	25.6
Croatia	29.5	29.0
Denmark	13.8	13.4
Switzerland	7.8	7.6
Estonia	28.6	28.2
Finland	13.7	13.3
France	11.0	10.8
Germany	13.7	13.3
Greece	24.3	24.0
Ireland	12.8	12.7
Italy	21.2	21.6
Latvia	26.5	26.1
Lithuania	29.0	28.5
Luxembourg	8.2	8.2
Malta	25.8	25.3
Great Britain	10.5	10.1
Norway	14.8	14.2
The Netherlands	9.8	9.5
Poland	25.0	24.4
Portugal	19.4	19.4
Romania	29.6	29.1
Slovakia	16.0	15.5
Slovenia	24.1	23.6
Spain	19.2	19.2
Sweden	14.7	14.3
Turkey	27.7	27.2
Hungary	22.8	22.5
Average of 31 countries	19.3	18.5

Source: Schneider (2011).

The analysis below includes only data relating to the year 2011 because the measurements for 2012 were made according to prognoses of macroeconomic indicators and the evaluation of 2011 is a little different from the one of 2012. Thus, it can be seen that our country ranks last but one, before Bulgaria, with its underground economy measured at 29.6%

of the GDP. Moreover, the GDP share in Romania is 10.3 % higher than the average share in all the 31 European countries (19.3%).

Furthermore, the GDP share of underground economy is below 10% only in 4 countries: Switzerland, Austria, Luxembourg, Netherlands, whereas in a number of 8 different countries the share is between 10% and 15%: Great Britain, France, Ireland, Finland, Germany, Denmark, Sweden, Norway.



Source: prepared by the author according to the data in Table 1

Graph no. 1. Underground economy size in 31 European countries in 2011 and 2012 (as GDP share)

Several methods can be used to estimate underground economy such as: the MIMIC Model (multiple indicators-multiple causes), the DYMIMIC Model (dynamic multiple indicators-multiple causes), the methodology of the National Institute of Statistics (INS).

By analyzing the change in Romania's underground economy size expressed as GDP percentage during 1999-2010, according to the estimations of the National Institute of Statistics (INS) and of Schneider (Table 2 and Graph 2), it can be seen the two measurements differ significantly, with 14-17 percent gaps in favour of the former estimation for 1999 – 2007 and around 10% in favour of the same estimation for 2008 – 2010.

According to the INS estimations, underground economy was about 20% of the GDP during the former and the latter periods discussed here, it had an ascending trend of up to 14.5% during 1999 – 2004 and increased almost continuously during 2005 – 2010.

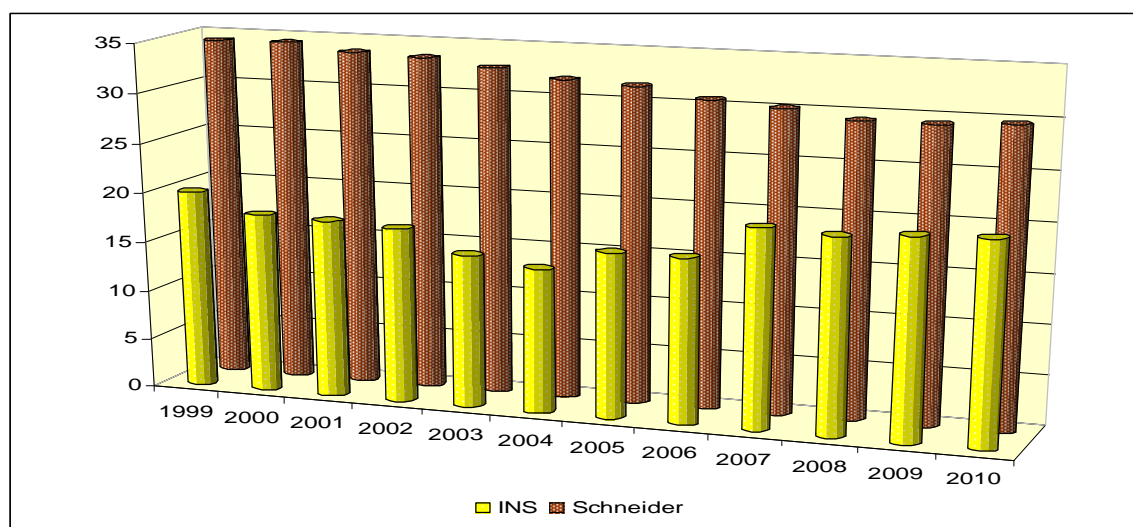
At the same time, Schneider's measurements are to be taken into account based on the MIMIC Model which place underground economy at around 34% of the GDP during the first years of the respective period (the maximum value of 34.4% was reached in 2000) and at around 30% of the GDP for the last years of the same period (the minimum value of 29.4% was reached in 2008 and 2009), with a general descending trend.

Table no. 2. Underground economy as Romanian GDP percentage during 1999-2010

Year	GDP share expressed in % INS evaluation	GDP share expressed in % Schneider Evaluation
1999	20.0	34.3
2000	18.1	34.4
2001	17.9	33.7
2002	17.6	33.5
2003	15.4	32.8
2004	14.5	32.0
2005	16.6	31.7
2006	16.6	30.7
2007	20.0	30.2
2008	19.6	29.4
2009	20.1	29.4
2010	20.3	29.8

Source: Romanian Government (2011) – for INS evaluation; Schneider et al (2010a) – for Schneider evaluation during 1999-2007; Schneider (2011) – for Schneider evaluation during 2008-2010.

The values determined by the MIMIC methodology are more credible than those determined by means of an easier methodology of the National Institute of Statistics both in terms of a trend, and as real values. In addition, it can be stated that the last two years include similar data series values.



Source: prepared by the author according to the data in Table 2

Graph no.2 Size of Romania's underground economy during 1999 – 2010, in INS and Schneider's measurements (expressed as GDP share)

Measuring Romania's underground economy has been the concern of various Romanian researchers. According to a study (Albu, 2008), informal revenue during 2000 – 2006 decreased in Romania from 22.3-22.8% of total household revenue to 16.3-17.5%. The methodology used thereof relies on the tax evasion model designed to estimate underground economy (Allingham and Sandmo, 1972).

Another study (Andrei, 2011) determined the size of Romania's underground economy during 2000 – 2009 relying on the monetary method of Cagan and Ahumada, with

higher values exceeding 30% of the GDP and reaching an ascending trend after 2005, since that was the year they started the application of the 16% single tax rate.

3. MIMIC Methodology

In order to briefly describe the MIMIC methodology (multiple indicators-multiple causes), one starts from the idea that shadow economy effects show up simultaneously in the production, labour, and money markets (Schneider et al, 2010b). The methodology supposes taking account of several causes that determine the existence and size of an underground economy and its effects over time.

According to the methodology, underground economy is defined by a latent variable (not directly noticeable which is why it is also called unobserved variable) being part of functional relationships where the other variables are observed (measured). Observed variables in these functional relationships are causal (explanatory) variables and indicators.

The MIMIC model consists of two parts: the structural equation model and the measurement model. The structural equation expresses by a linear regression relationship a latent variable according to causal variables. The measurement model is made up of several linear regression equations where the indicators are expressed according to the latent variable.

The way to measure the size of the underground economy requires several stages which are described in the following (Schneider et al, 2010b). The first stage is the statistical analysis of relationships among latent variable – causal variables and indicators - latent variable. After having identified equations and estimated the parameters, the MIMIC index is calculated according to the results provided by the model. The analysis supplies only relative, not absolute estimations of the underground economy size. Therefore it is necessary to have a calibration (benchmarking) procedure to calculate the absolute values of the underground economy size.

The MIMIC method generally applies to a large sample of countries and during several years. Causal variables may be, for example: fiscal freedom, business freedom, economic freedom index (all the three indices are calculated by Heritage Foundation), direct taxes as a proportion of total overall taxation, indirect taxes as a proportion of total overall taxation, general government final consumption expenditures as a percentage of the GDP, Government Effectiveness (from the Worldwide Governance Indicators), rate of unemployment, GDP per capita, inflation rate etc. Among indicators, there are: GDP per capita, growth rate of GDP per capita, rate of labour force participation, growth index of labour force participation etc.

The method used by Schneider in his surveys over the last years is MIMIC. Besides, the most frequent methods used to measure the size of underground economy are MIMIC and DYMIMIC.

4. Forecasting Romania's Underground Economy Size

In order to forecast the GDP percentage share of Romania's underground economy it is firstly necessary to set the former's dependence upon the time-related factor. It is obvious that other variables act upon the underground economy, too, but it must be demonstrated that time is the main factor. The econometric evaluations needed in this respect have been carried out by means of the EViews 6 programme package.

With the GDP percentage share of the underground economy being an endogenous variable and time being an exogenous variable, one may consider the linear model for a single dependent variable

$$P_i = a + b \cdot t_i + \varepsilon_i, \quad i = 1, 2, \dots, 14 \quad (1)$$

where $t_i = i$ - means year i , $i = 1, 2, \dots, 14$, according to compliance $1 \rightarrow 1999$, $2 \rightarrow 2000$, $3 \rightarrow 2001$, ..., $14 \rightarrow 2012$, namely $i \rightarrow 1998 + i$, $i = 1, 2, \dots, 14$;

$P_i = PROC_i$ - means the GDP percentage share of Romania's underground economy in year i , $i = 1, 2, \dots, 14$;

ε_i - means the residual variable level I year i , $i = 1, 2, \dots, 14$;

According to the statistical data related to Romania's underground economy size expressed as a percentage share of the GDP during 1999 – 2012 (table no. 1 and table no. 2), the software mentioned above helps reach the values of model parameters and necessary econometric tests (table no.3).

Table no. 3. Values of model coefficients and econometric tests

Dependent Variable: PROC
Method: Least Squares
Date: 12/08/12 Time: 23:40
Sample (adjusted): 1 14
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	34.89341	0.287313	121.4472	0.0000
TIMP	-0.456264	0.033743	-13.52163	0.0000
R-squared	0.938409	Mean dependent var		31.47143
Adjusted R-squared	0.933277	S.D. dependent var		1.970329
S.E. of regression	0.508953	Akaike info criterion		1.618641
Sum squared resid	3.108396	Schwarz criterion		1.709935
Log likelihood	-9.330485	Hannan-Quinn criter.		1.610190
F-statistic	182.8345	Durbin-Watson stat		1.363092
Prob(F-statistic)	0.000000			

The least square method has been used to solve the model. By replacing the estimated values of coefficients (in the Coefficient column) in model (1), there is equation

$$P_i = 34.89341 - 0.456264i + \varepsilon_i, \quad i = 1, 2, \dots, 14 \quad (2)$$

The model coefficients are significantly different from 0 (their probability is higher than 0.9999), because the significance level values related to them (in the Prob. Column) are all lower than 0.0001.

The determination coefficient (R-squared) is high and its value indicates that 93.84% of the dependent variable variation is due to the equation factor variable. The adjusted value of this coefficient (Adjusted R-squared) which has a similar interpretation but it penalizes the introduction of independent variables having low significance upon a dependent variable is quite close to 1.

The significance level for the validity of this model (Prob(F-statistic)) which is very low, even lower than 0.000001, shows that at least some of the overall regression parameters are non-zero (higher than 0.999999).

It should also be checked that errors are uncorrelated and the Durbin-Watson test is available for this purpose. The critical values (lower and upper critical values) for the test related to significance level $\alpha = 5\%$, to number of parameters $k = 2$ (number of model

parameters) and to number of observations $n = 14$, are $d_1 = 1.05$, respectively $d_2 = 1.35$. As

$DW_{calc} = 1.363092 \in (d_2, 4 - d_2) = (1.35; 2.65)$, the errors are uncorrelated (Andrei et al, 2008, p. 126).

The results reached in such econometric tests lead to model acceptance. Therefore, the model may be used in economic forecasting. Econometric model-based forecasts rely on the supposition that the influences of all factors are persistent in the future, too, as they are expressed by the estimations of model coefficients for a past period related to the data used (Pecican, 2006, p. 89). According to equation (2), adjusted (theoretical) values of Romania's underground economy size during 1999 – 2012 (as GDP percentage share) are calculated by means of formula

$$\hat{P}_i = 34.89341 - 0.456264i, \quad i = 1, 2, \dots, 14 \quad (3)$$

This relation determines Romania's underground economy size in 2013

$$\hat{P}_{15} = 34.89341 - 0.456264 \cdot 15 = 28.05$$

Consequently, the forecasted value of Romania's underground economy size in 2013 is 28.05% of the GDP.

5. Conclusions

Underground economy is present in all the countries of the world and reaches remarkable sizes since the average value in 31 major states in Europe is 19.3% of the official GDP in the year 2011. In Romania, the underground economy share in the GDP is almost 30%, which is quite worrying. At the same time, there has been a slight decrease in the underground economy size of our country over the last five years.

Estimating the underground economy is a difficult thing to do and several methods can be used for this purpose, providing results that are sometimes very different from one another. Underground economy is a controversial matter: there are disagreements related to the definition of its activities, to the procedures of estimating its size and to the use of estimations in economic analyses (Schneider 2007a). If one refers to the MIMIC method, the difficulty also resides in the identification of causes and indicators of underground economy.

In other words, it is obvious that a great challenge to the Romanian government is to take effective political steps so that to render underground economy activities less attractive and official activities more attractive. The successful implementation of such policies could lead to a decrease in the underground economy size. The level of fiscality has a special impact upon the underground economy which, if too high, has a negative influence upon it.

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