

INFORMAL ECONOMY IN BOSNIA AND HERZEGOVINA – AN EMPIRICAL INVESTIGATION

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Abstract

This paper explores the size of the informal economy in Bosnia and Herzegovina (BiH) over the period 1998-2016, based on an indirect method of measurement known as the MIMIC approach (Multiple Input Multiple Causes). As the underlying determinants of the informal economy in BiH we include tax burden, the level of unemployment, the size of the agricultural sector and the level of government subsidies. We estimate that the average size of the informal economy for the observed period was 34% of GDP, with the largest percentage in 1998 (43%) and the smallest in 2009 and 2016 (30%). There is a modest decreasing trend in the size of the informal economy over time. Our model identifies two structural brakes over the observed period. The first is positive and is linked to the introduction of the value added tax in 2006 (a decrease in 2007-2009 follows). The second captures a short-run negative effect of the latest global economic crisis in 2009 (an increase between 2010-2011). To further assess these results and check their consistency with available primary data, we investigate the size of the undeclared work, assess tax morality and the additional income of families coming from informal sector. These indicators provide consistent results with those of the MIMIC approach.

Keywords: *informal economy, tax burden, tax morality, undeclared work, unemployment, MIMIC, Bosnia and Herzegovina*

JEL classification: *O17.*

INTRODUCTION

The informal economy¹ is most often explained as a part of the economy that is not declared to official authorities. It is legal in nature and thus should be formalized. The main dilemma for participants in the informal economy is whether it is better to conduct economic activities in the informal economy or to formalize them. At the same time, government authorities do not have such doubts and would be happy to see as much of the informal economy declared as possible. Thus, participants in the informal economy are often in a situation where they must choose between these two options, the formal *versus* informal economy. Nevertheless, we should not forget that many formal businesses are also sometimes partly informal (De Soto 2001); hence, this outcome is very likely to be

seen in practice, which further complicates estimating the size of the informal economy. Bearing in mind that

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the impact of the informal economy is not negative in all its dimensions, the informal economy needs to be tackled with appropriate strategies and policies, with the goal of minimizing its negative effects, while aiming to improve environments that cause the manoeuvring of entrepreneurs or households between formality and informality (Halilovich and Efendic, 2019).

This study contributes to the existing literature by offering an estimate of the informal economy for BiH over the period of 1998-2016 based on the targeted MIMIC methodology, the most recent data and country-specific influences. Moreover, we provide a supplementary assessment of the undeclared work, tax morality and additional income of households in BiH coming from the informal economy. We use these accompanying indicators to check the consistency of results obtained through the preferred MIMIC approach, a method of estimation that has its own limitations.

The paper is structured as follows. Following this introductory section, we provide a typical literature review of theoretical and empirical studies. The following section includes an explanation of the MIMIC methodology, including its advantages and disadvantages. The next two sections contain empirical analysis, which report the main outputs on the size of the informal economy in BiH, including a discussion of our findings. The penultimate section provides a supplementary investigation of undeclared work, tax morality and the additional income of households coming from the informal sector in BiH, while concluding remarks comprise the final section.

LITERATURE REVIEW

The theoretical background as well as empirical analysis of the informal economy phenomenon is examined in a number of theoretical and empirical studies (e.g. Feige 1989; Williams 2006; Feige 1989; Williams 2006a; Giles and Tedds 2002; Schneider 2000; Schneider and Buehn 2013; Williams and Schneider 2016; Tanzi 1999, etc.). These papers are useful for our investigation, as they identify the relevant determinants of the informal economy and provide a comparison of the relevant measurement methods. Moreover, our research interest is primarily linked to studies covering BiH, countries from the Western Balkans region, and the studies based on MIMIC approach of measurement, which is the approach used in this paper.

At the outset it must be noted that there are numerous definitions of the informal economy. The most frequently used definition in the key economic literature describes the informal economy as all currently unregistered economic activities that contribute to

the officially calculated or observed gross domestic product (Feige 1989; Schneider 1994; Breusch 2005). This is the definition we adopt. It does not observe transactions of illegal activities such as stolen goods, narcotics, prostitution or theft, but tries to capture activities that should be included in GDP without being declared to the official authorities.

Webb et al. (2009) elaborate that the informal economy exists because of the discrepancy between what is defined as legitimate by formal and informal institutions. A gap between formal and informal institutions is evident in transition countries that work to establish the rule of law and at the same time struggle with the inheritance of former systems and imposed norms and regulations. Institutions influence economic performance in post-socialist societies (Efendic and Pugh 2015), especially in cases where formal and informal institutions come into conflict, which leads to participation in activities within the informal economy. Although it is more common in transition and undeveloped countries, the informal economy is not a specific problem solely in these contexts, and is also a burden even for the most developed economies of the world. The transition process, together with post-war challenges, brought systematic transformation to BiH and an increase in informal activities (Efendic and Hadziahmetovic 2015).

The activities of the informal sector cause the inefficient functioning of the market and labour, decreasing the total revenues of the state, encouraging corruption while reducing trust in institutions (Rebmann, Efendic and Mickiewicz 2017). Choi and Thum (2005) in their research suggest that in addition to policies tackling the informal economy, policy makers should aim to eliminate corruption in particular. Non-transparent procedures, such as suspicious public procurement contracts, may lower institutional trust and serve as an example of how higher transparency might affect both corruption and the informal economy (Vukovic 2017). Also, there is a question of efficiency from the microeconomic point of view, which is reflected in a poor allocation of resources and ultimately in a decrease in gross domestic production (Eilat and Zinnes 2002). The discouraging aspect of engagement in the informal economy includes the lack of access to public goods. The primary problem is the lack of support for the legal system, since transactions are outside of state control. If business activities are performed in the informal sector, participants lose the right of social protection (Eilat and Zinnes 2002). The informal economy also exposes citizens to the risk of the violation of their rights, lack of access to the health care system, lower pensions in the future and the reduction of funds for public goods (Golias 2013). However, two-thirds of the

income from the informal economy is spent in the official economy, which shows that caution is needed in approaching this phenomenon (Enste and Schneider 2002). Also, it is possible for the informal economy to alleviate the effects of unemployment and increase economic activity.

Krstic and Schneider (2015) combine a series of works dealing with tax evasion, labour market distortion, resource shortages, and the causes and measures of the informal economy in Serbia. This study offers a contribution to the measures of reducing the informal economy, as well as its effects on the growth of the official economy in Serbia.

Klaric (2010) investigates the size of the informal economy in Croatia by using the MIMIC methodology for his estimation. The author makes estimates of the non-observed economy in Croatia for the period 1998-2009. He finds that the informal economy grows during times of crisis and increases its share in the formal economy. This finding is important and should be checked in the BiH sample as well.

Buehn and Schneider (2008) also rely on the MIMIC model, emphasizing the relationship of cointegration and error correction through the example and application of the model when it is used to estimate the informal economy in France. In this paper, the authors distinguish between short and long-term analysis and conclude that the results of this macroeconomic model could be used to support policy makers and economic strategies.

Zagoršek, Jaklič, and Hribernik (2009) provide an analysis of informal activities in Slovenia by presenting historical and social institutions that, in their opinion, are closely related to the development and functioning of the informal economy. The authors find that the informal economy is an obstacle to economic development and future progress once the economy moves towards investment activities and growth. The results of the study show the effects of the informal economy on economic activity, such as an orientation towards low added value and the development of unfair competition in entrepreneurship.

Eilat and Zinnes (2002) investigate the informal economy in Poland and Ukraine in the early 1990s and assess the extent to which informal activities are useful in the short term for their participants. They argue that informal economic activities serve as a temporary leverage of productive work in environments with high levels of corruption and bureaucracy, although the implications of the informal economy for long-term recovery have not been properly clarified.

Zaman and Goschin (2015) examine the informal economy and economic growth in Romania, based on the advantages and disadvantages of the informal

economy for the economy and society in general. Their main conclusion is, that in the long run, there is a consistent link between the informal economy and economic growth in Romania.

Dell'Anno (2007) estimates the size of the informal economy of Portugal from 1977 to 2004 and tests the statistical link between the informal economy and macroeconomic variables using the MIMIC model. This study recommends the reduction of the informal economy through the reform of the social protection system, and an increase in the efficiency of the public sector, with an increase in economic freedom and the reform of tax regulation for the self-employed.

Mai and Schneider (2016) model the informal economy of Egypt using two different research methods. In addition to the MIMIC model, they also use the currency demand approach, and conclude that the informal economy takes a significant share in the official economy, but at the same time point to a downward trend.

In the end, we have examined the limited empirical literature focused on BiH. One interesting research in this literature is by Schneider, Buehn and Montenegro (2010), based on MIMIC approach and panel data. This study includes estimates of the informal economy for 162 countries, including BiH, for the period from 1999 to 2006/2007. These authors estimate the average value of the informal economy in BiH at 33% of GDP for the observed period. Similarly, Medina and Schneider (2018) in their working paper apply the MIMIC approach using panel data for 158 countries, including BiH, covering the 1991-2015 period. They report that the average level of the informal economy is around 34%. However, there is no discussion of this phenomenon for BiH, as the data are generic, adopted for a global sample, and do not capture some important country-specific economic behaviours, which our study does.

Dell'Anno and Piirisild (2004) estimate the size of the non-observed economy, aggregated into legal and illegal activities, together with the structure of informal activities in different sectors. They find that the informal economy in BiH, in the period from 1999 to 2002, was on average 41% of GDP.

One of the frequent references that we find in BiH literature is research by Tomas (2010) in which the author provides an assessment of the informal economy in BiH using the indirect method. The author uses several factors in the analysis (for example, labour supply, tax evasion) to provide his estimate of the size of the informal economy in BiH for 2008, which was 26.5% of GDP.

Nastav and Bojnec (2007) investigate the performance of the labour force in BiH, Croatia and Slovenia,

based on which they provide their estimate of the informal economy. The levels of informal activity differ significantly in these countries, even though there are indications of a common trend over the long run. The authors estimate the size of the informal economy to be around 30% of GDP for the period 1999-2001, attributing this to a lower level of economic development, high unemployment rates and destructive warfare (Nastav and Bojnec 2007).

To conclude, there are a number of studies which offer estimates of the informal economy, but very few focused on BiH. While the majority of studies are based on the MIMIC methodology of estimation, this approach has not been utilized for BiH, apart from Schneider, Buehn and Montenegro (2010) and Medina and Schneider (2018), where the estimate is part of panel data analysis and is unaccompanied by any supporting, country-specific discussion. Our intention is to fill the gap in the existing literature and to provide estimates of the informal economy using the latest data and country-specific variables, including the potential effect of the economic crisis and other potential structural brakes. Moreover, we rely on additional primary indicators to check the consistency of MIMIC outcomes with these data.

METHODS OF ESTIMATION OF THE INFORMAL ECONOMY

There are two main methods of estimation of the informal economy in use: direct and indirect methods. The direct methods of informal economy estimates are based mostly on interviews implemented on the ground. In this type of investigation, it is important to define the research problem and clearly link relevant respondents to the theoretical settings and activities that fall within the domain of the informal economy (Williams 2006).

Another direct approach that we encounter in the literature is based on official fiscal audits. These methods are particularly effective when it comes to keeping track of differences between declared tax revenues and actual income, where the amount of undeclared income that is subject to taxation and the size of the informal economy is brought into direct relation (Feige 1989).

Overall, the advantages of the direct methods are a detailed and in-depth report on monetary activities, structural and socioeconomic characteristics, and the methods and motivations of people involved in the informal economy. It is especially useful to use these methods when preparing policies and strategies that can contribute to improving social well-being.

However, direct approaches are difficult to apply at the international level, given the specifics of different areas and in different countries, and the need for standardized interviews that will enable the comparability of results.

Indirect approaches are based on relevant indirect indicators that are used to provide estimates of an informal economy. There are a number of these approaches, such as the Eurostat model for unregistered economy (Smith 1994), an approach based on the volume of cash transactions (Feige 1989), a currency demand approach (Cagan 1958; Tanzi 1982), an approach based on electricity consumption (Kaufmann and Kaliberda 1996), among others. A widely used indirect method of estimation of informal economy is the MIMIC (Multiple Inputs Multiple Causes) model. The MIMIC model constructs the informal economy as a latent variable, which means that it cannot be directly observed or measured. Accordingly, other variables that are observed in the model explain the existence of the informal economy, i.e. they indirectly become a measure of the extent of the latent variable, i.e. a proxy for the informal economy. The MIMIC model belongs to a group of linear independent structural models (LISREL) and is modelled by using structural equations models (SEM). Theoretical conditions were set by Joreskog and Gooldberger (1975), while it was first applied to measure the informal economy by Frey and Hannelore (1984). It was used to assess the relative size and development of the underground economy over time in an OECD sample of countries, where taxation, regulation and the moral duty of taxation were used as relevant determinants.

The MIMIC methodology compares the covariance matrix of the observed variables with the parametric structure imposed by a hypothesized model based on a strong theoretical confirmation, which leads to the conclusion that the MIMIC model is a confirmatory rather than exploratory research technique (Schneider and Buehn 2016). The model assumes that all model factors are correlated, all the observed variables directly affect other factors, and that the errors within the model are not in correlation (Williams and Schneider 2016). The use of the MIMIC methodology involves evaluating a function that represents association between a latent variable as a clarifying variable:

$[\eta: \text{Shadow economy index}],$

and causes as the independent variables, for example:

$[Xq: \text{Agriculture } (X_1), \text{Taxes } (X_2), \text{Unemployment } (X_3), \text{Subsidies } (X_4)]$

represented with the following equation:

$$\eta = \alpha + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \zeta \quad (1)$$

The second equation links the indicators, for example:

$[Y_p: GDP Index (Y_1), M1 (Y_2)]$, and latent variable η , represents measurement model that is estimated in the following way:

$$Y_1 = \delta_1 + \lambda_1 \eta + \varepsilon_1 \quad (2)$$

$$Y_2 = \delta_2 + \lambda_2 \eta + \varepsilon_2 \quad (3)$$

The MIMIC model provides an assessment of the relative changes in the size of the informal economy over time, which means that an additional step is required to express the informal economy through absolute values. The authors most often express the informal economy as a percentage of GDP. The procedure is termed "benchmarking" and essentially defines the reference value of the informal economy using the index obtained by the MIMIC model. This is also the main shortcoming of the methodology, as this step is needed to express the relative values in absolute terms (Schneider and Williams 2013).

Adapting this model for use implies a need to rely on informal economy estimates, which are derived by another model or authors, which potentially multiplies the probability of calculation errors. In addition, the most frequent criticisms of the MIMIC model refer to the latent variable itself, since it is difficult to delineate potential legal and illegal activities within the model, and it is impossible to exclude completely obscure variables from illegal activities that do not enter the informal economy.

The choice of the normalized index between 1 / -1 in front of the GDP variable, to which theoretically the informal economy can influence positively or negatively depending on the specificity of individual economies, directly determines the sign of the structural parameters of the causative variables, which leads to the potential subjective adaptation of the effects of certain causes of the informal economy in order to adapt it to the theoretical setting (Feige 2016). This also is a convincing criticism, which sheds light on the weaknesses of this empirical approach.

Helberger and Knepel (1988) is critical of the relevance of causal and indicator variables used in MIMIC models. The indicators' independance from the causes together with the mutal independancy of indicators, as a MIMIC model requirement, suggests that the indicator variables are related to the causes in the model only through the size of the informal economy, which doesn't fit well into economic theory (Breusch 2005).

To sum up, it is the prevailing practice among

researchers to use indirect methods for measuring the size of the informal economy and direct methods to identify the characteristics of this phenomenon (Williams and Schneider 2016; Eurofound 2013). Moreover, our literature review implies that there is no best methodology for the estimation of the informal economy, as any approach has its advantages and disadvantages. Still, the MIMIC methodology is a widely used method of estimation, having credibility among researchers, and furnishes the possibility for longer time-span observations. This led us to rely on the MIMIC approach in estimating the informal economy in BiH, while acknowledging all of the approach's weaknesses.

EMPIRICAL ANALYSIS

Model Specification

Following mainstream MIMIC literature (Breusch 2005; Dell'Anno 2007; Schneider and Buehn 2016), the inputs that we use in our MIMIC analysis include the real GDP index and money in circulation. On the causes side, we again follow the relevant literature and include data on the size of agricultural production, tax burden, unemployment and government subsidies. We argue that these indicators are very likely to be important for the investigation of the informal economy in BiH, bearing in mind that undeclared work is identified to be the largest in the BiH economy in the agricultural sector (MCPBiH 2010). The business sector in this country emphasizes the level of taxes and other parafiscal levies as burdensome (Efendic, Mickiewicz and Rebmann 2015). Moreover, the unemployment in BiH is extensive and very often ordinary people rely on different informal survival strategies in such environments (Efendic, Cveticanin, and Kumalic 2017). Finally, the level of government subsidies in this country is quite high, which is identified in the literature as a relevant determinant for investigation (Dell'Anno 2007). A further rationale behind these variables is presented below.

X1 - Size of the agriculture sector is used, as it is a sector with many undeclared informal participants, is typically difficult to regulate, and is generally poorly controlled (Chen 2007). For example, there is evidence of the significant influence of this sector for Egypt (Mai and Schneider 2016) and for countries in Latin America (Vuletin 2008). The agricultural sector is prevalent among the rural population, and has the lowest declared employment rate of around 20% (BiH Agency for Statistics 2017). It is expected that a larger agricultural sector leads to the greater scope of the informal economy in BiH.

X2 - Tax burden is one of the most commonly used causes behind the informal economy, and it is identified as relevant by many authors (e.g. Tanzi 1999; Dell'Anno 2007; Schneider 2010). Taxes affect decisions on employment and stimulate labour markets in different ways (Mai and Schneider 2016). The larger the gap between the total cost of labour and net revenues, the stronger the incentive to work in the informal economy and to avoid taxes (Loayza 1996). Tax burdens generally increase costs, which makes relevant products more expensive. Actors in developing countries often avoid taxes to offer more competitive prices on the market (Mai and Schneider 2016). However, the previous argument is not straightforward, as there is also evidence from panel and cross-section data that suggests that higher tax rates are associated with the lower scope of the informal economy (Johnson, Kaufman and Shleifer 1997; Friedman, et al. 2000; Torgler and Schneider 2007; Elgin 2010). This is identified in models, where trust in institutions and tax enforcement are explanatory and mediating factors. In the context of BiH, we still expect that a higher tax burden stimulates the growth of the informal economy, although this argument certainly needs a deeper investigation in the future.

X3 – The link between the unemployment rate and the size of the informal economy is not clearly established due to the opposing findings of researchers (Mai and Schneider 2016). Experiencing a higher unemployment rate, more people could potentially seek employment in the informal sector. On the other hand, the reduction of unemployment may indicate a general slowdown in economic activities and reduce activities in both the formal and informal sectors (Klaric 2010). The labour force has a heterogeneous structure, with part of participants being classified as unemployed and another part as retired, minors or housewives, categories excluded from official unemployment statistics (Dell'Anno 2007). Also, there is the possibility that officially employed people participate in the informal economy (Tanzi 1999). However, we link to conventional thinking and believe that the higher unemployment rate in BiH lead to the greater share of the informal economy.

X4 – Finally, subsidies may motivate participation in the official economy (Dell'Anno 2007). Still, if subsidies are ineffectively distributed, this could lead to discrepancies between business owners and an even larger share for the informal economy (Dell'Anno 2007), which makes this relationship complex. As there is a high possibility of inefficient distribution of subsidies in BiH, which has been often publicly reported and discussed (e.g. VPI BiH 2011), we expect that larger subsidies may lead to the increase of the

informal economy in BiH.

Y1 – Real GDP Index is used as a reference variable, that is, as a measure of the informal economy. The authors in empirical research report contradictory assumptions about the link between the official and the informal economy. The question arises whether the reduction in official economic activities leads to job losses and an increase in the number of participants in the informal economy, or to the contrary, a reduction in total GDP leads to a reduction in demand for products and services within the informal economy, thus neutralizing the effects created by the new participants in informal economy (Dell'Anno 2007). The assumption we use is that a higher informal economy is associated with higher GDP, reflecting an increase of general economic activities in the country and in both sectors of the economy.

Y2 - Currency in circulation is used based on the argument that most of the informal transactions are paid in cash, in favour of the use of credit and debit cards or other types of bank transactions, to avoid detection and punishment by the competent authorities (Mai and Schneider 2016). Breusch (2005); Dell'Anno (2007) and Schneider (2010) conclude that there is a significant positive link between the size of the informal economy and the money in circulation, which is the argument that we follow in our model.

Considering the lack of data and the specific situation of BiH, and given the conflict (1992-1995) and the first recovery period after the war, macroeconomic analysis is based on data for the past two decades, between 1998 and 2016. A standard set of descriptive statistics for the indicators used in empirical modelling is available in Appendix 1.

Descriptive statistics of the data

Economic and financial time series data are subject to behavioural changes over time or instability of the mean. Thus, from an empirical point of view, it is important to determine if the data that we use in the MIMIC approach are trended. This is to ensure that the time series does not follow the time trend, which means that the mean and variance remain the same regardless of the time of the measurement of the variable. After conducting relevant tests, we note that all variables are non-stationary after the first differentiation $I(1)$, which allows us to use the level data to examine the effects of the variables used in the long run (Buehn and Schneider 2008).

A check of the correlation between the MIMIC variables is also useful to analyze the validity of the model. To investigate this possibility, we use the Engle

Table 1: ADF Unit root test

Variable	Level data			First difference		
	Intercept	Trend and Intercept	No Trend, No Intercept	Intercept	Trend and Intercept	No Trend, No Intercept
Agriculture	-0.812	-4.285*	-1.816	-3.264**	-3.931**	-4.518*
Taxes	-3.874**	-4.461**	-0.547	-6.113*	-6.244*	-5.736*
Unemployment	-3.184**	-2.857	0.145	-3.837**	-4.104**	-3.971*
Subsidies	-1.568	-3.337	1.783	-4.02**	-3.749**	-4.138*
Indicators						
GDP	-2.755***	-1.047	1.589	-2.959***	-3.335***	-2.055**
M1	-2.768***	-3.613***	-1.041	-4.714*	-4.539***	-4.852*

MacKinnon (1996) p-values

*, **, *** statistical significance at 1%, 5%, and 10% level

and Granger's two-step approach to make sure that all four indicators that we aim to use are correlated with the imposed indicators. In the first step we estimate regression with the level data, using the Ordinary Least Squares (OLS) method and obtain the outcomes reported in Table 2.

Table 2: Engle Granger cointegration test

Coefficient	GDP	M1
Agriculture	-0.04	0.37
Taxes	0.03	0.16
Unemployment	-0.01	0.17
Subsidies	0.01	0.07
R-squared	0.87	0.71

Table 2 reports cointegration test results, after which we perform the Augmented Dickey-Fuller (ADF) test over the residuals u_1 (-3.2) and u_2 (-2.07). We reject the null hypothesis (H_0 : Variables are non-stationary) at the conventional 5% level. Thus, we conclude that the causes of the informal economy are cointegrated with both indicators that we use, i.e. GDP and money circulation.

Estimating the model parameters

The MIMIC approach assumes a normal distribution of errors, limiting the model error parameters, by restraining the mean to a value of zero and standard deviation to a constant, while retaining the conditions of uncorrelated error terms (Dell'Anno and Schneider 2009). As stated in the model explanation, it is necessary to specify one of the indicators to a value different from zero. Given that the GDP sign can be positive and negative (+/- 1) depending on the impact,

we decide to limit the value of +1, so we can monitor the movement of the informal economy index and express it through the ratio of GDP. The approach to limiting the parameter in front of one of the indicators is typically used in the MIMIC literature (e.g. Giles and Tedds 2002).

To estimate the MIMIC coefficients, we use Maximum likelihood (MLE) estimation, a method that determines the values of model parameters, but we also use the option to calculate parameters for a time series with incomplete data. This is because the tax burden and subsidies are variables with a few missing data.

Table 3: MIMIC model

Variable	MIMIC model 4-1-2	MIMIC model 3-1-2
Agriculture	0.8*	0.76*
Taxes	0.31**	0.34**
Unemployment	0.31**	0.27***
Subsidies	0.15	-
GDP	1	1
M1	0.99*	0.99*
Chi-square	47.547	32.936
RMSEA LO90	0.322	0.332
Degrees of Freedom	10	6

*, **, *** denotes statistical significance at 1%, 5%, 10%

MIMIC is a confirmatory method that tests previously imposed theoretical conditions. Thus, we can conclude that all variables within the model have the expected sign explained in the previous section. If we look at the coefficients, all variables included in the

final model (second column) are statistically significant at the 10% level or lower. We exclude subsidies from the final model as this variable is not statistically significant.

The implemented procedure indicates the symptoms that appear in models with a small number of observations, which are reported in other studies (Klaric 2010; Buehn and Schneider 2008; Krstić and Schneider 2015). The expected high RMSEA results (Root Mean Squared Error of Approximation) of 0.322, with high Chi-square 32.936, are attributed to the small number of observations per variable. This is a limitation, as Helberger and Knepel (1988) find that MIMIC estimations might derive unstable coefficients when changing the sample size. Unfortunately, the availability of data for BiH is an exogenous limitation that we cannot overcome at this stage.

Benchmarking of the informal economy index

The final step in the analysis is the evaluation of the index, as it is used by Dell’Anno and Schneider (2009). There is no consensus on the most appropriate benchmark variable, so the process of benchmarking will be performed by multiplying method to reach real values expressed in percentages of GDP (Mai and Schneider 2016):

$$\eta_t = \frac{\bar{\eta}_t}{\bar{n}_{base\ year}} \eta * base\ year$$

Where:

$$\eta_t = \frac{\bar{\eta}_t}{\bar{n}_{base\ year}} \eta * base\ year$$

$\bar{\eta}_t$ – value of MIMIC index for year t (based on structural model)

$\bar{n}_{base\ year}$ – value of MMIC index at base year (2008)

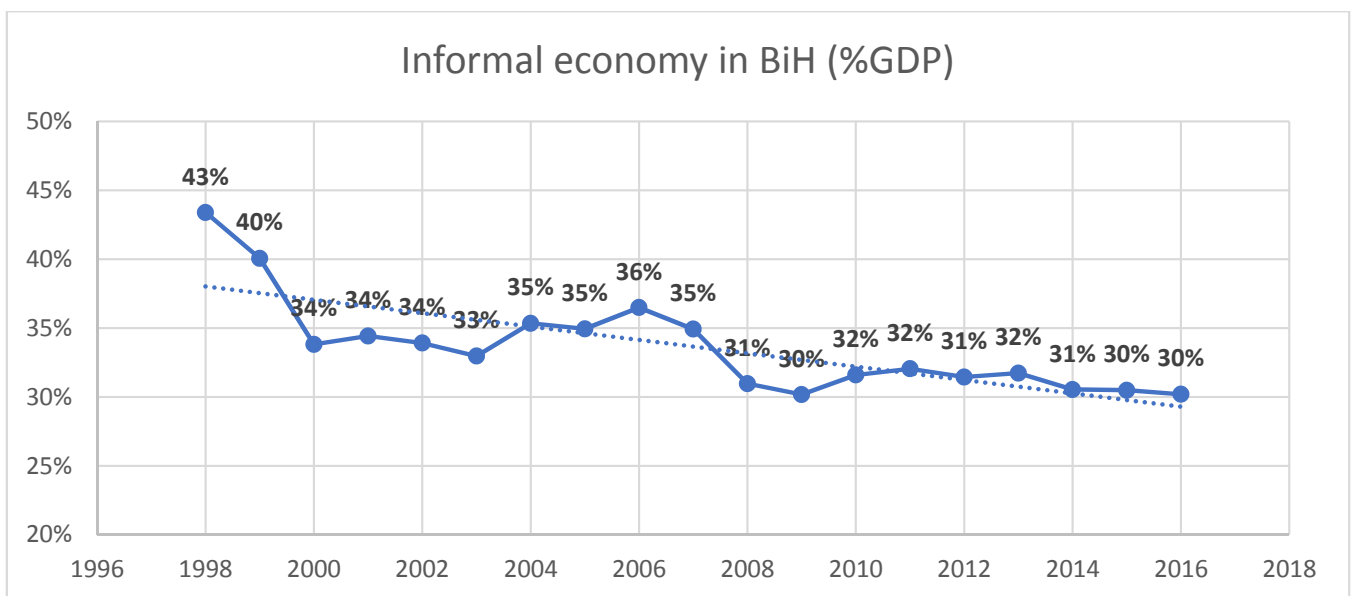
$\eta * base\ year$ – previous estimation of informal economy in BiH for 2008

The model relies on the results of the study introduced earlier that estimate the BiH informal economy in 2008 at the level of 30.97% of GDP, and which is also based on the MIMIC method (Medina and Schneider, 2018).

INTERPRETATION OF THE RESULTS

To improve interpretation of the results, we provide a visual presentation of the MIMIC estimate, which is reported in Figure 1. Based on the adjustment and transformation of the index, the informal economy is estimated to be around 43% of GDP in 1998 and had recorded a downward oriented trend over time, down to 30% in 2016.

Figure 1: Informal economy dynamics



Source: Authors’ calculations

The high values of the informal economy in the first available years of measurement (1998-1999) could be attributed to the low level of GDP in the post-war recovery period and the undeveloped formal institutional environment. This was the period when BiH was rebuilding infrastructure and implementing market reforms in a situation that was characterized by a low level of regulation and high instability. Investment activities were limited, purchasing power low, while the involvement of residents in the informal economy was high and motivated by efforts to ensure a better economic status amid instability (Efendic and Hadizahmetovic 2015).

After the expected slowdown of GDP growth rates over the period 2000-2002, the informal economy adapted to more stable economic flows. In the forthcoming period, we can identify two structural changes. The first is after 2006, when the value added (VAT) tax reform was implemented and VAT introduced in BiH, which all lead to a further decrease in the informal economy. The introduction of VAT allowed for the informal sector to be indirectly taxed, as the tax is paid in every stage of added value creation, therefore providing incentives for informal participants to formalize (Keen 2007). It is not possible to apply for a VAT return, unless the company is registered as a taxpayer, causing VAT to be economically less distorting in developing countries (Joshi et al. 2014). Also, the new indirect tax system improved tax monitoring and made tax evasion more challenging. The effect of the latest global economic crisis that hit the BiH economy in 2009 (with a one-year lag in comparison to the western economies) was a slight increase in the informal economy over the next two years. Dealing with external effects, such as a crisis, forces companies to discover new strategies by utilizing current capacities and resources in order to stay stable during the economic downturn (Vitezic, et al. 2018). Srhoj et al. (2018) used the evidence from Croatia and finds that even small grants can support business development and help the young firms' survival. This is important especially for small developing economies, such as BiH, where young firms are expected to be a generator of economic activities that could ultimately lower the total unemployment rate. The remaining period after the global crisis is rather stable and hovers around 30% of GDP.

These changes are in line with economic expectations, thus confirming the rationality of the data and methodology used in this study. Still, given the weaknesses and limitations of the MIMIC method that we discussed above, the estimates that we report should be viewed as approximate values of the dynamics of

the informal economy in BiH, rather than the exact values of the scope of this sector.

ANALYSIS OF THE PRIMARY DATA

To check the constancy of our MIMIC estimate with available primary data, we further assess the undeclared work by using the direct method of estimations, which is based on two representative surveys from BiH. The first is performed in 2015, where the survey data was collected by a professional research agency for social, media and marketing research in BiH². 6,021 randomly selected respondents from 16-65 years of age participated in the survey³. The survey data was collected at the household level, but we use the data from individuals to estimate the size of the informal sector in BiH (Williams and Horodnic 2016).

The second primary data are collected from a regional INFORM⁴ project, "Closing the gap between formal and informal institutions in the Balkans," which is a EU Horizon 2020 multidisciplinary research focused on formal and informal institutions in the Balkans. The survey was conducted in all of the countries in the Western Balkans in 2017 by a professional research agency. The database contains 1,246 respondents for the BiH sample, including respondents from household and entrepreneurial sectors (302 entrepreneurs in the sample). From the INFORM database we analyze data on tax morality, which is very often identified to be one of the primary reasons of high presence of the informal economy (e.g. Riahi-Belkaoui 2004; Alm, Martinez, and Torgler 2006; Richardson 2006; Torgler 2011).

Undeclared work is defined as paid activities that are legal in nature but are not declared to the public authorities (Eurofound 2013). If we look at the scope of undeclared work, which is one of the underpinnings of the informal economy, we might get a very good indication of the size of the informal economy as well. Similarly, the data on tax morality might indicate attitudes toward tax measures in BiH, as one of the underlying factors that influences incentives to participate in the informal economy.

To estimate undeclared employment in BiH, we rely on a research question from the first survey: "Do you have some informal job(s) or activities which bring you some income?". Respondents defined as undeclared workers are those who answered "Yes" to this question. The following table shows the distribution of the undeclared workers in BiH, with additional information on living area differences.

Table 4: Distribution of undeclared workers in BiH

%	LABOUR FORCE			LIVING AREA		
	BiH	Yes	No	Urban	Suburb	Rural
NO	74	79	70	80	76	69
YES	26	21	30	20	24	31

*Those who have informal employment and activities but not formal employment

We find that around 34% of respondents from our survey earn income through undeclared job(s) or activities, while around 8% of these workers have a regular formal job in addition to an informal one. Thus, 26% of respondents report incomes that come from the undeclared job(s) or activities only. The investigated data also suggests that there are more undeclared workers among those who are out of the labour force and among respondents living in the rural areas. These percentages are around 30%, providing quite consistent results to what we obtained through our indirect method of informal economy estimation based on the MIMIC approach.

In the second INFORM survey, we asked if the respondents' households have income from activities that are not part of their official earnings (such as regular salaries and pensions) in order to assess income that might be generated in the informal sector. The following table shows the distribution of income from informal activities in BiH and the Western Balkans region.

Table 5: Distribution of income from informal activity in BiH and Western Balkans

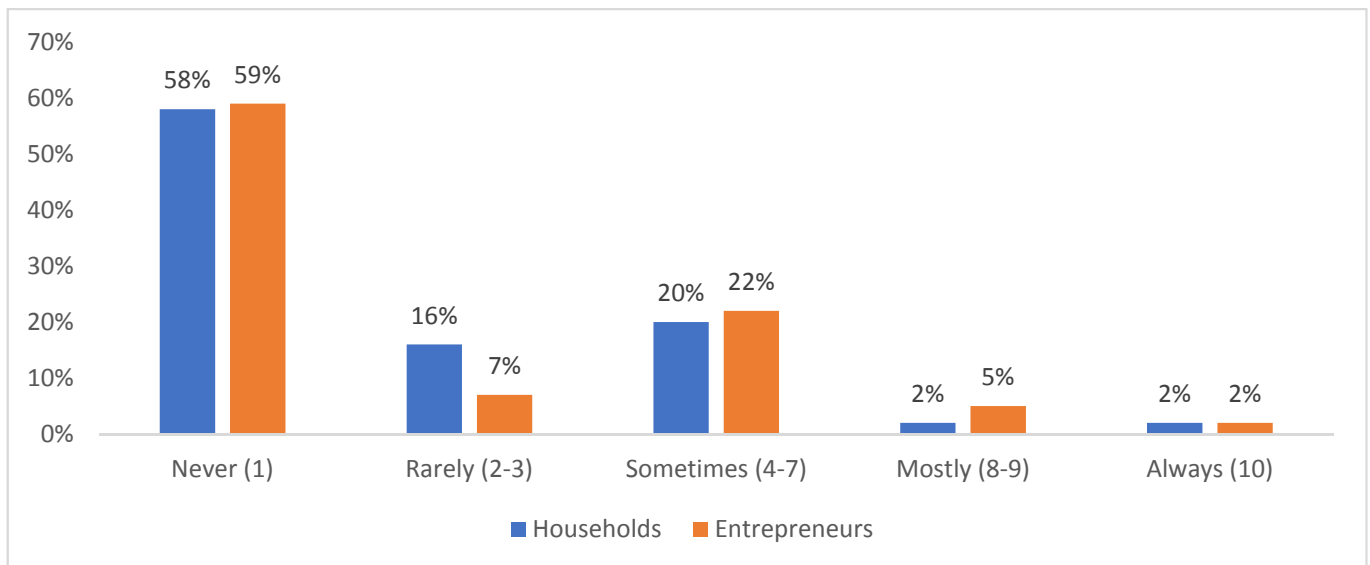
%	HOUSEHOLDS		ENTREPRENEURS	
	BiH	Western Balkans	BiH	Western Balkans
NO	70	71	56	55
YES	30	29	44	45

We find that around 30% of households receive some form of additional income from the informal sector, while these responses by entrepreneurs are systematically larger and are above 40% in both BiH and the Western Balkans region.

A good number of authors (e.g. Riahi-Belkaoui 2004; Alm, Martinez, and Torgler 2006; Richardson 2006; Torgler 2011) identify a relationship between tax morality and participation in the informal economy, with a consistent finding that lower level of tax morality is linked with the higher probability of participation in the informal economy. It is important to investigate this indication for BiH environment as well. For this purpose, we use a question also from the INFORM survey, which asked if tax evasion can be justified, proxying respondents' attitudes about their tax morality.

Our investigation identifies that 60% of respondents don't justify the tax evasion in any given situation, while 20% consider it sometimes justified. However, these numbers indicate that tax morality in BiH is lower compared to the EU average (European Commission 2013), especially when it comes to entrepreneurs who justify tax evasion more often than ordinary citizens in the sample. Such attitude can be

Figure 2: Justifiability of evading taxes in BiH



Source: INFORM, 2017

a reason of involvement in the informal economy, among entrepreneurs in particular. Overall, this finding again suggests that the informal economy in BiH might be high due to a low tax morality (as around 40% respondents to smaller or larger extent do not recognize tax evasion as a problem), especially when compared to the developed economies of the EU.

Tax evasion influences change in total tax revenues, which creates distortion in resource allocation, but also may have an additional effect on the behaviour of participants in economic activity. When tax evasion practices are unpunished, those participants who fulfil their tax obligations might be motivated to engage with the informal sector or to follow a path similar to that of their competitors, causing an additional widening of the gap between market participants and tax authorities.

CONCLUSIONS

This study investigated the dynamics of the informal economy in Bosnia and Herzegovina, covering the period 1998-2016. The study uses secondary data and the MIMIC methodology to calculate a proxy for informal economy. Our empirical investigation reveals that the informal economy in BiH has had a decreasing trend over the observed period, ranging between 43% and 30% of GDP, with an average value over the observed period of 34%. The most recent data suggest that the informal economy in this country is around 30% of GDP, which signifies the importance of this issue to policy makers and a need for policies and strategies that will tackle this phenomenon.

The data suggests also that the dynamic behaviour of the informal economy in BiH recorded two brakes worth mentioning. The first is the introduction of the value added tax reform in 2006, which had a positive effect by lowering the level of the informal economy over the following few years (2007-2009). A contrary, negative effect was identified during the latest crisis that affected BiH in 2009, which slightly increased the value of the informal economy for the following couple of years (2009-2011). Both results are in line with our prior expectations.

Finally, we use a direct method to evaluate the scope of undeclared work, tax morality and income from the informal economy in BiH to check the consistency of our results with these primary data. The obtained outcomes from these supplementary investigations provide a reliable story, supporting the consistency of the MIMIC estimate with other indicators relevant for observation. We find that around 30% of workers in BiH economy are undeclared, around 30%

of households report additional (informal) incomes, while around 40% of respondents approve tax evasion practices to a greater or smaller extent.

The high level of the informal economy in BiH has remained persistent over the last few years, which indicates that the current government policies used to tackle the informal economy seem not to be effective. The current policy approach in BiH used to tackle undeclared work is rather repressive, static and based on "sticks" measures. We recommend that the BiH governments at all levels should adopt a holistic approach to this phenomenon, which includes additionally simulative measures to tackle informal economy. An array of policy measures should include policies that incentivize transfers from the undeclared to the declared economy, which would improve formal institutional efficiency, the perceptions and beliefs of citizens, and eventually narrow the gap between state and societal morality. However, the array of government policies should differentiate between informal economy participants that used informality as a survival strategy from participants that use informal economy to generate more profit or harm market competition.

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(Endnotes)

1 In the literature, it is possible to identify a number of other words used to define what we call here the informal economy. This includes terms such as the grey economy, informal economy, undeclared economy, unobserved economy and similar terms. To avoid any inconsistency in the text, we will refer always to the informal economy.

2 The data were collected as part of the RRPP supported project: 'Social capital, migration and economic performance – evidence from a post-conflict environment', implemented by CISAR, Sarajevo, 2014-2016.

3 The technique of random selection by closest birthday was used to implement the survey. On first contact, the interviewers asked about the number of persons living in one apartment or house in the specified age range. The interviewers conducted the interview with a selected household member whose birthday was closest to the date they were interviewing. If that person was not at home, they arranged call-backs, if possible. The software schedules the call-backs five times before omitting the number. This method ensures a random selection of respondents. In the final dataset, there are 44 observations per municipality, on average. The minimum number of observations per municipality is 40 and the maximum is 46.

Appendix 1

Variable name	Observations	Mean	Std. Dev.	Min	Max	Description
Year	20			1997	2016	Time series
Agriculture	20	10.51	3.91	7.23	21.34	Agriculture as % of GDP
Taxes	12	20.18	0.75	18.95	21.69	Taxes as % of GDP
Unemployment	20	26.58	2.33	22.21	31.1	ILO Unemployment rate
Subsidies	12	45.20	2.82	40.58	50.13	Subsidies as % of total costs
BDPindex	20	0.85	0.18	0.48	1.08	GDP index (base year 2008)
M1	19	2.38	0.86	0.77	4.35	Natural logarithm of money growth

*Yearly data

REFERENCES

- Alm, J., Martinez-Vazque, J., and Torgler, B. 2006. Russian attitudes towards paying taxes: before, during and after transition. *International Journal of Social Economics* 33 (12): 832-857.
- Arandarenko, M. 2017. The shadow economy: Challenges to economic and social policy. In *Formalizing the shadow economy in Serbia. Contributions to economics*, edited by Schneider, F. and Krstić G. Springer.
- BiH Agency for Statistics. 2017. *Demography and social statistics: labour force survey 2017*. Sarajevo: BiH Agency for Statistics.
- Breusch, T. 2005. Estimating the underground economy using MIMIC models.
- Buehn, A., and Schneider, F. 2008. MIMIC models, cointegration and error correction: An application to the French shadow economy. IZA DP 3306.
- Cagan, P. 1958. The demand for currency relative to the total money supply. *Journal of Political Economy* 66 (4): 303-328.
- Chen, M. A. 2007. Rethinking the informal economy linkages with the formal economy and to the formal regulatory environment. DESA Working Paper 1 (46): 1-30.
- De Soto, H. 2001. *The mystery of capital: why capitalism triumphs in the West and fails everywhere else*. London: Black Swan.
- Dell'Anno, R., and Piirisild, M. 2007. Measuring the Non-observed Economy in a Transition Economy: The Case of Bosnia-Herzegovina. *Comparative Economic Studies* 49: 609-631.
- Dell'Anno, R., and Schneider, F. 2009. Estimating the underground economy by using MIMIC models: A Response to T. Breusch Critique. Working Paper. Department of Economics. Johannes Kepler University of Linz 0607
- Dell'Anno, R. 2007. The shadow economy in Portugal: An analysis with the MIMIC approach. *Journal of Applied Economics* 10 (2): 253-277.
- Efendic, A., and Hadziahmetovic, A. 2015. Post-war economic transition in Bosnia and Herzegovina - a challenging transformation. In *State-Building and democratization in Bosnia and Herzegovina*, by Soeren K., and Valery, P. Farnham: Ashgate.
- Efendic, A., and Pugh, G. 2015. Institutional effects on economic performance in post-socialist transition: A dynamic panel analysis. *Acta Oeconomica* 65 (4): 503-523.
- Efendic, A., Cveticanin, P., and Kumalic, I. 2017. Thriving and surviving activities of households during the crisis period. *Empirical Evidence from Southeastern Europe. Südosteuropa* 65 (3): 495-519.
- Efendic, A., Mickiewicz, T., and Rebmann, A. (2013). Growth aspirations and social capital: Young firms in a post-conflict environment. *International Small Business Journal* 33 (5): 537-561.
- Eilat, Y., and Zinnes, C. 2002. The shadow economy in transition countries: Friend or foe? A policy perspective. *World Development* 30: 1233-1254.
- Elgin, C. 2010. Political turnover, taxes, and the shadow economy. Bogazici University Institute of Social Sciences Working Paper Series ISS/EC 2010-08.
- Enste, D., and Schneider, F. 2002. Hiding in the shadows the growth of the underground economy. *IMF Economic Issues* 30, International Monetary Fund.
- Eurofound. 2013. *Tackling undeclared work in 27 European Union member States and Norway: Approaches and measures since 2008*. Dublin: Eurofund.
- Eurofound. 2013. *Tackling undeclared work in 27 European Union member States and Norway: approaches and measures since 2008*. Dublin: Eurofound.

- European Commission. 2013. Public opinion in the European Union.
- Feige, L. E. 1989. The underground economies. Tax evasion and information distortion. Cambridge: Cambridge University Press.
- Feige, L. E. 1998. Underground activity and institutional change: Productive, protective and predatory behavior in transition economies. In *Transforming post-communist political economies*, edited by Tilly, and Walker N., 19-34. Washington: National Academy Press.
- Feige, L. E. 2016. Professor Schneider's shadow economy: What do we really know? A rejoinder. *Journal of Tax Administration* 2 (2): 93-107.
- Fleming, M. H., Roman, J., and Farrell, G. 2000. The shadow economy. *Journal of International Affairs* 53 (2): 387-409.
- Frey, B., and Weck-Hanneman, H. 1984. The hidden economy as an 'unobserved' variable. *European Economic Review* 26 (1-2): 33-53.
- Friedman, E., Johnson, S., Kaufman, D., and Zoldo-Lobaton, P. 2000. Dodging the grabbing hand: The determinants of unofficial activity in 69 countries. *Journal of Public Economics* 76 (3): 459-493.
- Giles, D., and Tedds, L. 2002. Taxes and the Canadian underground economy. Toronto: Canadian Tax Foundation.
- Golias, P. 2013. The shadow economy and how to fight against it. Institute for Economic and Social Reforms.
- Helberger, C., and Knepel, H. 1988. How big is the shadow economy? : A re-analysis of the unobserved-variable approach of B.S. Frey and H. Weck-Hannemann. *European Economic Review* 32 (4): 965-976.
- Keen, M. 2007. VAT, tariffs, and withholding: Border taxes and informality in developing countries. IMF Working Paper, WP/07/174. Washington, DC: IMF.
- Johnson, S., Kaufman, D., and Shleifer, A. 1997. The unofficial economy in transition. *Brookings Papers on Economic Activity* (2): 159-239.
- Joshi, A., Prichard, W., and Heady, C. 2014. Taxing the informal economy: The Current State of Knowledge and Agendas for Future Research. *The Journal of Development Studies* 50 (10): 1325-1347.
- Joreskog, K., and Goldberger, A. 1975. Estimation of a model with multiple indicators and multiple causes of a single latent variable. *Journal of the American Statistical Association* 70 (351): 631-639.
- Kaufmann, D., and Kaliberda, A. 1996. Integrating the unofficial economy into the dynamics of post-socialist economies: a framework of analysis and evidence. In *Economic Transition in Russia and the New States of Eurasia*, edited by Kaminski, B., 81-120. New York and London: M. E. Sharpe.
- Klaric, V. 2010. Estimating the size of non-observed economy in Croatia using the MIMIC approach. *Financial theory and practice* 35 (1): 59-90.
- Krstić, G., and Schneider, F. 2015. Formalizing the shadow economy in Serbia. Belgrade: Springer Open.
- Krstic, G., and Sanfey, P. 2006. Mobility, poverty and well-being among the informally employed in Bosnia and Herzegovina. EBRD.
- Lacko, M. 2000. Hidden economy - An unknown quantity: Comparative analysis of economies in transition countries, 1989-95. *Economics of Transition* 8 (1): 117-149.
- Loayza, N. V. 1996. The economics of the informal sector: a simple model and some empirical evidence from Latin America. Policy Research Working Paper Series 1727, The World Bank.
- Mai, H., and Schneider, F. 2016. Modeling the Egyptian shadow economy: A currency demand and a MIMIC model approach. *Journal of Economics and Political Economy* 3 (2): 309-333.
- Medina, L., and Schneider, F. 2018. Shadow economies around the World: What did we learn over the last 20 years? IMF Working Papers 18/17, International Monetary Fund.
- Ministarstvo Civilnih Poslova BiH (MCPBiH). 2010. Strategija zapošljavanja u Bosni i Hercegovini 2010-2014. Ministarstvo Civilnih Poslova BiH.
- Nastav, B., and Bojnec, S. 2007. The shadow economy in Bosnia and Herzegovina, Croatia, and Slovenia: the labor approach. *Eastern European Economics* 45 (1): 29-58.
- Rebmann, A., Efendic, A., and Mickiewicz, T. 2017. Nascent enterprises and growth aspirations in a post-conflict environment: the role of social capital. In *Handbook of Entrepreneurship in Developing Economies*, by Williams C. A., 70-89. Oxon and New York: Routledge.
- Riahi-Belkaoui, A. 2004. Relationship between tax compliance internationally and selected determinants of tax morale. *Journal of International Accounting, Auditing and Taxation* 13 (2): 135-143.
- Richardson, G. 2006. Determinants of tax evasion: a cross-country investigation. *Journal of International Accounting, Auditing and Taxation* 15 (2): 150-169.
- Schneider, F. 2010. The influence of public institutions on the shadow economy: An empirical investigation for OECD countries. *Review of Law and Economics* 6 (3): 113-130.
- Schneider, F. 1994. Can the shadow economy be reduced through major tax reforms? An empirical investigation for Austria. *Supplement to Public Finance/Finances Publiques* 49: 137-152.
- Schneider, F. 2000. Dimensions of the shadow economy. *The Independent Review* 5 (1): 81-91.
- Schneider, F., and Buehn, A. 2016. Estimating the size of the shadow economy: Methods, problems and open questions. IZA DP (9820).
- Schneider, F., and Buehn, A. 2013. Estimating the size of the shadow economy: Methods, problems and open questions. *Economics working papers 2013-20*, Department of Economics, Johannes Kepler University Linz, Austria.

- Schneider, F., and Williams, C. C. 2013. *The shadow economy*. London: The Institute of Economic Affairs.
- Schneider, F., Buehn, A., and Montenegro, C. 2010. *Shadow economies all over the World: New estimates for 162 Countries from 1999 to 2007*. The World Bank Development Research Group Poverty and Inequality Team: Policy Research Working Paper.
- Smith, P. 1994. *Assessing the Size of the underground economy: The Canadian Statistical Perspectives*. Canadian Economic Observer 41 (2): 247-258.
- Srhoj, S., Skrinjaric, B., and Radas, S. 2018. *Bidding against the odds? The impact evaluation of grants for young micro and small firms during the recession*. EIZ Working Papers.
- Tanzi, V. 1982. *The underground economy in the United States and abroad*. Lexington: Lexington Books.
- Tanzi, V. 1999. *Uses and abuses of estimates of the underground Economy*. The Economic Journal 109 (456): 338-347.
- Tomaš, R. 2010. *Kriza i siva ekonomija u BiH*. Sarajevo: Friedrich-Ebert-Stiftung BiH.
- Torgler, B. 2011. *Tax morale and compliance: review of evidence and case studies for Europe*. World Bank Policy Research Working Paper Series 5922. Washington DC: The World Bank.
- Vanjskopoliticka inicijativa BiH. 2011. *(S)poticaji u poljoprivredi Bosne i Hercegovine*. Sarajevo, VCI.
- Vitezić, V., Srhoj, S., and Perić, M. 2018. *Investigating industry dynamics in a recessionary transition economy*. South East European Journal of Economics and Business 13 (1): 43-67.
- Vukovic, V. 2017. *The political economy of local government in Croatia: winning coalitions, corruption, and taxes*. Public Sector Economics 41 (4): 387-420.
- Vuletin, G. J. 2008. *Measuring the informal economy in Latin America and the Caribbean*. IMF Working Papers 08 (102).
- Webb, J. W., Tihanyi, L., Ireland, R. D., and Sirmon, D. 2009. *You say illegal, I say legitimate: Enterprenuership in the informal economy*. Academy of Management Review 34 (3): 492-510.
- Williams, C. C. 2006. *Evaluating the magnitude of the shadow economy: A direct survey approach*. Journal of Economic Studies 33 (5): 369-385.
- Williams, C. C., and Horodnic, I. A. 2016. *Cross-country variations in the participation of small businesses in the informal economy: An institutional asymmetry explanation*. Journal of Small Business and Enterprise Development 23 (1): 3-24.
- Williams, C. C., and Schneider, F. 2016. *Measuring the global shadow economy: The prevalence of informal work and labour*. Cheltenham and Northampton: Edward Elgar Publishing.
- The World Bank. 2018. *World development indicators*. Washington DC: The World Bank.
- Zagoršek, H., Jaklič, M., and Hribernik, A. 2009. *The shadow economy and its impact on national competitiveness: The case of Slovenia*. South East European Journal of Economics and Business 4 (1): 37-50.
- Zaman, G., and Goschin, Z. 2015. *Shadow economy and economic growth in Romania cons and pros*. Procedia Economics and Finance 22: 80-87.