

Andrea Galić Nagyszombaty*

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UNOFFICIAL ECONOMY IN CROATIA: ESTIMATION METHODS AND RESULTS

According to the Eurostat's recommendations, GDP of each country must be as exhaustive as possible regarding economic activity coverage. All EU member states and candidate countries have a strict obligation to include the estimate of the unofficial economy (UE) in official GDP data. Over the past few years, the Croatian Bureau of Statistics (CBS) has been working on a project of improvement the exhaustiveness of national accounts. Recently, official national accounts data have been revised, thus expanding coverage to include the estimated unofficial economy.

This paper deals with the comparison of results of various methods used for UE estimation in Croatia. Besides description of methods and results presented in recent economic literature in this paper, author presents Eurostat methodology for the estimation of non-exhaustiveness of national accounts used in Croatian national accounts. Additionally author developed estimation of undeclared work based on post-stratification of labour force survey data.

The aim of the paper is to test the hypothesis that various methods of UE estimation differ, in assumptions and methodology used, but all methods point to similar conclusion on trends of unofficial economy. Author found that in the period of economic growth, a share of unofficial economy is decreasing while in downturn phase of economic cycle unofficial economy

* A. Galić Nagyszombaty, M. Sc., Croatian Bureau of Statistics. (E-mail: galica@dzs.hr).

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helps to reduce overall negative economic effects on the income of individuals.

Key words: Unofficial economy, Eurostat approach, Exhaustiveness of national accounts, MIMIC approach, Croatia

Introduction

In each economy, a certain proportion of production, income and employment falls outside the official monitoring systems. Factors behind the lack of exhaustiveness of national accounts could be classified as:

a) economic factors - intentional non-registration or underreporting of economic activities and income by producers and individuals; and

b) statistical factors - statistical system is not adequate to capture total economic activities, e.g. non-existent or obsolete registers.

The existence of an unofficial economy has a negative impact on the official economy, especially in terms of public finance and labour market developments. According to theory, unofficial economy has direct and indirect effects. Direct effect is revealed in the decreased ability of the government to collect taxes from economic agents. On the other hand, indirect effect is predominantly concealed in the inability of official statistics to accurately measure economic activity. Lack of exhaustiveness in national accounts estimates results in distortions in international comparisons of macroeconomic indicators.

According to production boundary, defined in the national accounts system¹, the unofficial economy should be covered in the national accounts. The 1993 SNA use the term hidden economic activities, defined as legal production deliberately concealed from public authorities to avoid payment of taxes and social contributions or compliance with administrative procedures and standards. Illegal activities are defined as productive activities forbidden by law or productive activities which are usually legal but carried out by unauthorized producers. Both hidden and illegal activities should be included in national accounts. As national accounts data for European countries are used for determining contributions to the EU budget, European commission introduced regulation to harmonise GNI of the member states (regulation 1287/2003). Regulation states that national accounts data must be exhaustive. This means that they should account for the activities that are not reported in statistical surveys or to fiscal, social and other administrative authorities.

¹ See SNA 1993, pp. 6.30-6.36.

The terms and the definition of unofficial economy are very broadly defined in the economic literature. Apart from unofficial economy, various authors in most cases use terms such as: hidden economy, informal economy, underground economy, black economy, unreported economy. Generally, most definitions agree that unofficial economy comprises of all currently unregistered productive economic activities: “market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP” (Smith 1994). This definition is used, e.g., by Feige (1989, 1994), Schneider (1994, 2003, 2005) and Frey and Pommerehne (1984). A broader definition, taken from Del’Anno (2003), Del’Anno and Schneider (2003) and Feige (1989), is: “...those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation”. For other definition see also Thomas (1999) or Feld and Larsen (2005).

The informal or unofficial economy contains that part of the economic activity that is difficult to measure. Thus far, different methods of unofficial economy estimation resulting in significantly different estimates have been proposed in the literature. The results in most cases indicate that the size of the shadow economy is larger in the transition countries in comparison with market economies².

The structure of this paper is as follows. After these introductory remarks, the first section of the paper brings a short literature review on the methods for estimation of unofficial economy. Second part of the paper presents literature review on relation between official and unofficial economy. In the third section of the paper, an estimate of the unofficial economy is presented for the Croatian economy in the period 2000-2010. In comparison the author used results from two published studies which comprised Croatia and presents own calculations based on the Eurostat approach and labour market method. The last section concludes.

1. Methods for estimating the size of underground economy

In this section, a brief overview of the methods for estimation of the size of unofficial economy (UE) is given. There are numerous methods for an estimate of the UE. Some of them are more applicable to the developed countries while others are more suitable for estimation of UE in transition economies. According to the numbers of approaches applied by different researchers, and the diversity of their views, one can conclude that there is no universal approach capable of being

² Recent estimates of the size of the shadow economy for 22 transition countries and 21 OECD countries could be found in Schneider (2012). For the estimates for a larger sample of countries see Friedman, Johnson, Kaufmann and Zoido-Lobaton (2000).

applied to all countries or even to the same country at different periods of time. The best method of estimation, in each individual case, depends on the specific features of the economy. According to their common characteristics and authors who developed the method, the following classification can be used:

Table 1.

CLASSIFICATION OF METHODS FOR ESTIMATING THE SIZE OF UE

Direct methods	Indirect methods	Causal methods	Eurostat approach
1) Questionnaires 2) Tax statistics	1) Difference between tax statistics and the national accounts 2) Difference between revenues and expenditures-a macro approach 3) Difference between receipts and expenditures-a micro approach 4) Labour market 5) Cash in circulation 6) Transaction method (Feige) 7) Use of physical inputs method (Lacko)	1) Demand for cash (Tanzi) 2) Determinants/ indicators-MIMIC (Frey, Schneider)	1) Exhaustiveness of national accounts

Source: Schneider (2012, 2002), Smith and Wied-Nebbeling (1986).

A detailed description of all disadvantages and advantages related to the use of particular approach see in Schneider (2002, 2012), Prokhorov (2001), Enste and Schneider (2000). The results of different methods indicate a possible size of UE in an economy, but reliability is related to the plausibility of the assumptions.

Data availability issues cause serious difficulties in the search for comprehensive and methodologically comparable UE studies in transition countries. Namely, the most commonly used approach in market economies is the monetary approach that is not applicable in Croatian case due to deepening of the financial markets and high level of eurisation which significantly influenced trends in monetary aggregates denominated in domestic currency. In Croatian case a significant propor-

tion of informal transactions are related to Euro transactions and therefore avoid to be recorded in the official monetary statistics. Volume of foreign currency outside the standard monetary system is virtually impossible to estimate.

Due to data limitation, five different approaches are used to estimate the size of the underground economy in Croatia. The first two methods are the so called input approach, which uses electricity consumption data as an indicator (Kaufmann-Kaliberda method, Lacko method). The third one is the DYMIMIC approach, labour market method is the fourth available method and the last but most detailed method is the so-called Eurostat exhaustiveness of national accounts approach. In the recent economic literature there are no studies for analysed period which comprised Croatian economy and which are based on input approach for UE estimation. Therefore in empirical part I compare the results from two papers based on MIMIC approach and results of two methods based on own calculation (Eurostat and labour market method). In the continuation a short description of methods of UE estimation is given.

Although physical input approach has already been used in underground economy estimates, the application of the Kaufmann-Kaliberda method has developed relatively recently³. In order to measure the total economic activity of a national economy, Kaufmann and Kaliberda (1996) assume that electricity consumption is the best physical indicator. Advantage of this method is simplicity and data availability. Total (official) economic activity data as well as electricity consumption data are available for the majority of the economies. The authors also assume that the electricity consumption is a good indicator of the total GDP (official and unofficial) trend as the short-term elasticity is equal to one⁴. Therefore, they assume that the difference between electricity consumption growth rate and the official GDP growth rate is a consequence of the underground economy. The criticism of this method⁵ includes that electricity is not a significant input in certain underground activities (namely personal and business services), and alternative energy sources can also be used (such as coal, oil, etc.) and therefore this method only partially measures the true size of the underground economy. Furthermore, energy production and consumption are today far more efficient than in the past period. Finally, there are significant differences and variations in the elasticity ratios between GDP and electricity consumption, both dynamically and across different countries.

The Lacko method (Lacko, 1998) assumes that a certain amount of underground economic activity is connected with household electricity consumption. Based on a cross-country analysis, an econometric regression is estimated. The

³ This method has been used by Portes (1996), Kaufmann and Kaliberda (1996).

⁴ Johnson, Kaufmann and Shleifer (1997).

⁵ Schneider (2002).

dependant variable is the per capita household electricity consumption, and the independent variables are the following: average real per capita expenditure, electricity price, number of heating months, the proportion of the other energy sources consumption and per capita underground economy output. This last variable is calculated in another regression as a function of personal income tax ratio, company profits and overall tax burden on goods and services, as well as the ratio of public expenditure in the GDP and the share of dependant population in total population. Merging the two equations results in the expected household electricity consumption in each country. The difference between observed and expected consumption is assigned to electricity consumption in the underground economy.

The critique of this method is similar to the Kaufmann-Kaliberda method and Johnson et al. electricity method⁶. Firstly, a considerable energy input is not a prerequisite for all underground activities, as other energy sources can be used. Next, underground economy is not restricted to household sector. The notion that the UE can be explained by the proportion of public sector size is disputable, especially in the transition economies and developing countries. Finally, it is questionable which estimate value of the unit of the electricity is the most reliable input for estimating GDP per capita.

Determinants/indicators – the MIMIC model. Majority of the described methods used a single indicator of underground economy size and dynamics in order to estimate the UE size. It is, however, clear that the underground economy affects the product market, labour market and the monetary markets simultaneously. The model approach therefore, explicitly considers multiple causes and effects of the underground economy. The method is based on the “latent variable”⁷ statistical theory. Factorial analysis is used to empirically evaluate the parameters linking the determinants of UE with the indicators. A group of structural equations is used to evaluate the unknown value of the coefficients. The DYMIMIC approach (dynamic multiple-indicators multiple-causes) consists of two parts. The measurement model connects the latent variables with known indicators. Thus, Frey considered the causes, which are commonly used in the MIMIC models⁸: the official economy tax burden; tax morale and public administration capacity; labour market conditions; structural factors (specific characteristics of various sectors and activities within the economy). A limitation of this method is the fact that it only provides information on the relative size of the underground economy⁹.

⁶ Prokhorov (2001), Schneider (2002), Johnson, Kaufmann and Shleifer (1997).

⁷ Unobserved variables (see in Aigner, Scheider and Ghosh, 1988).

⁸ Prokhorov (2001).

⁹ For further details, please refer to Schneider (2012), Giles and Tedds (2002), Giles, Tedds and Guga (1999).

2. Relation between official and unofficial economy – literature review

Majority of methods for unofficial economy estimation presented in previous chapter are based on the attempts to divide total economic activity on official (recorded in the official national accounts data) and unofficial part. The relation between unofficial and official economy is very important not only for estimation purposes but also from economic policy point of view. Economic agents are primarily concerned with total income (which comprises unofficial part). On the other hand, a rising share of unofficial income can cause significant problems for public sector. Shadow economic activities are also significant and alarming in developed countries. The recent crisis in Greece has demonstrated the negative outcomes of a significant shadow economy on tax bases and social security systems (Buehen, Schneider, 2012). Besides Greece, economies with share of informal economy above the average recorded unfavourable budgetary position. Most of estimation methods use official data from standard statistical system as indicators and determinants which point to the size of UE sector. Because of that, in this chapter a short literature review on relation between official and unofficial economy is given. According to a number of studies (Enste and Schneider 2006; Feld and Schneider 2010), the situation of the official economy plays a crucial role in people's decision to engage in unofficial sector. In periods of economic expansion there are a lot of opportunities to increase income in the official economy. Opposite is the case in a recession when individuals try to compensate decreasing income from the official economy through engagement in unofficial sector.

Houston (1990) developed a simple macroeconomic model to incorporate the unofficial economy. The model suggests how traditional macroeconomic models may be limited by their failure to consider the underground economy. Given that the underground economy represents a portion of total output, its size and impact should be of importance to macroeconomists. He demonstrated that total aggregate supply varies less than formal supply in response to shifts in marginal tax rates. This was shown to partially offset the position that higher taxation leads to dramatic supply reductions, which negatively affect prices and interest rates. The same author pointed to implications for the conduct of monetary policy because of high currency-intensive nature of unofficial activities.

Gershuni (1979) presented a relationship between official and unofficial economy with a circle flow of economy diagram. Left side of picture 1 presents the flows in the economy without informal production. Formal producers employ labour and deliver goods and services to households. Household sector receive wages for labour input and use it to buy goods and services from formal producers.

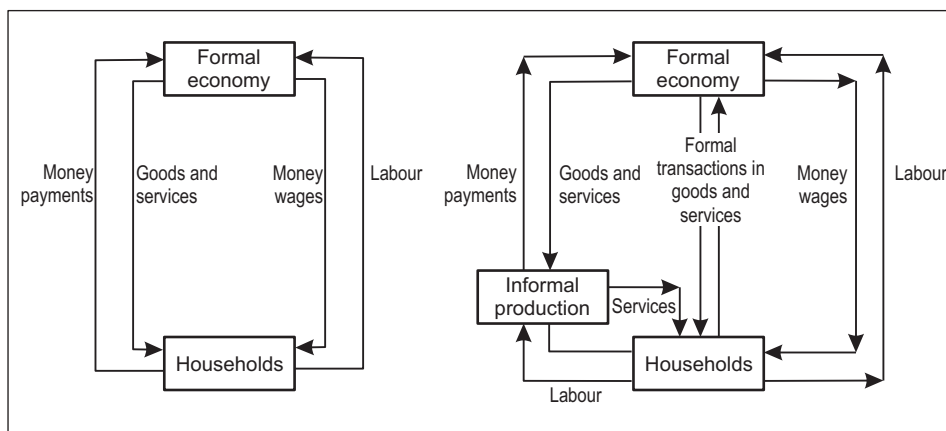
Right side of the picture presents flows in the situation when part of the production is unofficial or informal. The household sector buys goods and services

and chooses between formal and informal producers. On the labour supply side, individuals decide to work in official or unofficial economy. Those are factors in favour of conclusion that official and unofficial sectors are substitutes.

On the other hand, households spend a significant part of the income generated in informal production on goods and services produced by formal producers. In the production process informal producers use inputs (intermediate goods and services) from the formal producers. Those are factors supporting opinion that official and unofficial economy are complements, i.e. rise of unofficial economy could induce rise of official sectors and vice versa.

Picture 1.

ECONOMIC TRANSACTIONS IN FORMAL AND INFORMAL ECONOMY



Source: Gershuni (1979)

The literature dealing with the correlation between the formal and informal economy, so far has not produced the final answer whether this relation is positive or negative. According to Chen (2007) there are at least three schools of thought on links between shadow and formal economy. The dualists argue that informal units and activities have few (if any) linkages to the formal economy but, rather, operate as a distinct separate sector of the economy; and that informal workers comprise the less-advantaged sector of a dualistic labour market. Hypothesis is that growth of the shadow economy leads to a decrease in tax revenues and there-

fore lower quality and quantity of public goods and services, which ultimately has negative impact on economic growth of formal economy (Nikopour, Shah Habibullah and Schneider, 2010). According to structuralism approach, unofficial and official sectors are intrinsically linked. To increase competitiveness, firms in the formal economy are seen to reduce their input costs, including labour costs, by promoting informal production. The economic explanation is that the value-added created in the shadow economy is spent in the official sector, while more official production increases the demand of unofficial goods and service. The legalists focus on the relationship between informal entrepreneurs/enterprises and the formal regulatory environment, not formal firms. They acknowledge that capitalist interests collude with government to set the bureaucratic 'rules of the game'.

In the neoclassical view, the shadow economy is positive in the sense that it responds to the economic environment's demand for services and small-scale manufacturing (Asea, 1996). Adam and Ginsberg (1985) proposed the theoretical model in which, under the assumption of low entering cost to the informal sector, a positive relationship could be established. Empirical analysis conducted on data for Belgium confirmed these results. Recent models also indicate a positive relationship. For example, Bhattacharyya (1999) argues that it is necessary for the shadow economy growth to positively influence the growth of the official sector, the main channel being personal consumption. Specifically, Bhattacharyya (1999) claims that significant share of funds which the agents acquire in the shadow market create additional demand, which can positively influence the growth of the official sector. Similarly, Schneider (1998) shows that over 66% of the earnings in the shadow economy are almost immediately spent in the official sector.

Specifically, Eilat and Zinnes (2000) argue that the growth of the shadow economy share up to the levels registered in transition countries is actually a way of structural adjustment to new market conditions. They assume that the slow development of market institutions in the transition economies forced the part of the agents to conduct their activities in the unofficial sector. However, once the market institutions are adequately developed, those agents would find it more profitable to organize their activities in the regulated sector. In that context, it could be expected that as the transition economies recover from the transition crises, the shadow economy size will decrease significantly.

On the opposite side, Loayza (1996) and Johnson, Kaufmann, and Zoido-Lobaton (1998) study the effect of the shadow economy size on the rate of economic growth within the public good framework and find significant negative relation. Enste and Schneider (2002) point out that the presence of a large shadow economy, where free-riding on public services paid for by few is common, could lead to a sense of unfairness and deepen the distrust toward the ability of the political system to govern. It is not clear to what extent the shadow economy is the cause of bad morals rather than just an indicator of a legitimacy of the social and eco-

conomic order. According to Eilat (2002) another potential concern of an expanding shadow economy is the possible reduced eligibility of social services for workers in the shadow firms. Knack and Keefer (1997) find a strong and significantly positive relationship between social capital variable (measured as willingness to pay taxes) and economic growth. Therefore one may conclude that there is a negative relationship between the unofficial economy (higher tax avoidance) and formal economy.

For the group of transition economies, Feige (2001) worked on the correlation between the shadow economy and the official economy growth applying the regression for each country in the sample. The method applied clearly point out the negative correlation between the official and the unofficial sector in most analyzed countries. Kaufmann and Kaliberda (1996) have analysed the interdependence between the shadow economy growth rate and the officially registered growth rate for larger number of countries, but their research has focused on the early phase of transition. They have found that the shadow economy was used as the buffer during the early phases of transition, when the officially registered output has dropped severely. By applying the OLS method, they have found out that the cumulative drop of the officially registered GDP by 10 percent will result in the growth of the shadow economy of nearly 4 percent.

Botrić, Marić and Mikulić (2004) focused on the informal sector and formal sector relationship by panel data analysis. The regressions are conducted separately for transition and developed countries. Results indicated that there are differences between the transition and developed economies regarding unofficial/official economy relation. The decrease of the unofficial economy has positive impact on the rate of growth in the transition economies. In the developed economies, the link is vaguely positive, as indicated in previous studies.

Obviously, there is not a universal answer for the question whether the relationship between the official and the unofficial economy is positive or negative. This relationship depends on specific features of the individual economy and numerous socio-economic and legal factors. According to Nikopour, Shah Habibullah and Schneider (2010) the shadow activity is a “second best” alternative that contributes to the production of consumer and producer goods and, consequently, to economic growth. They conclude that compared to a Pareto optimal economy, shadow economy activity would appear to reduce the rate of growth, but in the real world the economy is not at an optimum. Given the real world with poorly defined and enforced property rights, poorly designed and often excessive regulation, corruption, and poor tax administration, the shadow economy may contribute to economic growth. Inclusion of underground economy may have important consequences for meeting Maastricht criteria especially for countries applying for euro adoption (Lovrinčević, Marić, Mikulić 2006).

3. Estimates of unofficial economy in Croatia

In this chapter estimates of the size of unofficial economy in Croatia based on different methods are pooled together. Aim of this comparison is to determine range of UE in Croatia and to test whether different methods, although based on various assumptions resulting with significantly different estimated size of informal sector, agree on the trend of UE activities. The results from two studies based on MIMIC approach and results of two method based on own calculation are compared (Eurostat and labour market method).

3.1. Estimates based on MIMIC approach

The main idea behind MIMIC approach is to determine the relationship between an unobservable variable (unofficial economy), and a set of indicators related to UE which are available in standard statistical system. In particular, the MIMIC model compares a sample covariance matrix, i.e. the covariance matrix of the observable variables, with the parametric structure imposed on it by a hypothesized mode (Buehen, Schneider, 2012; Schenider 2012). For this purpose, the unofficial economy is related to the selected indicator variables in a factor analytical model. The relationships between the unobservable variable and the observable explanatory (causal) variables or determinants are specified through a structural model.

In the MIMIC approach there are various factors determining relative significance of unofficial economy and relation to the official economy. Observable indicators which “cause” UE according to the theoretical papers are following (Frey and Pommerehne, 1984; Feld, 2010, Schneider and Enste, 2000; Buehen, Schneider, 2012; Schenider 2012):

- a) Burdens on the official economy;
- b) Public sector services;
- c) Tax morality and government controls;
- d) Labour market conditions;
- e) Structural factors.

All of above factors have an impact on relation between formal and informal economy. If tax burden is rising, we can expect rising share of unofficial economy. The higher the difference between the total cost of labour in the official economy and after-tax earnings from work, the greater is the incentive to work in the unofficial economy. Empirical evidence on the influence of the tax burden on the

shadow economy is provided by Schneider (1994, 2005), Johnson, Kaufmann and Zoido-Lobato (1998), Feld (2010).

An increase of the unofficial economy can lead to reduced public revenues from taxes which in turn reduce the quality and quantity of public goods and services. Ultimately, this can lead to an increase in the tax rates for firms and individuals in the official sector, quite often combined with deterioration in the quality of public goods and of the administration, leading to an even stronger incentive to participate in the shadow economy (Feld and Schneider, 2010).

A lower tax morality leads to an increased readiness to become active in the hidden economy. A growing intensity of public controls and a rise in expected punishment *ceteris paribus* reduces the return on hidden activities and therefore has the opposite effect according to Frey and Pommerehne (1984). Johnson, Kaufmann, and Shleifer (1997) predict that *ceteris paribus* countries with higher general regulation of their economies tend to have a higher share of the unofficial economy in total GDP. Underground economy is also very often closely linked to corruption (Lovrinčević, Mikulić, Budak 2006).

If labour market conditions are improving in terms of higher labour demand in official sectors, individuals have a stronger negotiation position and ask to be included in social security schemes. If labour demand is weak, individuals are more concentrated on short-term perspective (current income) and neglect loss of potential social benefits in the future. Additionally, the longer official working time, the higher are the opportunity costs of taking up additional work in the hidden economy. Unemployment benefits also influence readiness of workers to participate in official economy. If the wage of illicit work and the financial aid together yield more income than regular and overtime work, taking also into account the costs of detection and punishment and assuming risk neutrality, full-time illicit work as an unemployed person yields *ceteris paribus* a higher utility (Enste and Schneider, 2002).

MIMIC approach is applied in the study of Schneider (2012) and Buehen, Schneider (2012). Determinants used as possible causes of unofficial economy were the following: size of government, share of direct taxation, fiscal freedom, business freedom, unemployment rate, government effectiveness and sub-national government employment. In their model, authors used the following variables as possible indicators of the size of UE: currency in circulation, labour force participation rate and GDP per capita. They found that the variables capturing the burden of taxation (in a wide sense), i.e. the size of government and fiscal freedom, unemployment rate and business freedom have the expected signs and are statistically significant. Indicator variables - the labour force participation rate and GDP per capita are also found to be statistically significant and showing the expected signs.

Results of their estimate are presented in Table 1. As can be seen, Croatia recorded above average share of unofficial economy in the GDP. From the set of analysed countries only Bulgaria and Romania recorded higher unofficial economy. Second conclusion is that estimated size of unofficial economy is higher in new member states which is expected result having in mind that NMS are lacking behind old EU countries not only in terms of economic development but also regarding overall institutional environment. In the both subsamples (NMS and OECD-EU countries) one can notice a decreasing trend in unofficial economy in the 2000-2008 period. Impact of recession is slightly different. While unofficial economy in old EU member countries on average increased in 2009, majority of new member states recorded a growth of unofficial economy in 2009 and slight increase in 2010. According to that criterion Croatian economy has been more similar to the group of old EU member countries and has experienced increase in unofficial economy in 2009.

Table 2.

ESTIMATES OF THE UNOFFICIAL ECONOMY BASED ON MIMIC APPROACH
IN STUDIES BUEHEN, SCHNEIDER (2012) AND SCHENIDER (2012)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NMS*	27.4	27.1	26.8	26.4	26.0	25.5	24.9	24.6	24.7	24.2	24.3
Bulgaria	36.9	36.6	36.1	35.6	34.9	34.1	33.5	33.0	33.7	32.1	31.9
Czech Republic	19.1	18.9	18.8	18.7	18.4	17.8	17.3	16.3	15.2	15.7	15.4
Estonia	25.6	25.3	24.9	24.3	24.0	23.4	22.7	22.5	20.8	24.3	22.5
Hungary	25.1	24.8	24.5	24.4	24.1	24.0	23.7	23.7	23.1	23.1	23.1
Latvia	23.6	23.2	22.9	22.5	22.1	21.5	20.8	20.8	22.6	20.0	21.5
Lithuania	27.1	26.7	26.2	25.4	25.1	24.4	23.8	24.3	26.0	23.6	25.4
Poland	27.6	27.7	27.7	27.5	27.3	26.9	26.4	25.4	24.7	24.6	23.8
Romania	34.4	33.7	33.5	32.8	32.0	31.7	30.7	30.8	31.5	30.0	30.9
OECD-EU*	18.6	18.4	18.4	18.5	18.4	18.4	18.2	18.0	18.0	18.5	18.5
Austria	9.8	9.7	9.8	9.8	9.8	9.8	9.6	9.7	9.5	9.7	10.6
Belgium	22.2	22.1	22.0	22.0	21.8	21.8	21.4	20.8	20.3	20.5	20.7
Ireland	15.9	15.9	15.9	16.0	15.8	15.6	15.5	15.4	15.9	17.5	16.5
Italy	27.1	26.7	26.8	27.0	27.0	27.1	26.9	26.8	26.7	26.5	26.7
Netherlands	13.1	13.1	13.2	13.3	13.2	13.2	13.2	13.1	12.7	12.9	13.6
Spain	22.7	22.4	22.4	22.4	22.5	22.4	22.4	22.3	22.9	24.5	23.5
Sweden	19.2	19.1	19.0	18.7	18.5	18.6	18.2	18.0	17.7	17.9	18.1
Croatia	33.4	33.2	32.6	32.1	31.7	31.3	30.8	30.4	29.6	30.1	29.8

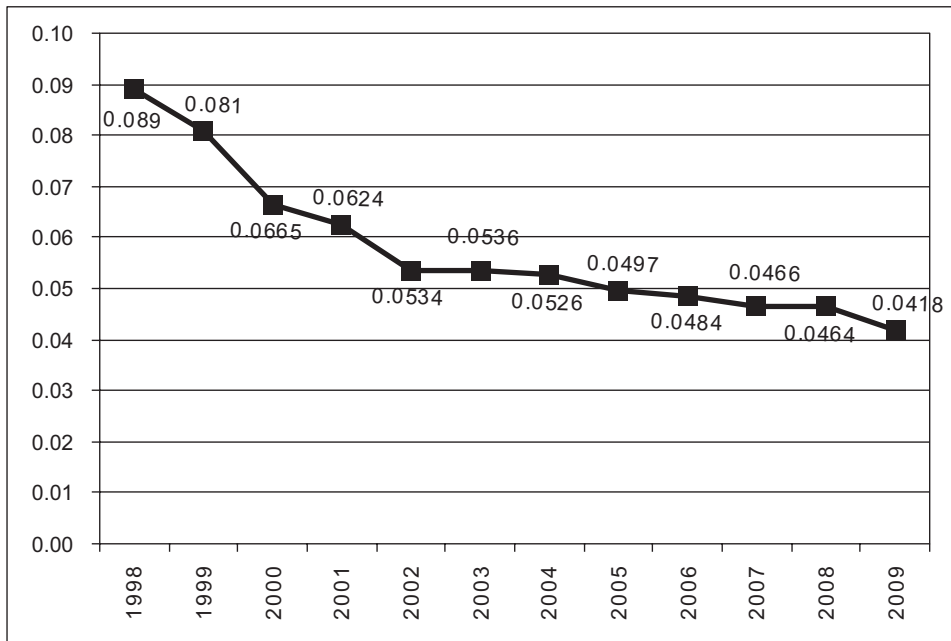
*unweighted average

Source: Buehen, Schneider (2012) and Schenider (2012)

Klarić (2011) also applied the MIMIC model to the Croatian economy. In his model a standard set of observable variables are used: data on taxes and contributions collected unemployment rate, GDP and monetary indicators. Results are presented in chart 1 which point to the same conclusion on decreasing share of unofficial economy till the year 2009. Comparison of this estimate and other methods will be elaborated in next chapter.

Chart 1:

ESTIMATE OF UNOFFICIAL ECONOMY IN CROATIA BASED
ON MIMIC APPROACH PRESENTED IN KLARIĆ (2011),
EXPRESSED IN TERMS OF OFFICIAL GDP



Source: Klarić (2011).

3.2. Estimate of non-exhaustiveness of national accounts in Croatia based on Eurostat approach

The basic methodology used to estimate the size of UE is the Eurostat's Tabular Approach to Exhaustiveness. This approach provides a framework for the estimate of the UE that is particularly well suited for transition countries. According to this approach, different types of non-exhaustiveness have to be precisely defined and separated. All types of non-exhaustiveness are systematically covered and are mutually excluded. Main advantage of this method comes from the possibility of a comparison of different types of non-exhaustiveness adjustments by countries. This is the most conservative method because the results are lower in comparison with other methods used to estimate the unofficial economy. The classification of non-exhaustiveness types in the national accounts is based on various characteristics of the producer, i.e. the way in which data is obtained from producers. The classification of non-exhaustiveness types in the national accounts is elaborated in Lovrinčević, Mikulić, Galić Nagyszombaty (2011) and here is presented only summary of the method and types of UE.

- N1 Producer should have registered (underground producer)
- N2 Illegal producer that fails to register
- N3 Producer is not obliged to register
- N4 Registered legal person is not included in statistics
- N5 Registered entrepreneur is not included in statistics
- N6 Mis-reporting by the producer
- N7 Statistical deficiencies in the data

Table 3.
 UNOFFICIAL ECONOMY IN CROATIA BY TYPE (N1-N7),
 IN THOUSAND HRK

Type of unofficial economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
N1 Non-registered (underground producers)	1.186.705	1.133.514	1.044.911	686.040	707.371	766.236	624.921	549.323	571.693	698.290
N2 Non-registered illegal producers	1.514.001	1.634.453	1.774.766	1.945.918	2.103.136	2.266.538	2.473.874	2.705.617	2.932.625	2.806.753
N3 Producer is not obliged to register	1.101.578	1.252.156	1.342.083	1.301.274	1.338.381	1.234.308	1.341.198	1.320.398	1.338.775	1.418.202
N4 Registered legal person is not included in statistics										
N5 Registered entrepreneur is not included in statistics	476.714	523.548	631.730	755.895	844.043	930.528	1.022.268	1.132.622	1.248.564	1.316.090
N6 Misreporting by the producer	11.840.772	12.461.792	13.567.439	13.709.554	14.641.177	15.928.268	15.908.740	15.939.720	16.568.219	17.034.561.
N7 Statistical deficiencies in the data	458.453	504.108	546.956	539.931	535.192	526.156	557.167	598.334	634.273	655.137
TOTAL	16.578.223	17.509.571	18.907.885	18.938.613	20.169.300	21.652.035	21.928.167	22.246.014	23.294.149	23.929.034
TOTAL (N2 excluded)	15.064.222	15.875.118	17.133.119	16.992.695	18.066.164	19.385.497	19.454.293	19.540.397	20.361.524	21.122.281
TOTAL, N2 excluded (% in GDP)	8.46	8.26	8.21	7.42	7.30	7.27	6.68	6.14	5.90	6.43

Source: CBS, author's calculation.

Table 3 shows the results according to the specific types of the total exhaustiveness adjustments according to Eurostat's approach. Type N6 (inaccurate reporting by producers) is the most significant in all period. N6 is estimated between 11.8 billion HRK in 2000 and 17 billion HRK in 2009.

Chart 2.

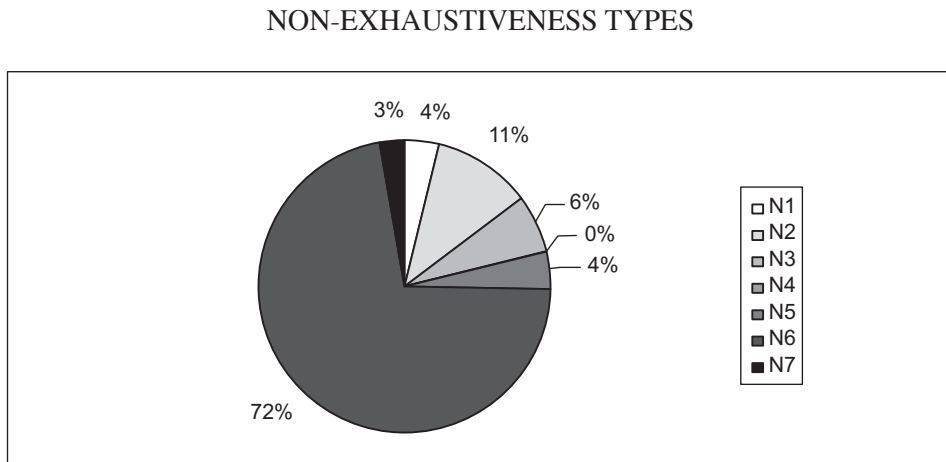


Chart 2. presents the shares of different types of non-exhaustiveness adjustments. In the chart is given average shares according to types in period 2000 – 2009. It is obvious that type N6 (inaccurate reporting by producers) is the most significant in all observed period. Average share of type N6 is 72% of total non-exhaustiveness adjustments. Then follow illegal activities with share of 11%. Type N2 are not included in official GDP at the moment because further investigations in this area will be done. Types N1, N3, N5 and N7 are estimated between 3 and 6% of total exhaustiveness adjustments.

Table 4.

EXHAUSTIVENESS ADJUSTMENTS BY ACTIVITY; AS A PERCENTAGE
 OF GROSS VALUE ADDED (GVA) OF ACTIVITY¹⁰

Activities, NACE 2002	% in Gross Value Added								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
A + B	13,87	11,89	12,47	12,74	11,27	10,52	9,67	9,46	8,38
C + D + E	11,00	9,66	10,91	8,12	6,96	7,66	6,75	6,35	6,32
F	20,65	22,55	18,73	17,88	19,64	16,43	14,18	12,16	10,99
G	20,96	20,80	15,56	14,70	14,20	14,57	13,48	12,25	11,78
H	23,60	25,03	24,74	24,10	25,42	26,43	24,38	24,20	23,79
I	7,62	7,12	6,60	5,47	6,32	6,93	6,77	6,11	5,98
J + K	5,47	5,36	6,49	5,99	5,89	5,31	5,20	4,63	4,35
L to O	3,29	2,30	3,12	2,26	1,92	1,99	1,77	1,65	1,54

Source: CBS, calculation of the authors.

Table 4 presents exhaustiveness adjustments by activities as a percentage of Gross Value Added of activity. NACE H (Hotels and restaurants) has the greatest share in total non-exhaustiveness adjustments in whole period. Average share of activity H is 24.6% in GVA of specific activity. This is followed by NACE F (Construction) with average 17% of GVA and NACE G (Wholesale and retail trade) with 15.4% of GVA. As evident, in the period of dynamic economic growth, although stagnant in nominal terms (current price value), the unofficial economy was constantly reducing its share in official GDP. The most significant reduction in share of unofficial economy in GVA was recorded in construction and trade. On the other hand, unofficial economy in activity hotels and restaurants recorded stable share in GVA.

3.3. Estimate of unofficial economy by labour market approach

Official data for hidden economy measured by Eurostat methodology for last two years (2010 and 2011) are not available yet. Impact of recession on unofficial economy in this paper is estimated on labour force survey data. In this paper,

¹⁰ Data for 2009 are not available according to NACE 2002.

post-stratification of labour force survey data is used to improve the precision of estimation of labour force data. The post-strata are constructed by sex (2 classes), and age group (5 groups). The weights are based on independently derived population figures. Official CBS data on population are used but in this paper persons not present in Croatia for period longer than 1 year¹¹ are not included.

Total employment according to post-stratified LFS data (in table marked as LFS) is calculated using the following formula:

$$LFS = \sum e_{ij} * P_{ij}$$

where e_{ij} is employment rate for population in group i ¹² and gender j ¹³ and P_{ij} marks population in the same group.

Total difference in employment between labour force survey and official CBS figures (OF), besides unregistered employees engaged in market activities, comprise a group of self-employed persons in agriculture which are primarily producers of agricultural products for their own consumption (OAA). In OAA group there is a significant share of population older than 65 which are classified as employed in LFS because they work occasionally for compensation in cash or kind. Because of limited impact of own account agricultural workers on rest of the economy and probably low value of production, estimate of employment in unofficial economy (UE presented in the last row of the table) do not comprise the OAA group.

¹¹ According to census data, 226.151 persons were abroad during census period, but because of occasional visits to their families in Croatia, those persons were included in total population. In 2011 census only persons that visit Croatia on weekly basis will be included in total population of Republic of Croatia.

¹² $i=1$, for population aged 0-14, $i=2$ for population aged 15-24, $i = 3$ for population aged 25-49, $i = 4$ for population aged 50-64 and $i = 5$ for population older than 65.

¹³ $j=1$ for males and $j=2$ for females.

Table 5.

ESTIMATE OF UNREGISTERED EMPLOYMENT
 BY LABOUR FORCE SURVEY

	2004	2005	2006	2007	2008	2009	2010 ^e
Employment rates - men (official LFS data)							
15-24	31,9	30	29,1	31,6	33,2	31	29,1
25-49	79,1	79,04	79,7	82,5	83,5	80,4	76,1
50-64	53,6	54,9	55,4	58,4	58	57,6	56,7
65+	9,7	9,1	8,3	6,2	6,3	7,4	6,8
Employment rates - women (official LFS data)							
15-24	21,7	21,3	21,8	21,1	20,6	19,4	18,4
25-49	67,3	69,6	69,5	71,3	72,6	72,3	69,8
50-64	32,1	33,6	35,8	35,8	37,4	39,8	39,15
65+	6,2	5,6	5,8	4,5	5	4,8	4,3
Employment (post-stratified LFS) – men							
15-24	92,1	85,4	81,9	87,5	90,2	82,8	76,0
25-49	580,4	578,5	584,8	601,1	607,7	584,3	550,7
50-64	190,7	199,2	205,3	219,9	221,1	223,6	224,9
65+	27,8	26,5	23,9	18,5	19,0	22,4	20,5
	891,0	889,7	895,8	927,0	938,0	913,1	872,1
Employment (post-stratified LFS) - women							
15-24	59,9	58,1	58,8	55,9	53,4	49,4	46,0
25-49	494,9	510,9	511,0	519,3	527,2	523,6	502,6
50-64	128,0	135,6	146,9	148,8	157,1	169,7	170,2
65+	28,2	25,8	26,5	21,1	23,6	22,7	20,2
	711,0	730,4	743,3	745,2	761,3	765,4	739,0
Estimate of total employment - post-stratified LFS							
Total LFS	1.602,0	1.620,1	1.639,1	1.672,2	1.699,3	1.678,5	1.611,1
Official employment							
Total OF	1409	1420	1468	1517	1555	1499	1427
Difference post-stratified LFS data and official employment							
LFS - OF	193,0	200,1	171,1	155,2	144,3	179,5	184,1
Self-employment in agriculture - low scale primarily own-account production							
OAA	136,9	147,1	121,9	108,9	117,7	122,5	124,5
Estimate of employment in unofficial economy							
UE = LFS-OF-OAA	56,1	53,0	49,2	46,3	26,6	57,0	59,6
(UE as % of OF)	4,0	3,7	3,4	3,1	1,7	3,8	4,2

^eData for 2010 are estimated, official data are not available for 4th quarter of 2010.

Source: CBS, calculation of the authors.

As can be seen from the table, a downward trend in unofficial employment has been recorded in the period 2004-2008. Official economy growth and improved labour market conditions resulted in the decrease of unofficial employment from 56.1 thousands in 2004 to 26.6 thousands in 2008. As a percentage of official employment, hidden employees had a share of 4.0% in 2004 and only 1.7% in 2008. The trend reversed in 2009 and the share of hidden employees increased to 3.8% in 2009 and 4.2% in 2010.

Official figures point to a decrease of more than 50 thousands employees in 2009. On the other hand, according to post-stratified LFS data, reduction in employment was only 20 thousands and the difference is attributed to the unofficial economy growth. In 2010 both official employment and LFS figures indicate significant reductions in employment. Obviously, in an attempt to compensate for the revenue drop (as a consequence of reduced demand), economic agents tried to reduce labour costs through tax evasion.

4. Comparison of unofficial economy estimates based on different methods

In this chapter a comparison of UE estimates is presented for the Croatian economy. Firstly one can notice that MIMIC approach as presented by Buehen, Schneider (2012) is on average higher than estimates used in Eurostat non-exhaustiveness (NOE) project aimed on inclusion of UE in official national accounts. As can be seen from Table 6, unweighted average for NOE adjustment in new member states was 11,1% of GDP which is almost double in comparison to old member states labelled as OECD-EU. Buehen and Schneider (2012) also found a significant higher share of unofficial economy in NMS. Their estimate is on average 2.7 times higher than NOE adjustment for NMS while in the subset of old member states the same indicator is 6.4 with significant dispersion among countries. For Croatia this ratio stands at 3.3 which is closer to NMS economies.

Table 6.

COMPARISON OF UE ESTIMATES BASED ON EXHAUSTIVENESS
 OF NATIONAL ACCOUNTS AND MIMIC APPROACH

	Reference period	Adjustment for NOE in national accounts	Buehen, Schneider (2012)	Ratio Buehen, Schneider (2012) NOE
NMS		11,1	29,6	2,7
Bulgaria	2001	10,2	36,6	3,6
Czech Republic	2000	4,6	19,1	4,2
Estonia	2002	9,6	32,0	3,3
Hungary	2000	11,9	25,1	2,1
Latvia	2000	8,3	29,8	3,6
Lithuania	2002	18,9	32,8	1,7
Poland	2002	7,8	27,7	3,6
Romania	2002	17,7	33,5	1,9
OECD-EU		6,2	18,6	6,4
Austria	2001	7,9	9,7	1,2
Belgium	2002	3,0	22,0	7,3
Ireland	1998	4,0	16,1	4,0
Italy	2003	14,8	27,0	1,8
Netherlands	1995	1,0	13,3	13,3
Spain	2000	11,2	22,7	2,0
Sweden	2000	1,3	19,2	14,8
Croatia	2002	10,1	33,3	3,3

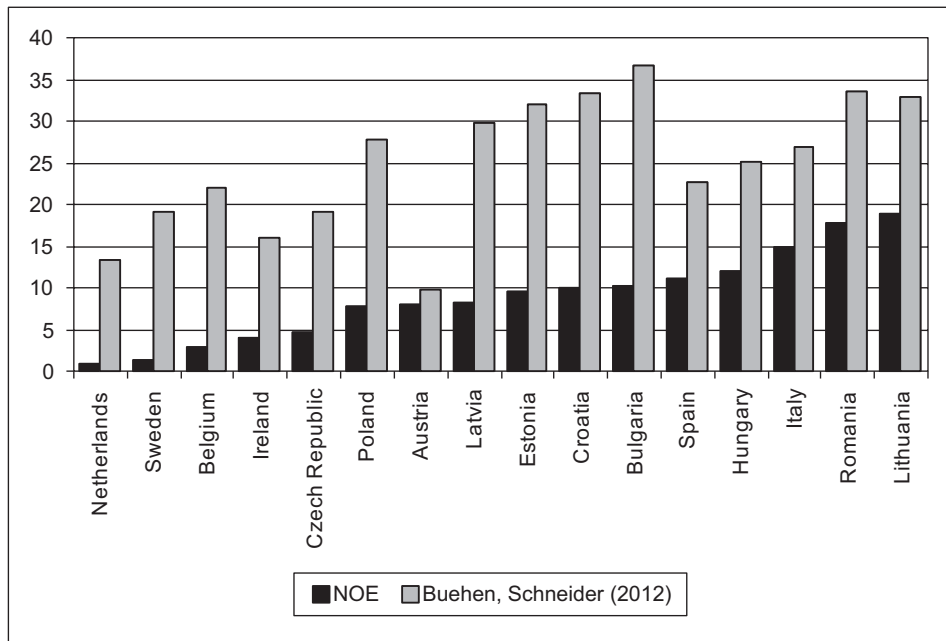
*unweighted average

Source: Buehen, Schneider (2012) and Schneider (2012)

Although differences in results are relatively high, one can notice that there are some similarities in ranks of UE with some outliers (chart 3.). Starting from results from Eurostat exhaustiveness project one could expect slightly higher MIM-IC estimate for Austria, Italy, Hungary and Spain.

Chart 3.

RANKING OF COUNTRIES ACCORDING TO THE SIZE OF UNOFFICIAL ECONOMY



Source: Buehen, Schneider (2012) and Schneider (2012)

Next table presents comparison of UE estimates based on four different methods described in previous chapter. The lowest share of UE is estimated by labour force method but one has to bear in mind that this estimate relates only to one part of unofficial economy – unregistered labour. A certain proportion of informal activities can be expected in registered units (as is presented in Eurostat approach under heading N6). Registered units are often deliberately underreporting income for tax purposes. Table 7. points to impossibility to get the final answer on the question how big unofficial economy is. Various methods could apply different definition and terminology, use specific assumptions and analytical procedures. If definitions and assumptions differ, it is expected that results will differ as well.

Table 7.

COMPARISON OF UE ESTIMATE FOR CROATIAN ECONOMY

	Non-exhaustiveness of national accounts	Buehen, Schneider (2012)	Labour force method	Klarić (2011)
2000	8,5	33,4		6,7
2001	8,3	33,2		6,2
2002	8,2	32,6		5,3
2003	7,4	32,1		5,4
2004	7,3	31,7	4	5,3
2005	7,3	31,3	3,7	4,9
2006	6,7	30,8	3,4	4,8
2007	6,1	30,4	3,1	4,7
2008	5,9	29,6	1,7	4,6
2009	6,4	30,1	3,8	4,2
2010		29,8	4,2	

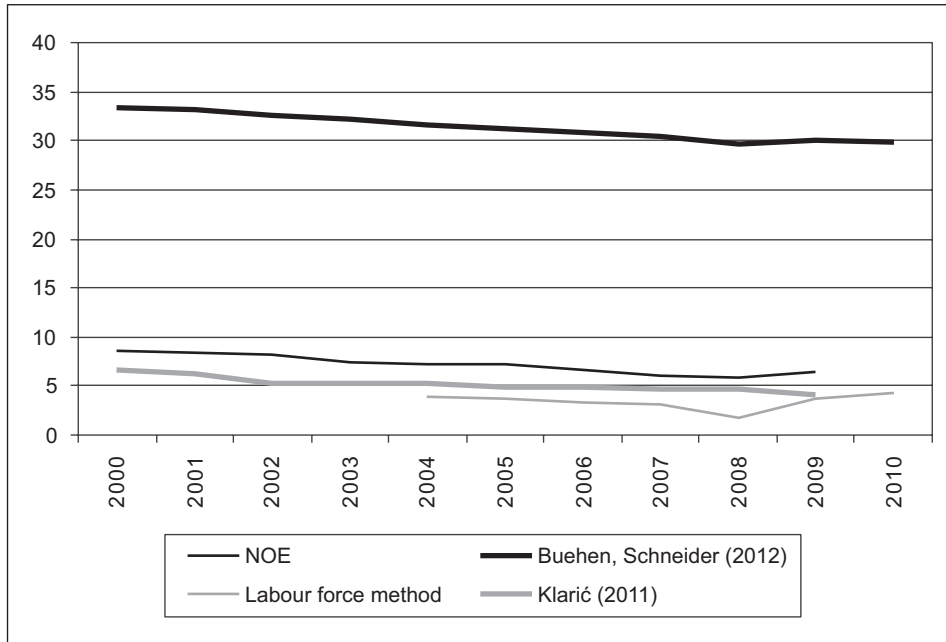
Sources: Buehen, Schneider (2012), Klarić (2011), own calculations

Although the exact size of unofficial economy for Croatia is unknown because of relatively high range of estimated results, one could notice that all the methods applied point to the same conclusion that unofficial economy has been decreasing (as percentage of GDP) in period 2000-2008. This conclusion is in accordance with recent literature which found negative relationship between official and unofficial economy. In the period of economic expansion an additional income could be realised through official and registered activities and motivation for engagement in UE sector is lower.

According to three out of four methods, in recession period, unofficial economy increased in terms of GDP. According to literature, factor behind these results is an attempt of economic units (households and corporations) to compensate decrease of official income with unofficial activities. In opposition, Klarić (2011) found continuation of decreasing trend of unofficial economy even in 2009 when recession started. He explains it with possibility that the economic crisis and the measures to counteract it, left the entire economy shaken up and some time for all the subjects to adapt to the new situation is required. Some of the variables used to model the NOE probably lag in showing the full effects of global economic phenomena such as the crisis. The NOE itself in reality probably lags even further, needing time to respond to the major changes in the values of its causes.

Chart 4.

**TRENDS IN UNOFFICIAL ECONOMY
IN CROATIA BASED ON VARIOUS METHODS**



Sources: Buehen, Schneider (2012), Klarić (2011), own calculations

5. Conclusion

According to the number of approaches applied by different researchers, and the diversity of their views, one can conclude that there is no universal approach capable of being applied to all of the countries or even to the same country at different periods of time. The best method of estimation, in each individual case, depends on the specific features of the economy. Methods are using different sets of initial assumptions and apply heterogeneous analytical techniques which lead to variety of results. Comparison of different methods can insure that one can estimate lower and upper boundary of unofficial economy. Moreover, although level of estimated unofficial economy differs, various methods do not differ significantly regarding estimated downturn of upturn trend of unofficial economy.

According to type of non-exhaustiveness, N6 type (inaccurate reporting by producers) is the most significant in all observed period. Average share of type N6 is 72% of total non-exhaustiveness adjustments. Then the illegal activities follow with share of 11%. Type N2 are not included in official GDP at the moment because further investigations in this area will be done. Types N1, N3, N5 and N7 are estimated between 3 and 6% of total exhaustiveness adjustments.

Regarding structural factors, non-exhaustiveness adjustments have the most significant share in gross value added in Hotels and restaurants (NACE H) in the whole period. Average share of UE in activity H is 24.6% in GVA of specific activity. This is followed by NACE F (Construction) with average UE share of 17% of GVA and NACE G (Wholesale and retail trade) with UE share of 15.4% of GVA. On the other hand, total non-exhaustiveness adjustments has the lowest share in industries NACE L to O (Public administration, Education, Health and Other services) in the whole period. It is in accordance with expectation because this sector mainly consists of government units.

According to majority of estimates, the trend of decreasing share of underground economy in GDP has stopped in 2008 and reversed in 2009. This finding supports the conclusion that the official and the underground economy in Croatia are substitutes, working in opposite direction. Most important factors influencing the unofficial economy in Croatia (tax moral, tax burden and labour market conditions) worked in the same direction and induced increasing share of unofficial economy in recent period.

This conclusion is in line with most results for other transition and NMS economies. It means that official statistical data overestimate total economic activity (sum of official and unofficial income) during periods of growth, while underestimating activity during recessions.

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NESLUŽBENO GOSPODARSTVO U HRVATSKOJ: METODE MJERENJA I PROCJENE

Sažetak

U skladu s preporukama Eurostata, BDP svake zemlje mora obuhvaćati ukupnu ekonomsku aktivnost. Sve članice Europske Unije i zemlje kandidati stoga su imale obvezu uključivanja procjene neslužbenog gospodarstva u službenu statistiku nacionalnih računa. Državni zavod za statistiku Republike Hrvatske radio je na projektu poboljšanja obuhvata nacionalnih računa. U skladu s rezultatima toga projekta revidirani su službeni podaci iz područja nacionalnih računa na način da je obuhvat proširen i uključena je procjena dohotka ostvarenog u neslužbenom sektoru.

Rad prikazuje usporedbu rezultata različitih metoda procjene neslužbenog gospodarstva u Hrvatskoj. Rad prikazuje metode procjene neslužbenog gospodarstva korištene u relevantnoj literaturi iz ovog područja, i rezultate tih procjena. Nadalje, prikazana je Eurostatova metodologija procjene obuhvatnosti nacionalnih računa i rezultati za hrvatsko gospodarstvo. Dodatno, autor koristi i podatke iz ankete o radnoj snazi za procjenu broja zaposlenih koji nisu registrirani u službenoj statistici.

Cilj rada je testiranje hipoteze da predma različite metode procjene neslužbenog gospodarstva polaze od različitih pretpostavki i metodologije, u slučaju hrvatskog gospodarstva njihova primjena upućuje na zajednički zaključak o trendu kretanja neslužbenog gospodarstva u Hrvatskoj. Autor je zaključio da se u razdoblju ekonomskog rasta udio neslužbenog gospodarstva smanjivao, dok se u razdoblju recesije rastom udjela neslužbenog gospodarstva u određenoj mjeri amortizirao negativni učinak recesije na smanjenje dohotka kućanstava.

Ključne riječi: Neslužbeno gospodarstvo, Eurostat metoda, Puni obuhvat nacionalnih računa, MIMIC metoda, Hrvatska