Indirect Taxes in Romania – an Econometric Analysis

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Abstract   *Indirect taxes have a significant weight in the GDP. Statistical data reveals that the new states that joined the EU in its funding sources to the greatest extent through indirect taxes. They reveal, on the one hand, reducing the tax burden on the producer, and on the other hand, the difficulty faced by the country in direct tax collection, but also some problems of social nature. This article proposes an econometric analysis of the relationship between indirect taxes and household final consumption expenditure.*

Key words   Indirect taxes, household final consumption expenditure, fiscal pressure, simple regression

JEL Codes: C22, H20

1. Introduction

The taxes are the main instrument of taxation. The taxation can be seen both as a negative, but as a positive one. The negative side consists in the obligation of taxpayers to pay their taxes and the positive side is considering the fact that through taxes forms the necessary financial resources to achieve economic and social objectives. In the structure of taxes, value added tax and excise duties (indirect taxes) have a significant share.

Indirect taxes apply on consumption and can be found in the price of products, services or the works. Therefore, indirect taxes are paid by the final consumer.

In this article we intend to analyze to what extend the household final consumption expenditure influence the income from indirect taxes (value added tax, excise duties and custom duty).

2. Literature review

The indirect taxation need has long been discussed in the literature. Differences between the direct taxation and indirect taxation were analyzed by Atkinson and Stiglitz (1977) revealed that direct taxes take into account the individual characteristics of taxpayers, while indirect taxes are levied on transactions by eliminating the conditions of the seller or buyer. They revealed that the income should not be supplemented by goods taxation. The results were contested by Browning and Meghir in 1991, Cremer and Gahvari in 1995 Natio in 1999. Helmut

Cremer, Pierre and Jean-Charles Rochet Fish (2001) created a model aiming to analyze the problem of the optimal taxation, directly or indirectly. Results showed that an optimal fiscal policy is not just about income taxation, but the taxation of products is necessary, too.

The effects of indirect taxation: income effect (revenue effect) and the effect of welfare were analyzed by Ardic, Erus and Sozdan (2010) and Madden (1995). Penu (2013) analyzed the optimal level of indirect taxation to maximize social welfare in Romania, while maintaining a level of budget revenues. Results showed the need to apply a differentiated VAT rate to take into account both the income effect and the effect of welfare.

The advantages of using statistical regression in macroeconomic analysis are presented by Pecican (2001). In his paper are presented the steps to obtain a regression, research methodology, estimation and testing processes, analysis elements. And Anghelache and Prodan (2013) presents an analysis using the model of simple linear regression, making a study on the relationship between gross domestic product and final consumption in Romania.

3. Methodology of research

In order to realize the analysis, we used the simple regression with the help of the software E-views 9.0. The general form of the model of simple linear regression is:

$$y = a + bx_i + \varepsilon_i, \tag{1}$$

Where:
y = endogenous variable or the result;
x = exogenous variable;
ε = residual variable.

We used a statistical significance of 0.05, n-2 degrees of free demand a total of 21 observations. The period analyzed was 1995 – 2015.

The estimation of the parameters of the model was based on the following assumptions (Tudorel *et al.*, 2008):

• H_1: *the regression model is linear both in the parameters and variable x;*

$$y_i = a + bx_i + \varepsilon_i \tag{2}$$

• H_2: *the mean of error is zero:*

$$E(\varepsilon_i) = 0, \forall i \tag{3}$$

• H_3: homoskedasticity or equal variance of the error ε_i, which means that, knowing the data values for x, the error variance of ε_i is the same for all observations.

$$\text{var}(\varepsilon_i / x_i) = E[\varepsilon_i - E(\varepsilon_i / x_i)]^2 = E(\varepsilon_i^2 / x_i) = \sigma^2, \tag{4}$$

the error of the variance is constant.

• H_4: *the* errors are uncorrelated (independent):

$$\text{cov}(\varepsilon_i, \varepsilon_j / x_i, x_j) = E[[\varepsilon_i - E(\varepsilon_i / x_i)][\varepsilon_j - E(\varepsilon_j / x_j)]] = E[(\varepsilon_i / x_i)(\varepsilon_j / x_j)] = 0 \tag{5}$$

• H_5: covariance between x_i and ε_i is equal to zero:

$$\text{cov}(x_i, \varepsilon_i) = 0 \tag{6}$$

• H_6: the normality of the errors:

$$\varepsilon_i \approx N(0, \sigma^2) \tag{7}$$

To validate the model we have considered the Student test and Fisher-Snedecortest. The parameters of the simple linear regression were estimated by the method of least squares. For the validation of the model of simple linear regression were following steps: hypotheses on the method of least squares; the significance of estimators; checking the plausibility of the model; the significance of the correlation ratio.

4. Data analysis

For the model of simple linear regression development, we considered the correlations between the independent variable: household final consumption expenditure and the dependent variable: indirect taxes (as percentage of gross domestic product). In implementing the model we used data provided by the European Commission (Taxation Trends in the European Union 2007-2015), the Ministry of Public Finance (The Consolidated General Budget 2006-2015) and the National Institute of Statistics.

For the estimation of the parameters of the model of simple linear regression we obtained the equation:

IT = C(1)*HFCE + C(2)   (8)
Where:
IT = indirect taxes;
HFCE=household final consumption expenditure;

The equation takes the following form:
IT = 4.91122713482e-06*HFCE + 10.6383265077

5. Results

In the analyzed period, 1995 -2015, fluctuations occur in regards of indirect taxes. We observe that the tax burden of indirect taxes had an upward trend. The economic crisis, felt in Romania since 2008, has resulted in a reduction in the tax burden of indirect taxes. Their share in gross domestic product fell by 0.6 percentage points in 2008 compared to 2007 and one percentage point in 2009. A slight increase is observed in 2010-2012 and a reduction in the period 2013-2015 (figure 1). Regarding the second variable, household final consumption expenditure, small fluctuations recorded over the review period, but we can say that, overall, we have an upward trend (Anghelache and Prodan, 2013).
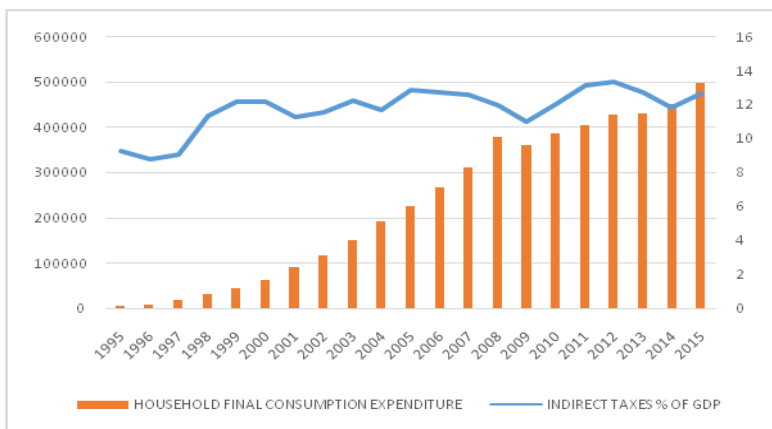

Figure 1. The evolution of indirect taxes as % of GDP and household final consumption expenditure in Romania in period 1995-2015

Using the point cloud chart we can see that the empirical distribution points can be approximated by a straight line, which means that the econometric model that describes the relationship between indirect taxes and household final consumption expenditure is a single factor linear model (figure 2).
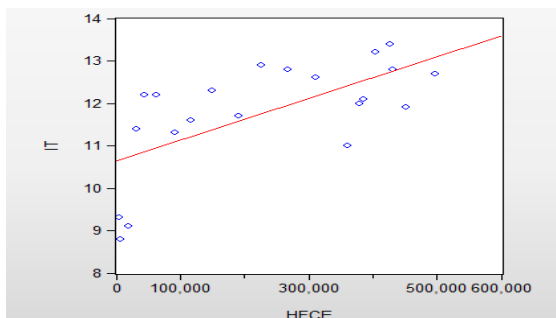
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Figure 2. Point cloud chart between indirect taxes and household final consumption expenditure

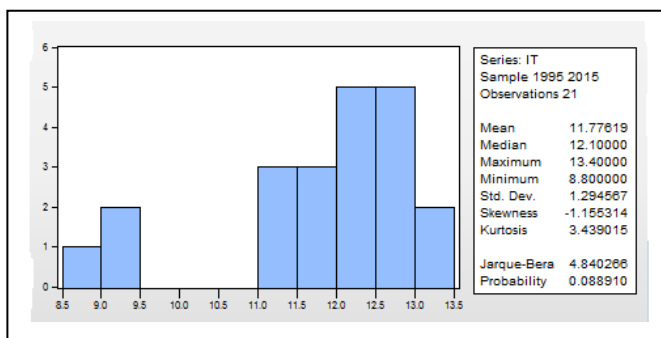The form of the dependent variable distribution, indirect taxes is shown in figure 3.

Figure 3. Histogram of indirect taxes

It is noted the dependent variable distribution (flattened) and the panel indicators reveal this form. Skewness test value is less than zero (-1.155314) which means that the distribution is titled to the right and it has more values to the extreme left. Since Kurtosist test value is greater than three (3.439015) our distribution is leptokurtic. Because the value of the Jarque-Bera test (4.840266) is less than the critical value (5.99), we obtained a normal distribution of this indicator.

The form of the independent variable distribution, household final consumption expenditure, is shown in figure 4.
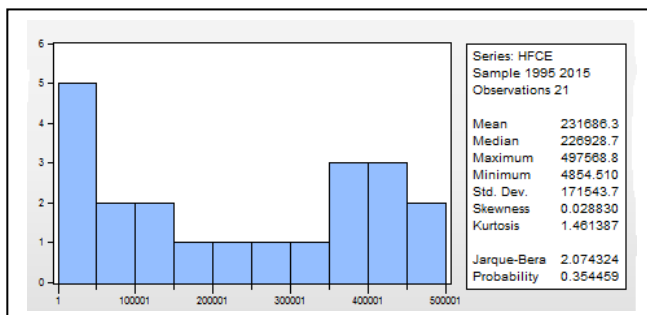
Figure 4. Histogram of household final consumption expenditure

We observe that Skewness test is greater than zero, so we can say that the distribution is titled to the left and it has more extreme values to the right. Kurtosis value is 1.3461387 and is less than 3, which means that the distribution is platikurtic. Because the value of the Jarque-Bera test (2.074324) is less than the critical value (5.99), we obtained a normal distribution of this indicator. In our model, estimators have the following values: a = 10.6383265077 and b = 4.91122713482e-06. The positive sign of the regression coefficient (4.91122713482e-06) shows a direct dependence between the revenues from indirect taxes and household final consumption expenditure. Its value is interpreted as: for one unit increase of the household final consumption expenditure, the revenues from indirect taxes will increase by 4.91122713482e-06 units. According to the chart we see that the relationship between the two variables is not strong. This will be confirmed by the value of R^2 coefficient of determination, too. The estimation results of the parameters of the model of simple linear regression are shown in figure 5.

Figure 5. The estimation results of the parameters of the model of simple linear regression

After estimating the parameters of the model of the simple linear regression we observed the following:

▪ between indirect taxes and dependent variable, household final consumption expenditure,there is a significant linear dependence (the slope of the regression line is positive);

▪ because p - *value* is zero, we can confirm the validity of the regression model;

▪ R^2 – squared coefficient of determination has a value of 0.423526 and show that only 42.35% of the variation of the indirect taxes variable is explained by the influence of the household final consumption expenditure.

Regarding the significance of parameters we note the following:

- thecoefficient of household final consumption expenditure is statistically significant (t_{calc} = 3.74 which is greater than the critical value: 2.2110 for a statistical significance level of 5% and 19 degree of freedom), p-value is 0.0014, therefore we obtained a significance of the parameter of 99.86%.

- the free term is statistical significant (t_{calc}=28.31, is greater than the critical value: 2.2110), and p-value is zero.

The correlation coefficient has the value of 0.65 ($r_{y/x} = \sqrt{0.4235626}$), and, by applying the t test (Student), t_{calc} = 3.534 which is greater than the critical value (t_{tab} = 2.093) for a 95% probability and 19 degrees of freedom.

To validate the econometric model we applied Fisher - Snedecor test, which implies that $F_{calc} > F_{\alpha, v_1, v_2}$. The value for F_{calc} is reported by the software as 13.95901, and from the Fisher - Snedecor distribution table, for 95 % probability and the number of degrees of freedom: v_1 = 1şi v_2= 19, we take the theoretical value: $F_{0.05;1;19}$ = 4.38. Because F_{calc} > $F_{0.05;1;19}$ we can say that the model is estimated properly.

6. Conclusions

Analyzing the results obtained, we can say the household final consumption expenditure do not have a strong influence on revenues from indirect taxes, the value of the coefficient of determination is only 42%. As DW test value is also lower, we conclude that the model can be improved to obtain clearer results. The increase of revenues from indirect taxes, in recent years, can be explained by increasing collection level and reducing tax evasion. In order to increase revenues from indirect taxes, Romania has taken a series of measures aimed mainly to improve the administrative apparatus, simplification of methodologies, ensuring predictability and improving the tax base.

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