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# THE SHADOW ECONOMY IN THE EASTERN PARTNERSHIP COUNTRIES: MODELLING AND ESTIMATING IN THE CONTEXT OF THE NEEDS TO DEVELOP ECONOMIC COOPERATION BETWEEN THE EUROPEAN UNION AND EASTERN PARTNERSHIP COUNTRIES

*RUTA BANELIENE, BORISAS MELNIKAS*

## **Abstract:**

The paper addresses a complex problem related to the development of economic relations between the European Union and the Eastern Partnership countries—Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine. The core issue lies in the excessively high level of the shadow economy in these countries, which significantly affects their internal economic conditions and has a profound negative impact on economic cooperation with the European Union. The assessment and monitoring of changes in shadow economies in the Eastern Partnership countries are crucial for the European Union, particularly for making informed policy decisions regarding economic cooperation. This creates a need to develop and apply appropriate instruments for modeling and evaluating the shadow economy. The paper discusses various tools for modeling and assessing the shadow economy, with a particular focus on a new integrated approach that analyzes the shadow economy holistically, taking into account multiple aspects of economic life and development processes. A new model for assessing the shadow economy in the Eastern Partnership countries is presented; it is based on the Tanzi model and incorporates both traditional variables such as taxes, wages, and salaries, as well as newly modified indicators. The paper also presents empirical research on modeling and estimating the scope and dynamics of the shadow economy in these countries, along with the main findings. The results indicate that the shadow economy is highly developed, widespread, and potentially dangerous. They also reveal the existence of a relationship between the size of the shadow economy and the control of corruption, although this relationship varies significantly across countries. The methodological approach and findings can be used to develop a decision support system for improving economic relations between the European Union and the Eastern Partnership countries.

## **Keywords:**

Shadow economy, Underground economy, Tax evasion, Income tax, Total taxation, Eastern Partnership countries

**JEL Classification:** C33, D78, E17

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## 1. Introduction

Economic cooperation with the countries of Eastern Europe and economic activities in the East is an extremely important factor in the economic development of the European Union. It is clear that the development of international trade and investment relations with Eastern Europe and the neighbouring Asian regions will have an ever-increasing impact on the European Union's economy. Particularly noteworthy, economic cooperation with the so-called Eastern Partnership countries is now playing an especially important role: relations with these countries not only allow for expansion of exports from the European Union and the development and absorption of new markets, but also create prerequisites for large investment projects in the whole of Eastern Europe and the neighbouring regions of Asia.

The group of the Eastern Partnership countries currently include Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine, some of these countries intend to become member of the European Union, while others will merely remain partners of the European Union. Obviously, both the economic and political situation in these countries greatly affects the possibilities of developing economic relations with the European Union; therefore, in the context of the needs for developing economic co-operation, it is very important to fully understand and assess this situation, as well as to be able to identify possible changes.

Research conducted by various international organizations and by various researchers shows that the current situation in the Eastern Partnership countries is characterized by a fairly bright level of the shadow economy (World Bank (2010), Schneider, Buehn, and Montenegro (2010), Melnikas (2002, 2011)). This means that the shadow economy must be identified as an essential circumstance characterizing the economic and even political situation in these countries. It should be noted that the shadow economy not only affects the situation in the Eastern Partnership countries itself, but also has a profound negative impact on economic cooperation with the European Union. Therefore, evaluating and monitoring changes in shadow economies in the Eastern Partnership countries has become an important issue for all European Union, especially, for the processes of decision-making on political relations and economic cooperation between the European Union and the Eastern Partnership countries.

The Eastern Partnership countries together have 71.8 million inhabitants and 3263 km of international border line with the European Union countries. Armenia is the smallest Eastern Partnership country in terms of population. It has 3 million inhabitants and no border with the EU countries. Georgia, with a population of 3.7 million and Azerbaijan, with a population of 9.3 million, also shares no international border with the EU countries. Moldova is a small Eastern Partnership country with a population of 3.6 million and a 683 km border with Romania. Belarus is the midsized Eastern Partnership country in terms of population, with 9.5 million inhabitants, and borders with three EU countries – Latvia (161 km), Lithuania (640 km), and Poland (418 km). Ukraine is the largest Eastern Partnership country with 42.8 million inhabitants and has the longest border line with the following EU countries: Hungary (128 km), Poland (535 km), Romania (601 km), and Slovakia (97 km)<sup>1</sup>.

According to the World Bank *et al.* estimate of control of corruption indicators, the Eastern Partnership countries are ranked as follows in 2014: the highest control of corruption was in Georgia, followed by Belarus, with Armenia in third place, then Moldova, Azerbaijan and, finally, Ukraine which had the lowest level of control of corruption. Therefore, it would be

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<sup>1</sup>The World Factbook, Central Intelligence Agency, United States of America, <https://www.cia.gov/library/publications/the-world-factbook/>; IMF data on population for year 2014.

logical to presume that the Eastern Partnership countries should be ranked in the same order according to the size of their shadow economy (from lowest to highest).

The scale and role of the shadow economy in the Eastern Partnership countries reflects the need to deep-seated and broadly explore the phenomena of the shadow economy, as well as modelling and comprehensively assessing the size and dynamics of the shadow economy.

*The problem* is that both the contemporary practice of analysing and evaluating shadow economy processes, as well as the theory of analysis, evaluations and modelling, are lacking in essential solutions that allow for the complex consideration of the most important factors and parameters of the shadow economy as well as of various circumstances specific to different countries.

*The aim of the research* described in the article is to prepare a model for the assessment of the shadow economy in the Eastern Partnership countries and to evaluate the long-term tendencies of the dynamics of shadow economy in these countries.

This article covers modelling and estimation of shadow economies on the basis of monetary evidence, and estimates the impact of evasion of income tax and total taxation on the size of shadow economies in the Eastern Partnership countries. In this research, the shadow economy covers underground production activities and informal activities which are carried out on the basis of monetary transactions and caused by tax evasion by businesses and individuals.

## 2. Theoretical background

The shadow economy is an especially complicated field of the scientific cognition and practical studies and analysis: there are many different theoretical and practical approaches of description, studies and assessments of the shadow economy; also there are many factors and contradictory circumstances which are influencing the appearance of the shadow economy, its size and dynamics.

In order to comprehensively explore the shadow economy in the Eastern Partnership countries, it is appropriate to refer to the suggestions and provisions of the main international organizations as well as to take into account the peculiarities of the economic development in these countries, especially under contemporary conditions of globalization, European integration and enlargement of the European Union.

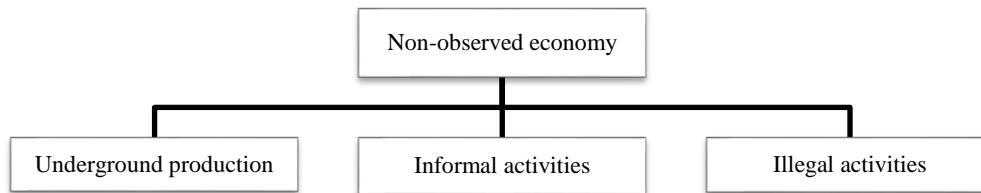
It is also necessary to take into account the fact that certain similar factors influenced the formation and dynamics of the shadow economy in the Eastern Partnership countries: all of these countries have undergone a transformation from the Soviet plan system to the market relations system; the economies of these countries are gradually being integrated into the global economic space; and all of these countries are severely lacking in the conditions of a democratic and civil society that could be a brake on the shadow economy.

The above-mentioned similarities in the Eastern Partnership countries allow to use the same methodology for analysis and evaluations of the shadow economies, their dynamics and size.

This methodology should be based on the definition of the non-observed economy (NOE): according to the United Nations definition (2008), the non-observed economy refers to all productive activities that may not be captured in the basic data sources used for national accounts compilation. The following activities are covered by the non-observed economy:

underground, informal (including those undertaken by households for their own final use), illegal, and other activities omitted due to deficiencies in the basic data collection programme.

**Figure 1. Non-observed economy**



*Source: prepared by authors according to the United Nations, 2008.*

The United Nations definition is similar to the OECD (2002) underground production activities described as those that are legal but deliberately concealed from public authorities in order to avoid paying tax (VAT, income tax and other) or social security contributions, meeting statutory standards, or complying with official procedures and regulations.

Informal activities, according to UN definition, are legal production activities that are characterized by a low level of organization, with little or no division between labour and capital as a factor of production. The informal sector typically functions on a system of unofficial relationships and does not rely on official agreements. It is broadly characterised as consisting of units engaged in small-scale production of goods and services with the primary objective of generating employment and incomes for persons concerned.

The OECD divided informal activities into two separate types:

1. Informal sector production, defined as those productive activities conducted by unincorporated enterprises in the household sector that are unregistered and/or are less than a specified size in terms of employment, and that have some market production; and
2. Production of households for their own final use, defined as those productive activities that result in goods or services consumed or capitalised by the households that produced them.

The last part of a non-observed economy – illegal activities – is described similarly by both previously mentioned international organizations as productive activities that are forbidden by law or become illegal when carried out by unauthorised persons (for example production, import and/or sale of drugs, prostitution, sale of stolen goods and smuggling).

According to the Frazer institute (1997), in the context of tax evasion and avoidance, the division of shadow activities into legal and illegal economic activities was based partly on monetary and partly on non-monetary transactions (see Table 1).

**Table 1. Taxonomy of types of underground economic activities**

	<b>Monetary transactions</b>		<b>Non-monetary transactions</b>	
<b>Illegal activities</b>	Trade in stolen goods, drugs; manufacture of drugs; prostitution, gambling, fraud		Barter, drugs, stolen goods, etc.	Produce or grow drugs for own use.  Theft for own use
	<b>Tax evasion</b>	<b>Tax avoidance</b>	<b>Tax evasion</b>	<b>Tax avoidance</b>
<b>Legal activities</b>	Unreported income from self-employment, wages, salaries, and assets	Employee discounts, fringe benefits (cars, subsidized food, etc.)	Barter of legal services and goods	Do-it-yourself work

Source: Grubel, Frazer Institute, 1997.

Due to the modelling and estimation of shadow economies for the Eastern Partnership countries on the basis of monetary evidence, the term “shadow economy” in this research covers legal activities that could be pursued according to the legal system of a country but are attributed to a shadow economy due to tax evasion in the process of carrying out these activities.

According to the United Nations and OECD definitions, “shadow economy”, in this research, covers underground production activities and part of informal activities based on monetary transactions. Despite the existence of monetary transactions in instances of illegal activities, illegal activities are not covered by the term “shadow economy” into this research due to the sample of independent variables.

To model and estimate shadow economies in the Eastern Partnership countries, a modified cash demand method is used that was initially developed by Tanzi in 1983. To estimate the size of an underground economy, Tanzi proposed a method where, in order to isolate the impact of taxation and regulation, the demand for cash (C) as a proportion of total money (M2) (where M2 is cash, current and deposit accounts), is described as a function of taxes, the ratio of wages and salaries in national income, the interest on time deposits, and per capita real income.

The Vito Tanzi method was employed by many authors using their own interpretations and a wider spectrum of independent variables and models. In the beginning, Tanzi’s method was used with regression analysis and logarithmic specification. Now, in many cases, the MIMIC model is used in the first step of modelling for setting causes and independent variables.

**Table 2. Some independent variables and methods used for modeling of a shadow economy**

Author(s) , publicati on year	Independent variables or causal variables	Modelling method	Country (-ies) for which shadow econom y were estimat ed	Sample period
Tanzi, 1983	Real per capita income Rate of interest paid on time deposits Ratio of wages and salaries in national income Tax variable: 1) weighted average tax rate on interest income, 2) ratio of total income tax payments after credit to adjusted gross income	Regression analysis (logarithmic specification)	USA	Annual, 1930-1980
Georgiou and Syrichas, 1994	Income tax National income Wages and salaries Interest rate GNP per capita	OLS <sup>2</sup>	Cyprus	Annual, 1960-1990
Spiro, 1994	Unemployment rate Interest rate Consumption Tax rate <sup>3</sup>	Regression analysis	Canada	Annual, 1950-1993
Giles and Tedds, 2002	<b>Causal variables:</b> Number of male holders of multiple jobs Nominal incomes of self-	MIMIC <sup>4</sup>	Canada	Annual, 1976-1995

<sup>2</sup> Ordinary least squares method.

<sup>3</sup> First difference of total personal taxes as a percentage of personal income. It includes personal income taxes, provincial sales taxes, and the goods and services tax, and employer and employee contributions to social insurance and government pensions.

<sup>4</sup> MIMIC (Multiple Indicators Multiple Causes) – a particular type of a structural equations model (SEM).

	<p>employed persons</p> <p>Nominal disposable income to (price level<math>\times</math>labour force)</p> <p>Nominal exchange rate (\$Can/\$US)</p> <p>Business taxes to nominal GDP</p> <p>Indirect taxes to nominal GDP</p> <p>Unemployment rate</p>			
Dell'Anno and Schneider, 2003	<p><b>Causal variables:</b></p> <p>Households taxes to nominal GDP</p> <p>Business taxes to nominal GDP</p> <p>Indirect taxes to nominal GDP</p> <p>Government expenditures to nominal GDP</p> <p>Number of self-employed persons to labour force</p>	MIMIC	Italy	Semi-annual, 1960S1-2000S2
Bajada and Schneider, 2005	<p><b>Causal variables:</b></p> <p>Nominal disposable income to (price level<math>\times</math>national population)</p> <p>Households taxes to nominal GDP</p> <p>Business taxes to nominal GDP</p> <p>Indirect taxes to nominal GDP</p> <p>Welfare state benefits and transfers to nominal disposable income</p>	MIMIC	Australia	Quarterly, 1966Q2-2003Q3, deseasonalized
Breusch, 2005	<p><b>Causal variables:</b></p> <p>Total number of male holders of multiple jobs aged 15 or older</p> <p>Income of self-employed</p>	MIMIC	Canada	Annual, 1976-1995

	<p>persons</p> <p>Real annual disposable income per member of the labour force</p> <p>Nominal exchange rate (\$Can/\$US)</p> <p>Corporate tax to GDP</p> <p>Indirect taxes to GDP</p> <p>Unemployment rate</p> <p><b>Other variables:</b></p> <p>Bank of Canada bank rate, end of year</p> <p>Nominal GDP</p> <p>Implicit GDP deflator</p>			
Schneider, Buehn, and Montenegro, 2010	<p><b>Causal variables:</b></p> <p>Size of government</p> <p>Share of direct taxation</p> <p>Total tax burden</p> <p>Fiscal freedom</p> <p>Business freedom</p> <p>Economic freedom</p> <p>Unemployment rate</p> <p>Regulatory quality</p> <p>Openness</p> <p>Inflation rate</p> <p>GDP per capita</p> <p>Government effectiveness</p>	MIMIC	162 countries	Annual, 1994/1996-2006/2007
Tafenau, Herwartz, and Schneider, 2010	<p><b>Causal variables:</b></p> <p>Paid taxes</p> <p>Tax wedge<sup>5</sup></p> <p>VAT</p> <p>Share of public employment</p>	MIMIC	22 European Union countries and their regions	Annual, 2004

<sup>5</sup> Difference between the labour cost for an employer and the net wage his employee takes home. Calculated for a single worker without children at 2/3 of average earnings.

	Unemployment rate Self-employment rate			
Orsi, Raggi, and Turino, 2012	Consumption growth expressed in percentage terms Investment growth Change in the gross real total earnings paid in the regular market Growth rates of fiscal revenues from: <ul style="list-style-type: none"> <li>• corporate taxation,</li> <li>• social security contributions, and</li> <li>• personal income taxation.</li> </ul>	DSGE <sup>6</sup> , MCMC <sup>7</sup>	Italy	Quarterly, 1982Q1- 2006Q4
Hosseini, Nasrollahi and Abtahi, 2014	<b>Causes:</b> Effective tax rate Degree of urbanization Human development index Degree of government regulation <sup>8</sup> Unemployment	MIMIC	Iran	Annual, 1973- 2009

Source: prepared by authors.

Analysing a sample of independent variables, or, in a MIMIC case, causes variables, tax variables could be found in all estimations, despite authors using different expressions such as income tax, tax rate, taxes collected from households and businesses, and indirect taxes to nominal observed GDP, shares of direct taxation, total tax burden, paid taxes, tax wedge, VAT, growth rates of fiscal revenues from corporate taxation, social security contributions and personal income taxation, and effective tax rate. Wealth indicators were used as a separate variable in 7 of 11 analysed models provided in Table 2. These expressions varied from disposable income to GDP (nominal, real, per capita, per labour). Also, in a few cases, different parts of GDP such as consumption, investment, and government expenditure, were used as separate, independent or causes variables. In some cases, a wages and salaries indicator was used for estimating the size of a shadow economy. Other indicators attributed to labour force – employment and unemployment rates, self-employment indicators, multiple jobs holders, and public employment – were included in 7 of 11 of the models. Monetary factors

<sup>6</sup> Dynamic stochastic general equilibrium model.

<sup>7</sup> Markov chain Monte Carlo methods.

<sup>8</sup>The ratio of government consumptive costs to GDP is used to calculate the degree of government regulation index.

were also included as independent or cause variables. In three models, this occurs as interest rates on deposits, and in two models as an exchange rate variable (Giles and Tedds, 2002 and Breusch, 2005). It should be noted that no one model included an interest rate as a causes variable in the MIMIC model, although, the exchange rate was a cause variable in two of the models.

In recent years, more sophisticated indicators were added to the models for estimating the size of a shadow economy. These include size of government, fiscal freedom, business freedom, economic freedom, regulatory quality, openness, government effectiveness, degree of urbanization and Human development index (see Table 2).

In summarizing the development of models for estimating the size of a shadow economy on the basis of monetary evidence (partially monetary evidence using MIMIC models) it could be concluded that the tax element as a basis of such models was modified during the time from income taxes to total taxation, including social security contributions. Wealth indicators are varied and can be expressed in terms of disposable income or GDP (per capita or per employee), but are included as separate independent or causes variable in only two thirds of the models. There were models which covered separate parts of GDP such as wages and salaries as in the initial model developed by Tanzi, including indicators such as consumption, investment and government expenditures. Note that the concept of changing cash to deposits, represented in the models by interest rate, could in some cases be changed to a different indicator such as the exchange rate of a national currency to a worldwide spread currency such as the U.S. dollar. Labour force indicators have also been useful in estimating the size of a shadow economy. Finally, sophisticated indicators, for example regulatory quality, also contribute to estimating the size of a shadow economy.

### 3. Description of the model and data

Our model idea is based on the basic regression equation for currency demand proposed by Tanzi (1983):

$$\ln C / M2 = a_0 + a_1 \ln T + a_2 \ln WS / NI + a_3 \ln R + a_4 \ln Y + \epsilon \quad (1)$$

Where  $C/M2$  is the ratio of cash holdings (C) to money (defined as M2) is the dependent variable. The tax variable  $T$ , which is used for estimating impact on a shadow economy,  $WS/NI$  – a proportion of wages and salaries in national income (to capture changing payment and money holding patterns),  $R$  – an interest paid on savings deposits (to capture the opportunity cost of holding cash), and  $Y$ , which is national income per capita, – all are independent variables, and  $\epsilon$  is an error term.

This model was used by Tanzi for estimating the shadow economy in the United States using data for the years 1929-1980. There it was possible to use long data series which only seem available for a few countries around the world, and as a basis for estimation was used the U.S. dollar as a national currency which in other countries arise “dollarization” effect, especially in emerged economies such as are the Eastern Partnership countries.

Our model concentrates on specific of Eastern Partnership countries where the interest rate variable (R) would make no sense for many reasons including exchange rate fluctuation of local currencies as measured against worldwide spread currencies such as the U.S. dollar or

euro in times of turbulences (for example in 2006-2014 the Belarusian ruble (BYR) fell close to five times against USD due to the high inflation in country, while at the same time the Ukrainian hryvnia (UAH) fell 2.4 times against USD due to the war situation in that country). Also, the instable banking systems of the Eastern Partnership countries in comparison with banking systems of developed countries such as USA, Germany and other OECD countries has own impact on unattractiveness of deposits against cash. This observation was proved by estimates that showed interest rate (R) insignificance. Therefore the interest rate (R) variable was changed to the exchange rate variable (E).

Instead national income there was chosen the *GDP* variable and incorporated into *T* and *WS* variables expressed as part of income taxes and total taxes in *GDP* and as a part of compensation of employees (which was used instead of wages and salaries) in *GDP*. There it should be noted that the *GDP* per capita variable was extracted from the equation due to insignificance since it was the same as the interest rate variable.

The constrained model for evaluation of income tax and also for total tax impact on a shadow economy in the Eastern Partnership countries is as follows:

$$\ln(M0/M2) = a0 + a1 \ln(1 + T/Y) + a2 \ln(WS/Y) + a3 \ln(E) + \epsilon \quad (2)$$

Where *MO/M2* is the ratio of cash holdings (money *MO*) to current and deposit accounts (money *M2*), *T* is 1) taxes on income, profits, & capital gains paid by individuals in equation of evaluation income tax impact on shadow economy, and 2) tax revenue of general government in the equation of evaluating tax impact on a shadow economy (1 was added for evaluation tax effect on shadow economy where one part of estimation was made keeping tax equal zero). *Y* is gross domestic product, *WS* – wages and salaries (here used statistical data on compensation of employees), and *E* is exchange rate of local currency unit (*LCU*) per U.S. dollar (period average).

For estimates, the 2006-2014 annual data of the International Monetary Fund, the World Bank, IHS, ILO and data provided by national statistics and other government agencies of the Eastern Partnership countries were used. Also, it was kept in mind that statistical data which represents cash – currency in circulation (*MO*) shows its liability for the outstanding amount of domestic currency that it has issued. Liabilities for the co-circulating foreign currency appear only in the records of the foreign central bank or central government that issued the currency<sup>9</sup>. Therefore, estimates on shadow economies were provided without the part of a shadow economy that covers monetary transactions related to tax evasions carried out in foreign currencies such as the U.S. dollar or euro, and other foreign currencies.

#### 4. Results

The Panel Least Squares Method with fixed cross-section and period variables (dummy variables) were used in the estimations. Equations for estimating the impact of shadow economies caused by income taxes (*T<sub>i</sub>*) and total taxes (*T*) evasion in the Eastern Partnership countries are as follows:

<sup>9</sup> Monetary and financial statistics compilation guide, IMF, 2008.

$$\ln(M0/M2) = -1.5249 + 4.7307 \ln(1 + Ti/Y) - 0.4513 \ln(WS/Y) + 0.0977 \ln(E) \quad (3)$$

(-10.6925)<sup>10</sup> (4.2154)
(-3.3263)
(2.1561)

R-squared ( $R^2$ ) = 0.9727; adjusted R-squared ( $\bar{R}^2$ ) = 0.9609; D-W = 1.5920.

$$\ln(M0/M2) = -1.5216 + 2.3174 \ln(1 + T/Y) - 0.4171 \ln(WS/Y) + 0.000047 \ln(E) \quad (4)$$

(-5.9964)
(2.8641)
(-3.0260)
(3.7387)

R-squared ( $R^2$ ) = 0.9740; adjusted R-squared ( $\bar{R}^2$ ) = 0.9628; D-W = 1.7450.

The impact of income tax evasion on a shadow economy was estimated by predicting the cash amount (M0) in local currencies units (LCU) for each country using created model: with taxes and without taxes (in both cases using the same formula and its indicators). After, was calculated the amount of illegal money that is the difference between predicted cash with taxes and without taxes. Then, was calculated legal money which is equal to money (M1) minus illegal money in local currency unit. Further there was calculated income velocity of legal money dividing GDP by the amount of legal money. Finally, the shadow economy was estimated by multiplying illegal money by the income velocity of legal money, thereby getting the shadow economy estimation in local currency units. An assumption was made that the income velocity of legal money is equal to the income velocity of illegal money as in Tanzi model.

The shadow economy was expressed in relation to total GDP (as a % of GDP), dividing the shadow economy estimate in units of local currency by GDP in current prices.

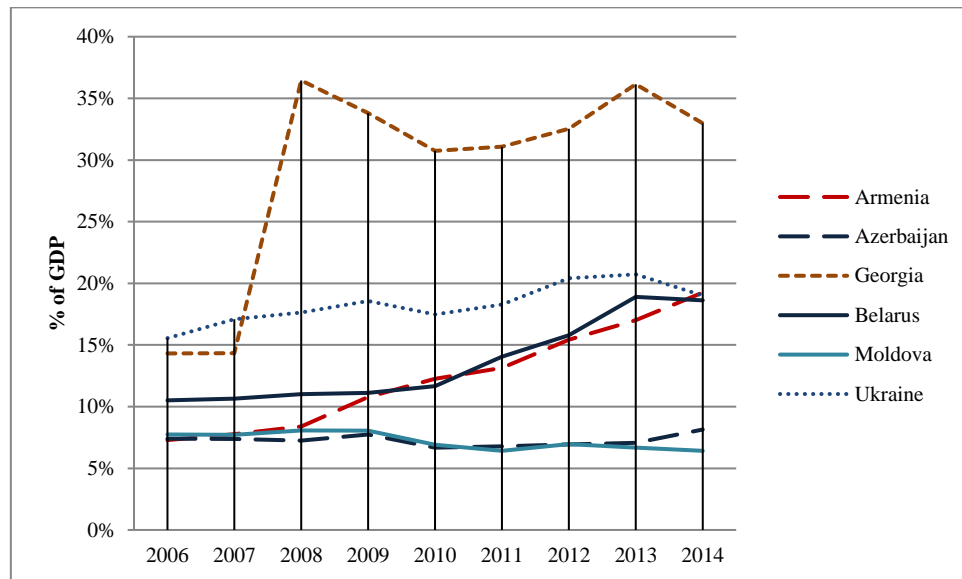
The estimate shows that the impact of income tax evasion on shadow economies in the Eastern Partnership countries varies significantly: from 7.2% of GDP in Moldova to 29.2% of GDP in Georgia (2006-2014 period average). The most significant impact of income taxes evasion was on the shadow economy of Georgia due to its highest income tax revenue as a % of GDP in comparison with other Eastern Partnership countries income tax levels. It should be noted that the Georgian income tax level was raised more than twice to 6.8% of GDP in 2008 up from 3.1% of GDP in the year 2007, and that is the reason for growth of the shadow economy impacted by income taxes evasion in Georgia in the year 2008.

The most stable income tax impact on a shadow economy during 2006-2014 was in Moldova and Azerbaijan. On average, their size fluctuated respectively on 7.2 % and 7.3 % of GDP levels. It should be noted that the average income tax level as a percent of GDP during the mentioned periods in Moldova was 54% higher than in Azerbaijan and this shows different reactions for intentions to avoid income taxes in the mentioned countries. During the research period, shadow economy growth impacted by income taxes evasion was observed in Armenia and Belarus and is related to growth of income taxes as % of GDP in these countries. The estimated part of the shadow economy that related to income tax evasion in Ukraine shows

<sup>10</sup> t-Statistic.

stabilization signs at the end of the research period when Ukraine stayed on the same level as Armenia and Belarus according to size of the shadow economy despite its excess during other years.

**Figure 2. Impact of income tax evasion on shadow economy, 2006-2014**

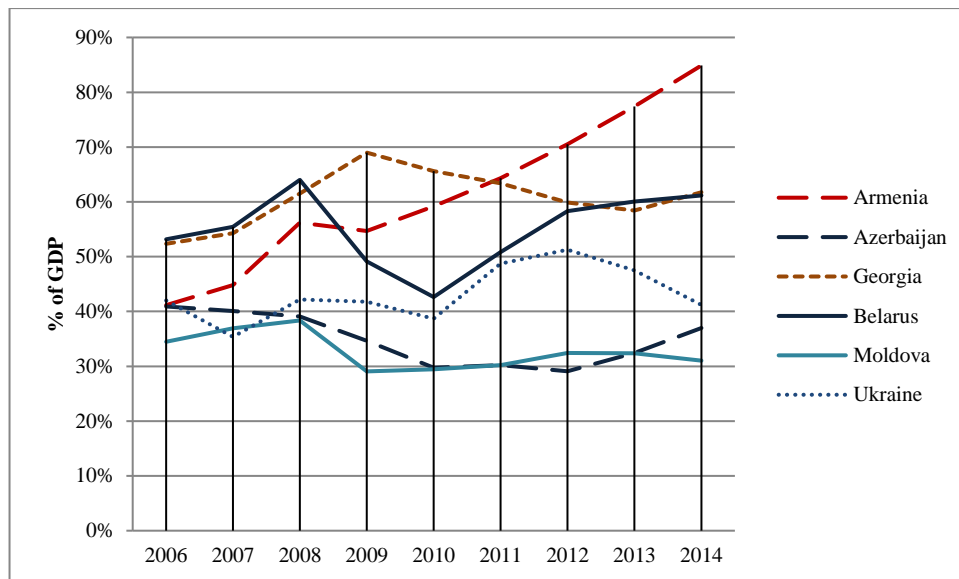


It should be noted that there was a lack of income tax data for Armenia for the year 2013 and after. According to statistical data, income tax level grew nearly three times in the year 2014 in comparison with year 2012 (from 2.3% of GDP in 2012 to 6.4% of GDP in 2014). This impact was adjusted in the estimate.

The estimate of total tax impact on a shadow economy was made using the same method as in the estimation of the impact of income taxes: prediction of cash (M0) with and without taxes by model, calculating amounts of illegal and legal money, calculating income velocity of legal money and assuming that it is equal to income velocity of illegal money, and estimating the shadow economy by multiplying illegal money by its income velocity and expressing a shadow economy in terms of % of GDP.

Variations of the estimated impact of total taxes on the size of a shadow economy among the Eastern Partnership countries are also significant: in 2006-2014 period average from 32.7% of GDP in Moldova to 60.7% of GDP in Georgia.

Estimates of the shadow economies in the Eastern Partnership countries show that, as in the case of income taxes, Georgia has one of largest shadow economies in comparison with other countries. At the end of the research period it stabilized at 61.8% of GDP level. The smallest shadow economy was in Moldova, which, at the end of the period was at 31% of GDP level and was half the size of Georgia's economic shadow.

**Figure 3. Size of shadow economy in the Eastern Partnership countries, 2006-2014**

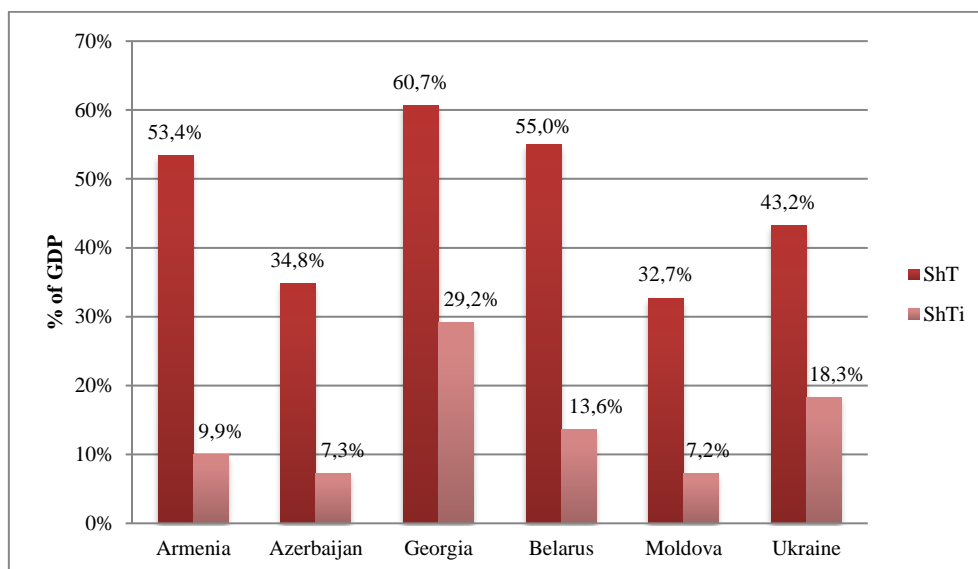
Regarding total tax, Azerbaijan had a shadow economy similar to Moldova. However, it should be remembered that total taxes in Moldova were 69% higher (available data period average) than in Azerbaijan in terms of per cent of GDP. Also, considerations should take into account that GDP level depends on size of GDP, and Azerbaijan has unique situation in comparison with other Eastern Partnership countries because extraction of crude petroleum and natural gas in monetary terms consisted 35.6%<sup>11</sup> of GDP in the year 2014 (similar as in all research period) and has had significant impact on total size of GDP. Furthermore, estimates show that Ukraine managed growth of their shadow economy that occurred due to a war situation in that country and, at the end of the research period, the shadow economy returned to the previous 41.2% of GDP. Belarus had one of the largest shadow economies among the Eastern Partnership countries. At the end of research period it reached 61.2% of GDP level. Decrease in the size of the shadow economy in Belarus during the years 2009-2011 related to the sharp decrease in taxation. In 2010 total tax revenue dropped to 27.3% of GDP from 37.7% of GDP in the year 2008. Armenia is a separate case due to lack of tax revenue data before the end of the research period and flash growth at the end of research period. The tax level in 2011 was 19.2% of GDP, and, at the end of the research period in the year 2014 it grew to 23.5% of GDP, which is near 25% growth in taxation. Therefore the impact of lack of data and its growth at the end of period were adjusted.

In summarizing estimates of the size of shadow economies in the Eastern Partnership countries, it can be observed that, during 2006-2014, the largest shadow economy was in Georgia, half of which was impacted by income taxes. In the second place we find Belarus, where the shadow economy consisted of 55% of GDP on average, however its size had less impact from income taxes – only  $\frac{1}{4}$  of the shadow economy. Armenia is in the third place ranked by the size of its shadow economy. Note however that there is the estimated data for 2011-2012 were adjusted. The size of the shadow economy of Ukraine in the period average placed this country as number four on the list and, as in the case of Georgia, nearly half of it (42%) was impacted by income taxes evasion.

<sup>11</sup> Calculated by IHS data

One of the smallest shadow economies among the Eastern Partnership countries was in Azerbaijan, but the income tax impact there, in comparison with other Eastern Partnership countries, was low, and consisted of only 21% of the size of shadow economy (in case of Azerbaijan keep in mind that 1/3 of Azerbaijan's GDP was created by extraction of crude petroleum and natural gas, therefore the size of the shadow economy of Azerbaijan would be much larger absent this impact). The estimate showed that the smallest shadow economy was in Moldova where it constituted only 32.7% of GDP (2006-2014 period average), but the impact of income taxes was low and covered only 22%. The results of the estimates are compiled in Figure 4.

**Figure 4. Shadow economy in the Eastern Partnership countries, 2006-2014 period average**



*Armenia 2006-2011 period average*

There it should be noted that the expectation that Eastern Partnership countries' shadow economies may be ranked according to the control of corruption indicator cannot be justified. Georgia, with the highest level of control of corruption, has also the largest shadow economy and the situation in Belarus and Armenia is similar. Also, the opposite situation can be observed in Moldova and Azerbaijan, where smaller shadow economies exist despite that lower levels of control of corruption persist. Also Ukraine, with the lowest level of control of corruption, nevertheless has only a mid-sized shadow economy among the Eastern Partnership countries, so, little correlation between shadow economy size and control of corruption actually exists.

Comparing these results with those of other researchers' there can be observed only partial compliance. In comparison with the Schneider, Buehn, and Montenegro (2010) estimate most in line is the size of the shadow economy estimated for Armenia where by estimation of mentioned authors the size of the shadow economy was 42.1% of GDP for year 2006 and 41.1% of GDP for year 2007. By this estimation, the size of the shadow economy was 41.1% of GDP for year 2006, and 44.8% of GDP for year 2007. Other estimate results vary in comparison with the Schneider et al. results. For the 2006-2007 period, the average estimated size of the shadow economy in Belarus was at 10.5 p.p. higher than the mentioned authors, and for other countries lower – for Azerbaijan – 12.5 p.p., Georgia – 9.5 p.p., and Ukraine – 8.4 p.p.

Therefore it could be concluded that the estimated size of a shadow economy depends not only on comparable data, but also on model specific and independent variables which were used in a model. Our model was created by modelling it with many independent variables more or less sophisticated such as real GDP per capita in U.S. dollars, interest rate for deposits, unemployment rate, as well as estimated indicators by the World Bank *et al.* such as control of corruption, regulatory quality, and others that were excluded by the reason of their insignificance. Additionally, a precise look at Eastern Partnership countries must include the consideration that they belong to areas of emerging economies where high impact on a shadow economy could have worldwide currencies such are U.S. dollar, euro and few others foreign currencies. For this reason an interest rate on deposits variable was changed to the exchange rate of national currency against the U.S. dollar variable, and these expectations were confirmed by estimating results that showed significance of this independent variable.

It could be concluded that estimated results vary from other authors' results because of differences in independent variables. Although, results of this research seem to be closer to reality due to including variables that are more in line with specifics of emerging economies.

## 5. Conclusions

The model applicable to the assessment of the shadow economy in the Eastern Partnership countries is created on the basic idea of the Tanzi model and was developed by covering the same independent variables such as taxes, wages and salaries, and modified indicators – GDP instead of GNI, and exchange rate of local currency unit per U.S. dollar instead of interest rate on deposits due to the specifics of the emerged economies countries as are the Eastern Partnership countries.

Estimates show that the impact of income tax evasion on shadow economies in the Eastern Partnership countries varies significantly – from 7.2% of GDP in Moldova to 29.2% of GDP in Georgia. Variations of the estimated impact of total taxes on the size of shadow economies among the Eastern Partnership countries are also significant – 32.7% of GDP in Moldova to 60.7% of GDP level in Georgia<sup>12</sup>.

The estimation shows what a little correlation between shadow economy size and control of corruption actually exists. Georgia, with the highest level of control of corruption, has also the largest shadow economy. Also, the opposite situation can be observed in Moldova, where the smallest shadow economy exist despite that one of the lowest levels of control of corruption persist.

Also, the estimated results varied from those of other authors due to the differences in independent variables. Although these results seem to be closer to reality due to including variables which are more in line with specific considerations of emerging economies.

Naturally, the application of the described model for the assessment of the shadow economies in the Eastern Partnership countries can allow a picture of both the shadow economy in general and the main aspects of business environment and its peculiarities.

It is also noteworthy that, in order to carry out a more detailed and deeper analysis of the shadow economies in the Eastern Partnership countries, it is necessary to create and use another more detailed version of the described model: such a version of the model should allow for a considerably greater number of factors covering a wider range of various economic as well as political, social, cultural and other circumstances.

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<sup>12</sup> Period average

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