Analyzing the Drivers of the Shadow Economy for the Case of the CESEE Region

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Abstract

This study explores the influence of financial development on the shadow economy, alongside other possible determinants, for the CESEE region. To this objective, we used a panel dataset of annual figures for eleven CESEE countries from 2003 to 2019. To estimate the long-run coefficients, panel FMOLS and DOLS were employed. Our findings suggest that an increase in financial development and tax burden leads to the enlargement of the shadow economy. While improvements in institutional quality, trade openness, and economic freedom reduce the magnitude of the shadow economy. The study's results offer various policy recommendations that can be used to combat the shadow economy in CESEE countries. Tax policy and institutional reforms are encouraged to promote greater trust within institutions, enabling the shift of economic activities from the shadow to the formal economy.

Keywords: *shadow economy, financial development, FMOLS, DOLS, transition economies*

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Introduction

The shadow economy, also known as the underground or informal economy, can be defined as comprised of all economic activities concealed from regulation for fiscal gain (Buehn, Dell'Anno and Schneider, 2018; Medina and Schneider,

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2019). The shadow economy is a complex phenomenon that imposes ramifications on the formal economy. For this reason, over the past several decades, economists have been tasked with measuring the size of the shadow economy and better comprehending its implications (Schneider and Enste, 2013; Medina and Schneider, 2017). The shadow economy's intricate nature and the economic and social problems it causes led to the emergence of a vast literature devoted to measuring its size, possible drivers, and consequences (Schneider and Medina, 2017; Almenar, Sánchez and Sapena, 2020).

The shadow economy creates many undesirable outcomes. Often shadow activities are conducted for tax avoidance purposes. An increase in tax avoidance results in the depletion of public revenues, ultimately causing a decline in government spending (Goel, Saunoris and Schneider 2019). Besides, resources intended for creating and delivering public goods and services are redirected to offset costs concerning the observance and discipline of those conducting tax-avoiding acts. Reducing government spending and inefficient use of resources constitutes inadequate public service quality (Schneider, 2004), impedes production and innovation (Dreher, Méon and Schneider, 2014), stunts economic growth prospects, and therefore boosts the incentive to engage in shadow activities. The shadow economy causes a miscalculation of the gross domestic product (GDP) and generates bias within statistics used in establishing economic policies (Ahumada, Alvaredo and Canavese, 2007). Moreover, underestimating official economic statistics can lead to false indicators being utilized in macro-policy decisions.

The extensive shadow economics literature can be classified in several ways. Considering the methods used, many researchers prefer panel data econometrics due to data limitations (Alm and Embaye, 2013; Berdiev and Saunoris, 2018). These studies examine a number of different samples, including global (Nguyen, Schinckus and Thanh, 2020; Canh, Schinckus and Dinh Thanh, 2021), developed and developing countries (Schneider, 2016; Mazhar and Méon, 2017; Baklouti and Boujelbene, 2020), European countries (Schneider, Raczkowski and Mróz, 2015; Mara, 2021), and transition economies (Johnson et al., 1997; Bayar et al., 2018). The literature, thus far, is yet to analyze the drives of the shadow economy for the Central, Eastern, and Southeastern Europe (CESEE) region. Therefore, this study attempts to identify the drivers of the shadow economy within the CESEE region to bridge a gap in the existing literature.

The CESEE region consists of European transition economies exposed to a larger shadow economy than other European countries (Schneider, 2022). The region's countries, which had a centrally planned economic structure under Soviet political and economic control post world war two, later switched to a market-

based economy. The transition process imposed challenges related to the creation of a legal framework for the market economy – requiring the transformation of political and social institutions, price freedom, privatization, instituting a banking system, setting a minimum wage rate, and others (Krelle, 2000). Johnson et al. (1997) hold the transition from communism to capitalism responsible for the growth of the shadow economy, stating that politicization creates greater participation within the informal economy to evade tax payments and regulation, resulting in resource reallocation from the formal to the informal sector.

Large tax burdens, poor institution quality, and income inequality can characterize the CESEE region. The privatization policy followed in the transition period made it compulsory to pay taxes, resulting in a significant increase in the tax burden (Lackó, 2000). A larger tax burden intensifies the desire to engage in the shadow economy – "tax-free" – to avoid taxes (Frey and Weck, 1983). Poor institution quality, defined as a flawed legal system, strict regulatory restraints, corrupt activities, and inadequate legislation, provides a conducive environment for the enlargement of the shadow economy within these countries (Torgler and Schneider, 2009). Besides, transition economies experienced significant income inequality, which creates mistrust within the formal economy, driving the desire to conduct shadow activities (Rosser Jr, Rosser and Ahmed, 2000).

Using panel data econometrics, we analyzed the potential determinants of the shadow economy for the case of CESEE countries for the 2003 – 2019 period. The present study contributes to the literature in several aspects. Firstly, the literature lacks studies focusing on transition economies within the CESEE region. Secondly, the role of financial development in the shadow economy for transition economies (such as the CESEE region) has been ignored. Understanding this relationship can offer essential insights to policymakers. Thirdly, we used a comprehensive newly measured index developed by Schneider (2022) to represent the shadow economy and included several control variables to avoid bias or model misspecifications. Furthermore, we assess the impact of institutional quality by incorporating an index comprised of six distinctive factors. For robustness, we utilized several proxies to reflect our primary variable of interest – financial development – in the forms of overall financial development, financial market development, and financial institution development. The stochastic properties of the variables and the existence of a long-run relationship between the variables were examined using multiple econometric methods. Then, fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) were employed to estimate the long-run coefficients of the study. Lastly, we applied Toda Yamamoto (1995) causality test to reveal the direction of the relationship among the variables.

Our findings suggest that increased financial development in all forms results in expanding the shadow economy for the CESEE region. This interesting result is discussed in the empirical findings section in detail. Our analysis also documents the detrimental role of the tax burden on the formal economy. In contrast, we observe that institutional quality, trade openness, economic freedom, and urbanization negatively affect the shadow economy. In the conclusion of our study, based on our findings, we offer policy recommendations intended to reduce the magnitude of the shadow economy.

The rest of the paper is as follows; the next section provides a literature review, the third section explains the variable selection and discusses the model specifications used within our study, followed by section four consists of methodology. Section five includes empirical findings and a discussion of the results. Finally, section six concludes with remarks and policy recommendations.

1. Literature Review

The term "informal economy" was first conceived by Hart (1973), who attempted to assess the differences between the formal and informal economy. Subsequently, researchers began focusing on gauging the size of the informal economy (Gutmann, 1977). These early studies led to further research defining what constitutes the shadow economy (Frey and Weck, 1983). Frey and Pommerehne (1984) claimed that the direct measurement approaches utilized previously to gauge the shadow economy size often result in biased findings. They deemed the informal economy as directly unobservable and suggested that several causes and indicators be included within shadow economy measurement techniques. Their suggestion was widely accepted in the literature and led to the reexamination of the size of the shadow economy (Dell'Anno and Schneider, 2009; Tafenau, Herwartz and Schneider, 2010). Reconsideration regarding the measurement of the shadow economy has resulted in more recent literature documenting its potential drivers (Schneider, 2015; Goel and Nelson, 2016).

Due to the importance of the research question, extensive literature has emerged on the determinants of the shadow economy. In this literature, many country groups were examined as samples. Although findings regarding the potential determinants of the shadow economy may vary from sample to sample, there is a broad consensus in the literature on the importance of some variables. Many researchers preferred to use a global sample to examine shadow economy determinants (Canh, Schinckus and Dinh Thanh, 2021). Schneider (2005) analyzed a sample of a hundred and ten countries and found that a greater tax burden, lower GDP per capita, poorer institutional quality, and poor economic freedom

promote the shadow economy. Studies that use a global sample emphasize the positive and negative impact of taxation (Buehn, Dell'Anno and Schneider, 2018; Medina and Schneider, 2019) and institutional quality (Torgler and Schneider, 2009; Berdiev and Saunoris, 2016; Canh, Schinckus and Dinh Thanh, 2021) on the shadow activities, respectively.

Fleming, Roman and Farrell (2000) questioned whether the developmental stage of a country matters for shadow economy research. Their study was the first to evaluate the shadow economy for samples of developed, developing, and transition countries. They concluded that social, political, and legal disparities cause the shadow economies to varying in composition and size for each sample. Following this study, researchers began analyzing the shadow economy for samples of countries with common characteristics. Especially, the literature on the case of Europe is quite large. Studies have reported a positive relationship between tax burden and the shadow economy, suggesting that a greater tax burden results in the expansion of the informal economy (Schneider, Raczkowski and Mróz, 2015; Ginevicius et al., 2020). The literature also displays a negative association between institutional quality and the shadow economy, suggesting that better institutional quality contracts the magnitude of the shadow economy within Europe (Kelmanson et al., 2019; Mara, 2021).

Previous studies have also investigated the drivers of the shadow economy for transition economies (Tudose and Clipa, 2016; Bayar et al., 2018). Researchers assessing the determinants of the informal economy for transition countries have displayed the notion that a larger tax burden leads to an increase in the size of the shadow economy (Bayar et al., 2018; Kelmanson et al., 2019; Mara, 2021). A negative relation between institutional quality and the shadow economy has also been reported for transition economies. Research suggests that poor institutional quality leads to the enlargement of the shadow economy (Bayar and Ozturk, 2016; Kelmanson et al., 2019). Given the strong support regarding the importance of tax burden and institutional quality within the literature, we incorporate these variables within our empirical models to assess the possible drivers of the shadow economy for the case of the CESEE region.

Several control variables have been incorporated within empirical models analyzing the shadow economy. Commonly trade openness has been used within the existing literature. As trade barriers extensively raise labor costs within the formal economy, it's suggested that trade restrictions increase the incentive to participate in the shadow economy (Berdiev and Saunoris, 2018). Previous studies have recorded evidence of a negative relationship between trade openness and the shadow economy (Medina and Schneider, 2017; Canh, Schinckus and Dinh Thanh, 2021). Urbanization is a demographic aspect that has been accounted for

frequently in the shadow economy literature. Further urbanization is associated with greater tax morale and is expected to alleviate the shadow economy (Lee, 2013). Some studies have found an inverted U-shape relationship between the two, indicating that in the later stages of urbanization, greater urbanization diminishes the size of the shadow economy (Elgin and Oyvat, 2013; Xu, Lv and Xie, 2018; Pang et al., 2022). The relationship between economic freedom and the shadow economy has also been investigated. Greater economic freedom brings advanced human development and reduces poverty (Gwartney et al., 2017). Thus, more economic freedom minimizes the need to engage within the shadow economy (Berdiev, Saunoris and Schneider, 2018; Bayar and Öztürk, 2019; Khan, Hamid and Rehman, 2021). We incorporate the aforementioned control variables within our models to avoid omitted variable bias.

Lately, studies have investigated the role of financial development in implicating the shadow economy size, as they provide vital financial aid for economic activities (Blackburn, Bose and Capasso, 2012). Many studies suggest the relationship is negative, indicating that further financial development reduces the shadow economy (Bayar and Ozturk, 2016; Khan, Hamid and Rehman, 2021). Berdiev and Saunoris (2016) argued that the effect of financial development on the shadow economy's growth differs depending on a country's financial development level. Other studies display an inverted U-shape relation between the two, suggesting that the relationship is dependent on a specific threshold (Habibullah et al., 2016). Thus far, the impact of financial development on the shadow economy for transition economies has been overlooked by the existing literature. We aim to shed light on this relationship in the case of the CESEE region. The association between financial development and the shadow economy – for this Region – is of particular interest, as countries within CESEE are considerably less financially developed compared to other European countries (Reininger and Walko, 2020).

The researchers investigating the shadow economy's determinants in transition economies display the notion that a high tax burden and poor institutional quality result in the expansion of the shadow economy (Schneider, 2009; Kelmanson et al., 2019). However, the literature has been silent about the role of financial development. In this respect, our main research question differs from those previously answered within the existing literature. Our research topic resembles that of Canh and Thanh (2020), who assessed the impact of financial development on the shadow economy for a global sample. Their findings suggest that an optimal level of financial development can diminish the size of the shadow economy. Our study differs from theirs in terms of sample and control variables. Their sample ignores the different economic characteristics of the countries utilized, which

may influence the interaction between financial development and the shadow economy. Furthermore, unlike Canh and Thanh (2020), we opt to include economic freedom and urbanization to enhance the robustness of our empirical models. We aim to close a gap within the existing literature by investigating the relationship between financial development and the shadow economy in the case of transition economies, specifically the CESEE region. Our finding offers policy recommendations to reduce the relatively large shadow economy within transition countries.

2. Data and Model Specification

2.1. Data

Our study uses a panel dataset composed of eleven countries within the CESEE region (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia Republic, and Slovenia) and seventeen years spanning from 2003 to 2019 inclusively. We chose the CESEE countries as our sample due to several reasons, including their larger shadow economy (Schneider, 2022), higher tax burden (in the form of labor tax) (International Monetary Fund, 2016), and lower financial development (Reininger and Walko, 2020) in comparison to other European countries.

The dependent variable SE is obtained from Schneider's (2022) study measuring the shadow economy of thirty-six European and OECD countries. Schneider's shadow economy index uses Multiple Indicators and Multiple Causes (MIMIC), and currency demand methods. We opt to utilize this index as the MIMIC approach is able to approximate the size of the shadow economy, an unobservable phenomenon, using quantitative measurable causes and indicators of the shadow economy to forecast its size as a percentage of official GDP. For comprehensive discussions concerning the advantages of using the MIMIC approach to gauge the size of the shadow economy, see Dell'Anno and Davidescu (2019), Bashlakova and Bashlakov (2021), and Medina and Schneider (2021).

Three different proxies for financial development – the overall financial development (OFD), financial market development (FM), and financial institutional development (FI) – are utilized to ensure the robustness of our findings. These proxies are measured by financial development index, financial market index, and financial institutional index that were gathered from the International Monetary Fund's financial development index database. OFD evaluates the depth, access, and efficiency of financial institutions and markets. FM assesses financial markets' depth, access, and efficiency – including stock market capitalization, stocks

traded, and debt securities of financial and non-financial corporations. FI appraises the depth, access, and efficiency of solely financial institutions – accounting for banks, insurance companies, and mutual and pension funds. For all three measures, observations range from 0 to 1; a greater value indicates further financial development.

To represent institutional quality, an index (IQ) was created and incorporated within our empirical models. The index consists of six unique indicators: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, the rule of law, and control of corruption. The indicators were collected from World Governance Indicators. Observational values range from –2.5 to +2.5, where bigger values signify better institutional quality. We applied Principal Component Analysis (PCA) technique to convert the six indicators into the IQ index. Tax burden (TB) is composed of personal and corporate income tax rates and the country's overall level of taxation as a percentage of GDP. Observational values range from 0 to 100, where a greater value implies a greater tax burden. The data was gathered from the Index of Economic Freedom.

We used gross domestic product (LGDP), trade openness (TO), economic freedom (EF), and urbanization (UPG) as control variables. LGDP, TO, and UPG were obtained from the WorldBank database; where LGDP is the logarithm of gross domestic product per capita, TO is calculated by the sum of imports and exports as a portion of GDP, and UPG is the urban population growth. Lastly, EF is proxied by the Index of Economic Freedom, which comprises twelve distinctive freedoms (property rights, government integrity, judicial effectiveness, tax burden, government spending, fiscal health, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom). Reported values range from 0 to 100, where a larger value implies greater economic freedom.

2.2. Model Specifications

The following basic empirical model is estimated:

$$SE_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 LGDP_{it} + \beta_3 TB_{it} + \beta_4 IQ_{it} + \beta_5 Controls_{it} + \varepsilon_{it} \qquad (1)$$

Where i is the cross-sectional unit, and t is the time element. The explanatory variables are described above, and ε is the random residual. We estimate twelve distinctive specifications to assess the determinants of the shadow economy. Given their importance within the existing shadow economy literature, taxation (TB), institutional quality (IQ) and gross domestic product (GDP) are incorporated within all twelve specifications. Financial development is proxied by three

variables – overall financial development (OFD), financial market development (FM), and financial institutional development (FI). To avoid multicollinearity, specifications (1) to (4) include OFD, specifications (5) to (8) utilize FM, and specifications (9) to (12) contain FI. Specifications (1), (5), and (9) are our base specifications – consisting of a financial development measure, gross domestic product, tax burden, and institutional quality – evaluating the impact of financial development on the shadow economy. The remaining specifications augmend the base model by adding several variables widely used in the literature. Specifications (2), (6), and (10) augment the base model with an economic factor, trade openness (TO). Similarly, specifications (3), (7), and (11) further enhance the model by incorporating economic freedom (EF). Finally, urbanization (UPG) is also added in specifications (4), (8), and (12).

3. Methodology

Our study employs panel data econometrics to investigate our research question. We begin our empirical analysis by assessing the stationarity of the variables using Breitung (2001), Im, Pesaran and Shin (2003), and Maddala and Wu (1999) Fisher ADF unit root tests. These panel unit root tests are considered to be appropriate for small samples, however, the test power improves as $N \to \infty$ and $T \to \infty$. For these unit root tests, the null hypothesis is that the series is non-stationary ($H_0: \rho_i = 0$ for all *i*'s); the alternative hypothesis assumes at least one individual within the series is stationary ($H_1: \rho_i < 0$ for at least one *i*). All panel unit root tests confirm the presence of unit roots within the variables.

After confirming that all variables within our study are integrated in order one, I(1), we employ two different panel cointegration tests, Pedroni (1999) and Kao (1999), to verify the presence of long-run relationships amongst variables. Kao (1999) panel cointegration test allows for cross-sectional intercepts and homogenous coefficients. Both cointegration tests demonstrate that regression residuals are integrated order of one, I(1), which implies a long run relationship among the variables.

After observing a long-run relationship amongst variables, we employ the FMOLS panel estimation method proposed by Phillips and Hansen (1990), which accounts for serial correlation and endogeneity within the model (Philips, 1995). We also apply the DOLS panel estimation method (Saikkonen, 1991; Stock and Watson, 1993) to confirm the findings obtained using FMOLS. DOLS is considered to be an asymptotically efficient estimator. The estimation process, in extension to FMOLS, includes both lags and leads in the cointegration regression, assuming that the expected value of the sum of all errors equals zero within

the cointegration equation. FMOLS and DOLS methods are advantageous for two purposes; firstly, they can correct endogeneity and serial correlation problems. Secondly, they eliminate sample bias errors, making them better estimation methods for the case of small samples (Narayan and Narayan, 2005).

Lastly, we apply Toda and Yamamoto's (1995) long-run causality test to analyze the possibility and direction of causal relationships amongst the variables. The test procedure minimizes risks related to incorrectly identifying the integrated order (Mavrotas and Kelly, 2001) by fitting a vector autoregressive (VAR) model to the levels of the variables. As a result, a modified Wald test (MWALD) is generated for the causality test. This testing procedure overcomes the problems associated with testing for Granger causality as it solves any issues stemming from possible non-stationarity or cointegration between series (Zapata and Rambaldi, 1997). The Toda and Yamamoto (1995) test procedure ensures that the usual Granger causality test statistic is of standard asymptotic distribution.

4. Empirical Findings

A data check was conducted prior to carrying out our econometric analysis. Tables 1 and 2 report the descriptive statistics and the correlation matrix for all variables used within our study. Table 1 shows that the dataset is a strongly balanced panel, as there are no missing values. Maximum and minimum observations imply that our data does not suffer from extreme values. According to the correlation matrix, we could claim that our dataset does not contain any severe multicollinearity issues.

T a b l e 1

Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
SE	187	25.089	5.458	12.150	34.900
OFD	187	0.356	0.103	0.110	0.570
FM	187	0.188	0.164	0.020	0.630
FI	187	0.511	0.097	0.170	0.690
LGDP	187	4.601	0.769	3.873	6.623
TB	187	77.936	9.345	53.100	94.000
IQ	187	0.002	0.984	–2.521	1.376
TO	187	121.749	32.630	56.180	190.699
EF	187	66.351	5.968	50.000	79.100
UPG	187	–0.201	0.620	–2.282	1.332

Note: SE: Shadow economy, OFD: Financial development index, FM: Financial market index, FI: Financial institutional index, GDP: Gross domestic product, TB: Tax burden, IQ: Institutional quality index, TO: Trade openness, EF: Economic freedom, UPG: Urbanization.

Source: Authors' calculation.

T a b l e 2

Matrix of Correlations (all models)

Variables	SE	OFD	FM	FI	LGDP	TB	IQ	TO	EF	UPG
SE	1									
OFD	–0.161	1								
FM	–0.264	0.883	1							
FI	0.102	0.609	0.167	1						
LGDP	–0.356	0.652	0.840	–0.050	1					
TB	0.088	–0.536	–0.557	–0.180	–0.288	1				
IQ	–0.528	0.145	0.162	0.034	0.131	–0.260	1			
TO	–0.606	0.021	0.002	0.042	0.205	0.115	0.567	1		
EF	–0.291	–0.284	–0.271	–0.113	–0.076	0.570	0.483	0.530	1	
UPG	–0.353	0.626	0.601	0.303	0.478	–0.575	0.213	0.242	–0.252	1

Note: SE: Shadow economy, OFD: Financial development index, FM: Financial market index, FI: Financial institutional index, GDP: Gross domestic product, TB: Tax burden, IQ: Institutional quality index, TO: Trade openness, EC: Economic freedom, UPG: Urbanization.

Source: Authors' calculation.

Panel unit root test results are recorded in Table 3. According to all three tests, our dependent variable SE is considered to be integrated order of one (I(1)), stationary at the first difference. Our main independent variable (proxied using OFD, FM, and FI), control variables (LGDP, IQ, and TB), and economic factors (TO, EF, and UPG) are stationary at first difference. Thus, all variables within our study are integrated order of one (I(1)).

As all the variables within our empirical models are considered to be integrated order of one (I(1)), we test for the cointegration relationship between the variables. Table 4a reports the finding of the Kao (1999) panel cointegration test. According to Table 4a, we find cointegration for all twelve specifications. Table 4b displays the Pedroni (1999) panel cointegration test which provides further evidence for the long run relationship among the variables.

Tables 5 and 6 display the long-run coefficients obtained; Table 5 reports results from FMOLS, and Table 6 presents the findings using DOLS.

We observe that most of the long-run coefficients – within all twelve specifications – are statistically significant. Our findings imply that all variables analyzed within our study, such as financial development, institutional factors, tax burden, and economic factors (trade openness, economic freedom, and urbanization), affect the CESEE region's shadow economy. We find our main independent variables; proxies for financial development – OFD, FM, and FI – to be positive and statistically significant in both the FMOLS and DOLS estimations. Our finding implies that further financial development, financial institution, and financial market improvements contribute to the size of the shadow economy within the CESEE region.

Table 3

Unit Root Tests Results

Level	SE	OFD	FM	FI	LGDP	TB	IQ	TO	EF	UPG
$\tau_{T\ Breitung}$	2.498	0.560	–0.800	2.355	–2.157**	1.500	–1.034	–0.678	–0.179	–1.917**
$\tau_{T\ IPS}$	1.782	–0.412	–1.357*	–0.300	–0.873	–0.062	0.102	–1.044	–0.387	–0.999
$\tau_{\mu\ IPS}$	4.021	–1.323*	–1.229	–2.376***	3.699	0.233	0.220	–0.129	0.460	–1.195
$\tau_{T\ fisher\ ADF\ Chi\text{-}square}$	14.636	23.836	32.153*	25.756	30.687	29.432	17.702	27.870	24.306	28.495
$\tau_{\mu\ fisher\ ADF\ Chi\text{-}square}$	8.349	30.694	28.322	40.033**	3.664	15.062	17.173	20.869	18.670	29.673
$\tau_{fisher\ ADF\ Chi\text{-}square}$	86.231***	11.591	17.725	10.788	1.784	8.205	20.607	3.858	7.672	27.730
First difference										
$\tau_{T\ Breitung}$	–4.677***	–2.726***	–2.692***	–3.872***	–2.913***	–2.219**	–5.496***	–7.163***	–0.027	–2.567***
$\tau_{T\ IPS}$	–2.449***	–4.184***	–4.329***	–1.117*	–4.636***	–3.649***	–3.359***	–2.920***	–2.652***	–3.575***
$\tau_{\mu\ IPS}$	–3.327***	–4.449***	–6.470***	–1.649**	–5.147***	–4.588***	–5.293***	–4.717***	–3.834***	–5.478***
$\tau_{T\ fisher\ ADF\ Chi\text{-}square}$	37.781**	57.570***	55.733***	26.894	61.802***	53.329***	47.940***	42.708***	44.424***	52.496***
$\tau_{\mu\ fisher\ ADF\ Chi\text{-}square}$	47.667***	59.561***	79.228***	30.365	68.033***	63.443***	68.429***	61.330***	53.124***	71.317***
$\tau_{fisher\ ADF\ Chi\text{-}square}$	41.530***	98.635***	124.929***	69.581***	84.207***	109.642***	162.012***	96.581***	79.335***	117.013***

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively.

Source: Authors' estimation.

Table 4a

Kao Cointegration Test Statistics

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6
ADF	–2.835***	–2.994***	–1.964**	–2.295**	–2.707***	–2.864***
	Spec. 7	**Spec. 8**	**Spec. 9**	**Spec. 10**	**Spec. 11**	**Spec. 12**
ADF	–1.723**	–2.021**	–2.927***	–2.407***	–2.311**	–2.495***

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively.

Source: Authors' estimation.

Table 4b

Pedroni Cointegration Test Statistics

	Spec. 1	Spec. 2	Spec. 3	Spec. 5	Spec. 6	Spec. 7	Spec. 9	Spec. 10	Spec. 11
Within statistics									
Panel v-Statistic	2.334***	2.544***	1.984**	2.315**	2.362***	2.807***	1.715**	1.940**	1.465*
Panel rho-Statistic	2.768	3.458	4.311	3.938	4.294	4.462	2.636	3.537	4.237
Panel PP-Statistic	–2.636***	–3.016***	–4.425***	1.024	0.818	–0.103	–1.410*	–2.889***	–3.037***
Panel ADF-Statistic	–2.914***	–2.992***	–2.513***	–0.180	–0.070	–0.900	–1.855**	–2.270**	–3.083***
Weighted statistics									
Panel v-Statistic	1.557*	0.569	–0.288	1.655**	0.397	0.0667	0.915	0.256	–0.337
Panel rho-Statistic	2.885	3.762	4.531	3.493	4.070	4.573	2.844	3.783	4.432
Panel PP-Statistic	–3.193***	–3.198***	–3.355***	–1.851**	–1.639*	–1.981**	–1.535*	–2.552***	–3.112***
Panel ADF-Statistic	–3.249***	–3.063***	–2.931***	–2.444***	–1.752**	–2.129**	–1.608*	–1.903**	–2.753***
Between statistics									
Group rho-Statistic	4.172	4.924	5.613	4.733	5.366	5.646	4.202	5.082	5.580
Group PP-Statistic	–4.471***	–4.513***	–8.458***	–5.758***	–3.706***	–9.613***	–3.199***	–6.806***	–10.072***
Group ADF-Statistic	–3.245***	–3.610***	–4.022***	–2.830***	–2.658***	–4.257***	–2.160**	–3.014***	–5.338***

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively. The table reports results for specifications one to three, five to seven, and nine to eleven. Pedroni panel cointegration test is able to detect cointegration for a maximum of seven covariates (Pedroni, 2004). Thus specifications four, eight, and twelve, which includes eight variables, could not be tested using this method.

Source: Authors' estimation.

Table 5

FMOLS Estimations

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Spec. 11	Spec. 12
OFD	4.648* (2.451)	3.414*** (0.902)	6.096*** (2.294)	6.062*** (2.226)								
FM					2.151** (0.976)	1.114*** (0.400)	1.595** (0.661)	2.505*** (0.956)				
FI									4.095** (2.045)	3.534*** (0.648)	6.050*** (1.890)	5.205*** (0.432)
LGDP	–12.235*** (0.842)	–10.973*** (0.383)	–9.320*** (1.020)	–8.514*** (1.083)	–12.302*** (0.430)	–10.790*** (0.320)	–9.438*** (0.389)	–8.054*** (0.669)	–12.663*** (0.874)	–11.305*** (0.334)	–9.480*** (1.023)	–9.359*** (0.251)
TB	0.045* (0.024)	0.0252*** (0.009)	0.105*** (0.026)	0.100*** (0.025)	0.025** (0.012)	0.035*** (0.006)	0.083*** (0.010)	0.105*** (0.014)	0.023 (0.026)	0.015* (0.008)	0.089*** (0.026)	0.060*** (0.006)
IQ	–1.364*** (0.320)	–1.254*** (0.116)	–0.929*** (0.300)	–0.758** (0.300)	–1.381*** (0.162)	–1.365*** (0.097)	–0.990*** (0.112)	–0.985*** (0.176)	–1.123*** (0.332)	–1.080*** (0.104)	–0.666** (0.312)	–0.564*** (0.070)
TO		–0.024*** (0.003)	–0.031*** (0.009)	–0.035*** (0.008)		–0.026*** (0.003)	–0.028*** (0.003)	–0.039*** (0.006)		–0.025*** (0.003)	–0.035*** (0.008)	–0.029*** (0.002)
EF			–0.183*** (0.049)	–0.200*** (0.048)			–0.156*** (0.018)	–0.173*** (0.026)			–0.210*** (0.049)	–0.195*** (0.011)
UPG				–0.717** (0.303)				–0.854*** (0.207)				–0.269*** (0.071)
Number of osbservaions	176	176	176	176	176	176	176	176	176	176	176	176
R squared	0.971	0.974	0.977	0.977	0.972	0.974	0.977	0.976	0.972	0.975	0.977	0.979

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively.

Source: Authors' estimation.

Table 6

DOLS Estimations

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Spec. 11	Spec. 12
OFD	5.464** (2.194)	5.024** (2.178)	6.245*** (1.914)	5.903*** (1.793)								
FM					2.770* (1.658)	0.640 (1.513)	0.275 (1.336)	1.518 (1.795)				
FI									6.354*** (1.639)	6.609*** (1.558)	7.864*** (1.401)	7.288*** (1.475)
LGDP	–12.823*** (0.846)	–11.838*** (0.963)	–9.799*** (0.995)	–8.474*** (0.993)	–12.387*** (0.961)	–10.592*** (1.095)	–8.750*** (1.222)	–7.662*** (1.137)	–13.768*** (0.720)	–13.204*** (0.895)	–11.560*** (0.946)	–10.410*** (1.063)
TB	0.028 (0.023)	0.054** (0.022)	0.121*** (0.025)	0.130*** (0.024)	0.041 (0.027)	0.072*** (0.024)	0.144*** (0.029)	0.138*** (0.029)	0.008 (0.020)	0.033* (0.019)	0.101*** (0.023)	0.1140*** (0.023)
IQ	–1.406*** (0.313)	–1.330*** (0.290)	–1.032*** (0.264)	–0.726*** (0.254)	–1.553*** (0.337)	–1.387*** (0.323)	–1.117*** (0.323)	–0.717** (0.309)	–0.766*** (0.272)	–0.884*** (0.262)	–0.628** (0.244)	–0.492*** (0.236)
TO		–0.025*** (0.008)	–0.030*** (0.007)	–0.036*** (0.007)		–0.034*** (0.011)	–0.041*** (0.011)	–0.042*** (0.008)		–0.018** (0.007)	–0.027*** (0.007)	–0.034*** (0.007)
EF			–0.188*** (0.044)	–0.237*** (0.041)			–0.181*** (0.052)	–0.222*** (0.049)			–0.165*** (0.042)	–0.203*** (0.042)
UPG				–0.901*** (0.266)				–0.951*** (0.328)				–0.655** (0.288)
Number of osbservaions	176	176	176	176	176	176	176	176	176	176	176	176
R squared	0.983	0.987	0.990	0.991	0.980	0.984	0.987	0.989	0.986	0.988	0.991	0.992

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively.

Source: Authors' estimation.

This result deserves some discussion on it. Although the dominant view in the literature is that there is a negative relationship between financial development and the shadow economy, there are also different ideas that the researchers have put forward. There are pieces of evidence that the effect of financial development on the shadow economy might differ due to some factors, such as time span and the level of financial development. Din et al. (2019) investigated the role of financial development on the size of the shadow economy in the case of Malaysia and found an inverted U-shaped relationship. This finding indicates that while at the early stage of financial development, this variable might lead to an increase in the shadow economy, the relationship will become negative above a threshold. In their recent study, Canh and Thanh (2020), claimed that the shadow economy-financial development relationship might be non-linear. They examined a sample of 114 countries with the help of various econometric methods and concluded that financial depth and financial access have a positive effect on the shadow economy in the short run. These findings emphasize the importance of time span and the level of financial development while investigating the financial development-shadow economy nexus. Gharleghi and Jahanshahi (2020) argue that the effect of financial development on the shadow economy depends on the national income level of the country. If a country's GDP per capita is below the threshold of 33,600 USD, financial development does not seem to have a reducing effect on the shadow economy.

CESEE countries generally have low levels of financial development, and none is among the top 20 countries. However, there is another striking point about the level of financial development in these countries. For the last two decades, the general trend in the world has been towards an increase in financial development and a decrease in the shadow economy. CESEE countries also seem to be in line with the general trend for the decline of the shadow economy (See Figure 1 in the Appendix). However, in a significant part of the Region (Estonia, Hungary, Latvia, Lithuania, and Slovenia), a substantial deterioration in financial development was observed after 2010 (See Figure 2 and Figure 3 in Appendix) (Gokmenoglu and Amir, 2023). The region's unique conditions can explain this divergence from the general trend. In addition, the GDP per capita of these countries is below the threshold stated by Gharleghi and Jahanshahi (2020). When the empirical findings of the studies mentioned above (Din et al., 2019; Canh and Thanh, 2020) are considered together with the unique characteristics of the countries of the Region, the positive relationship between financial development and shadow economy becomes meaningful.[1]

[1] In response to a suggestion made by an anonymous reviewer, we conducted additional tests to investigate the possibility of a nonlinear relationship between financial variables and the shadow economy. The results indicate that there is some degree of nonlinearity present in the relationship.

We observe a consistent and significant negative relationship between LGDP and SE across all twelve specifications estimated using FMOLS and DOLS. This suggests that an increase in the gross domestic product is associated with a reduction in the shadow economy in the CESEE region. Our results align with previous studies in the literature (Torgler and Schneider, 2009; Schneider, 2011; Khan, Hamid and Rehman, 2021; Imamoglu, 2021). Herwartz, Tafenau and Schneider (2015) stated that greater GDP per capita offers more job creation within the formal economy, decreasing the necessity to look for employment within the informal economy.

When analyzing the role of taxation on the shadow economy, we find a significant positive relationship amongst TB and SE for all specifications analyzed with FMOLS and most of the specifications investigated with DOLS. This observation implies an increase in tax burden causes the shadow economy to increase in size for the CESEE region. A larger tax burden encourages participation within the shadow economy to evade the associated large tax payments. The finding aligns with the existing shadow economy literature (Dreher, Kotsogiannis and McCorriston, 2009; Elgin and Oyvat, 2013; Baklouti and Boujelbene, 2020; Canh and Thanh, 2020).

Turning our interests to the effect of institutional quality on the shadow economy, we observe a significant negative relationship between IQ and SE. The IQ coefficient is negative and significant for all twelve specifications estimated with both FMOLS and DOLS. This finding indicates that institutional quality improvements assist in curbing the shadow economy size within CESEE countries. Our result is compatible with existing studies analyzing the effect of institutional quality on the shadow economy (Torgler and Schneider, 2007; Dreher, Kotsogiannis and McCorriston, 2009; Gaspareniene and Remeikiene, 2015; Bayar and Ozturk, 2016). Many studies have suggested that poor institutional quality is responsible for the growing size of the shadow economy (Friedman et al., 2000). Several papers imply that poor institutional quality results in higher labor costs within the formal economy, thus, increasing the desire to participate in the informal economy (Enste, 2018; Su, Nguyen and Christophe, 2019; Canh and Thanh, 2020).

In order to refrain from omitted variable bias, we opted to include popular economic factors utilized within the existing literature as control variables. Our economic factors include namely, TO, EF, and UPG. We find TO to exhibit a negative relationship with SE for all specifications and both estimation techniques applied. Our finding suggests that greater trade openness decreases the magnitude of the shadow economy for the CESEE region. Fewer trade barriers and greater trade within the formal economy diminishes the motivation to conduct

shadow activities (Felbermayr, Prat and Schmerer, 2011; Medina and Schneider, 2017; Kelmanson et al., 2019). Our observation aligns with existing studies (Torgler and Scheinder, 2007; Canh, Schinckus and Dinh Thanh, 2021).

EF displays a significant negative association with SE, suggesting that greater economic freedom reduces the shadow economy within the CESEE region. Our finding is consistent with previous literature (Schneider, Buehn and Montenegro, 2011; Enste, 2018; Bayar and Öztürk, 2019). Berdiev, Saunoris and Schneider (2018) note that a lack of economic freedom induces the development of the shadow economy and argue its necessity within the formal economy to reduce the size of the informal economy.

Finally, we identify the presence of a significant negative relation between UPG and SE which implies as the urban population increases, the shadow economy decreases. Our finding is in line with the existing literature (Elgin and Oyvat, 2013; Acosta-González, Fernández-Rodríguez and Sosvilla-Rivero, 2014).

Table 7 below reports the finding of Toda and Yamamoto (1995) causality test. We observe significant unidirectional causalities from all independent variables to the shadow economy (dependent variable). This finding suggests all factors investigated in our study Granger cause the shadow economy. We find a significant bidirectional relationship amongst SE and LGDP, suggesting that the shadow economy Granger causes gross domestic product and the gross domestic product Granger causes the shadow economy, for the case of the CESEE region.

T a b l e 7

Toda-Yamamoto Causality Test Results

	Chi Square
SE → OFD	2.354
OFD → SE	13.938***
SE → FM	1.327
FM → SE	16.451**
SE → FI	7.156
FI → SE	14.896***
SE → LGDP	10.112**
LGDP → SE	18.985***
SE → TB	6.052
TB → SE	8.809***
SE → IQ	3.612
IQ → SE	17.314***
SE → TO	0.112
TO → SE	0.597
SE → EF	1.838
EF → SE	8.004**
SE → UPG	4.289
UPG → SE	24.195***

Note: ***, **, and * signify 1%, 5%, and 10% significance, respectively.

Source: Authors' estimation.

Conclusion

This study analyzes the possible determinants of the shadow economy for the CESEE region. Although the previous literature has explored the determinants of the shadow economy for many country panels, they ignored the CESEE region. To the best of our knowledge, this is the first study investigating drivers of the shadow economy in the case of CESEE countries. Another novelty of our research is to utilize Schneider's (2022) new dataset gauging the shadow economy size. Besides, our study investigates the role of financial development using three proxies – financial development, financial market development, and financial institution development – for robustness.

Our findings indicate that further financial development escalates the shadow economy size for the CESEE region. The main explanation of this interesting finding is that the financial development of the Region's economies is below a certain level, as discussed in detail above. According to our results, a larger tax burden stimulates growth in the size of the shadow economy for our sample. To reduce the magnitude of the shadow economy, we recommend informing and educating taxpayers on where and what their tax payments are spent on to make. This will make fulfilling the tax obligation more enticing to citizens. Besides, taxpayers should be made aware of the trade-off concerning the benefits of tax evasion and the penalties for operating within the informal sector to increase tax attractiveness and compliance. Furthermore, promoting trust in the government through transparency and democracy will lessen tax evasion and reduce participation in the shadow economy (Goel and Saunoris, 2016). Lastly, we suggest using tax policy reforms to decrease the tax burden within CESEE countries.

We observe institutional quality to diminish the shadow economy, suggesting that greater institutional quality aids the reduction of the shadow economy for CESEE countries. Political reforms that advocate democracy and political inclusion should be pursued to increase institutional quality further. In addition, adopting a well-functioning law system is required to discourage the pursuit of informal activities. Tighter regulations and more supervision would decrease the prospects of conducting shadow activities. Legal and regulatory transparency, pinpointing the benefits of engaging in the formal and the cost associated with engaging within the informal economy, is vital for reducing the desire to take part in informal economy activities.

Turning our interest to the economic factors, we observe that enhanced trade openness reduces the informal economy for the CESEE region. Thus, we advocate fewer international trade restrictions to lessen the cost associated with operating within the formal economy. Our results suggest economic freedom improvements assist the shadow economy reduction. Thus, we recommend implementing

policies intended to eliminate oppressive regulations. These policies should diminish the necessity to engage in shadow activities; hence they cause a shift from the informal to the formal sector. Thus, policies that improve economic freedom are vital for combating the shadow economy within the CESEE region.

Finally, we would like to emphasize a potential limitation to generalizing the empirical results that indicate a positive relationship between financial development and the shadow economy. We argue that the significant decrease in the financial development levels of some countries in the sample following 2010 has a decisive effect on this finding. In this sense, the special conditions of the countries in the Region should not be overlooked when interpreting the results.

References

ACOSTA-GONZÁLEZ, E. – FERNÁNDEZ-RODRÍGUEZ, F. – SOSVILLA-RIVERO, S. (2014): An Empirical Examination of the Determinants of the Shadow Economy. Applied Economics Letters, *21*, No. 5, pp. 304 – 307.

AHUMADA, H. – ALVAREDO, F. – CANAVESE, A. (2007): The Monetary Method and the Size of the Shadow Economy: A Critical Assessment. Review of Income and Wealth, *53*, No. 2, pp. 363 – 371.

ALM, J. – EMBAYE, A. (2013): Using Dynamic Panel Methods to Estimate Shadow Economies Around the World, 1984 – 2006. Public Finance Review, *41*, No. 5, pp. 510 – 543.

ALMENAR, V. – SÁNCHEZ, J. L. – SAPENA, J. (2020): Measuring the Shadow Economy and Its Drivers: The Case of Peripheral EMU Countries. Economic Research-Ekonomska Istraživanja, *33*, No. 1, pp. 2904 – 2918.

BAKLOUTI, N. – BOUJELBENE, Y. (2020): A Simultaneous Equation Model of Economic Growth and Shadow Economy: Is There a Difference between the Developed and Developing Countries? Economic Change and Restructuring, *53*, No. 1, pp. 151 – 170.

BASHLAKOVA, V. – BASHLAKOV, H. (2021): The Study of the Shadow Economy in Modern Conditions: Theory, Methodology, Practice. The Quarterly Review of Economics and Finance, *81*, pp. 468 – 480.

BAYAR, Y. – OZTURK, O. F. (2016): Financial Development and Shadow Economy in European Union Transition Economies. Managing Global Transitions: International Research Journal, *14*, No. 2, pp. 157 – 173.

BAYAR, Y. – ÖZTÜRK, O. F. (2019): Economic Freedom, Globalization, and the Shadow Economy in the European Union Transition Economies: A Panel Cointegration Analysis. Organizations and Markets in Emerging Economies, *10*, No. 2, pp. 378 – 391.

BAYAR, Y. – ODABAS, H. – SASMAZ, M. U. – OZTURK, O. F. (2018): Corruption and Shadow Economy in Transition Economies of European Union Countries: A Panel Cointegration and Causality Analysis. Economic Research-Ekonomska Istraživanja, *31*, No. 1, pp. 1940 – 1952.

BERDIEV, A. N. – SAUNORIS, J. W. (2016): Financial Development and the Shadow Economy: A Panel VAR Analysis. Economic Modelling, *57*, pp. 197 – 207.

BERDIEV, A. N. – SAUNORIS, J. W. (2018): Does Globalisation Affect the Shadow Economy? The World Economy, *41*, No. 1, pp. 222 – 241.

BERDIEV, A. N. – SAUNORIS, J. W. – SCHNEIDER, F. (2018): Give Me Liberty, or I will Produce Underground: Effects of Economic Freedom on the Shadow Economy. Southern Economic Journal, *85*, No. 2, pp. 537 – 562.

BLACKBURN, K. – BOSE, N. – CAPASSO, S. (2012): Tax Evasion, the Underground Economy and Financial Development. Journal of Economic Behavior – Organization, *83*, No. 2, pp. 243 – 253.

BUEHN, A. – DELL'ANNO, R. – SCHNEIDER, F. (2018): Exploring the Dark Side of Tax Policy: An Analysis of the Interactions between Fiscal Illusion and the Shadow Economy. Empirical Economics, *54*, No. 4, pp. 1609 – 1630.

BREITUNG, J. (2001): The Local Power of Some Unit Root Tests for Panel Data. In: Nonstationary Panels, Panel Cointegration, and Dynamic Panels. Bingley, UK: Emerald Group Publishing Limited.

CANH, P. N. – SCHINCKUS, C. – DINH THANH, S. (2021): What Are the Drivers of Shadow Economy? A Further Evidence of Economic Integration and Institutional Quality. The Journal of International Trade – Economic Development, *30*, No. 1, pp. 47 – 67.

CANH, N. P. – THANH, S. D. (2020): Financial Development and the Shadow Economy: A Multi-Dimensional Analysis. Economic Analysis and Policy, *67*, pp. 37 – 54.

DELL'ANNO, R. – DAVIDESCU, A. A. (2019): Estimating Shadow Economy and Tax Evasion in Romania. A Comparison By Different Estimation Approaches. Economic Analysis and Policy, *63*, pp. 130 – 149.

DELL'ANNO, R. – SCHNEIDER, F. (2009): A Complex Approach to Estimate Shadow Economy: The Structural Equation Modelling. In Coping with the Complexity of Economics. Milano: Springer, pp. 111 – 130.

DIN, B. H. – HABIBULLAH, M. S. – HAMID, B. A. (2019): Re-estimation and Modelling Shadow Economy in Malaysia: Does Financial Development Mitigate Shadow Economy? International Journal of Business – Society, *20*, No. 3, pp. 1062 – 1075.

DREHER, A. – KOTSOGIANNIS, C. – McCORRISTON, S. (2009): How Do Institutions Affect Corruption and the Shadow Economy? International Tax and Public Finance, *16*, No. 6, pp. 773 – 796.

DREHER, A. – MÉON, P. G. – SCHNEIDER, F. (2014): The Devil Is in the Shadow. Do Institutions Affect Income and Productivity or Only Official Income and Official Productivity? Public Choice, *158*, No. 1 – 2, pp. 121 – 141.

ELGIN, C. – OYVAT, C. (2013): Lurking in The Cities: Urbanization and the Informal Economy. Structural Change and Economic Dynamics, *27*, pp. 36 – 47.

ENSTE, D. H. (2018): The Shadow Economy in OECD and EU Accession Countries – Empirical Evidence for the Influence of Institutions, Liberalization, Taxation and Regulation. In: Size, Causes and Consequences of the Underground Economy. Routledge, pp. 123 – 138.

FELBERMAYR, G. – PRAT, J. – SCHMERER, H. J. (2011): Trade and Unemployment: What Do the Data Say?. European Economic Review, *55*, No. 6, pp. 741 – 758.

FLEMING, M. H. – ROMAN, J. – FARRELL, G. (2000): The Shadow Economy. Journal of International Affairs, pp. 387 – 409.

FREY, B. S. – WECK, H. (1983): Estimating the Shadow Economy: A 'Naive' Approach. Oxford Economic Papers, *35*, No. 1, pp. 23 – 44.

FREY, B. S. – POMMEREHNE, W. W. (1984): The Hidden Economy: State and Prospects for Measurement 1. Review of Income and Wealth, *30*, No. 1, pp. 1 – 23.

FRIEDMAN, E. – JOHNSON, S. – KAUFMANN, D. – ZOIDO-LOBATON, P. (2000): Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries. Journal of Public Economics, *76,* No. 3, pp. 459 – 493.

GASPARENIENE, L. – REMEIKIENE, R. (2015): Digital Shadow Economy: A Critical Review of the Literature. Mediterranean Journal of Social Sciences, *6*, No. 6 S5, pp. 402 – 402.

GHARLEGHI, B. – JAHANSHAHI, A. A. (2020): The Shadow Economy and Sustainable Development: The Role of Financial Development. Journal of Public Affairs, *20*, No. 3, pp. 1 – 6.

GINEVICIUS, R. – KLIESTIK, T. – STASIUKYNAS, A. – SUHAJDA, K. (2020): The Impact of National Economic Development on the Shadow Economy. Journal of Competitiveness, *12*, No. 4, pp. 39 – 55.

GOEL, R. K. – NELSON, M. A. (2016): Shining a Light on the Shadows: Identifying Robust Determinants of the Shadow Economy. Economic Modelling, *58*, pp. 351 – 364.

GOEL, R. K. – SAUNORIS, J. W. (2016): Government Decentralization and Prevalence of the Shadow Economy. Public Finance Review, *44*, No. 2, pp. 263 – 288.

GOEL, R. K. – SAUNORIS, J. W. – SCHNEIDER, F. (2019): Growth in the Shadows: Effect of the Shadow Economy on US Economic Growth over More than a Century. Contemporary Economic Policy, *37*, No. 1, pp. 50 – 67.

GOKMENOGLU, K. K. – AMIR, A. (2023): Investigating the Determinants of the Shadow Economy: The Baltic Region. Eastern European Economics, pp. 1 – 18.

GUTMANN, P. M. (1977): The Subterranean Economy. Financial Analysts Journal, *33*, No. 6, pp. 26 – 27.

GWARTNEY, J. – LAWSON, R. – HALL, J. – MURPHY, R. (2017): Economic Freedom of the World: 2017 Annual Report. Vancouver, BC: Fraser Institute. Available at: <http://www.fraserinstitute.org/studies/economic-freedom>.

HABIBULLAH, M. S. – DIN, B. H. – YUSOF-SAARI, M. – BAHAROM, A. H. (2016): Shadow Economy and Financial Sector Development in Malaysia. International Journal of Economics and Financial Issues, *6*, No. 7S, pp. 181 – 185.

HART, K. (1973): Informal Income Opportunities and Urban Employment in Ghana. The Journal of Modern African Studies, *11*, No. 1, pp. 61 – 89.

HERWARTZ, H. – TAFENAU, E. – SCHNEIDER, F. (2015): One Share Fits All? Regional Variations in the Extent of the Shadow Economy in Europe. Regional Studies, *49*, No. 9, pp. 1575 – 1587.

IM, K. S. – PESARAN, M. H. – SHIN, Y. (2003): Testing for Unit Roots in Heterogeneous Panels. Journal of Econometrics, *115*, No. 1, pp. 53 – 74.

IMAMOGLU, H. (2021): The Role of Financial Development on the Underground Economy in Regards to Europe's 2020 Strategy. Economic Systems, *45*, No. 2, 100768.

INTERNATIONAL MONETARY FUND (2016): Regional Economic Issues: Central, Eastern, and Southeastern Europe – Effective Government for Stronger Growth. Washington, DC: IMF European Dept.

JOHNSON, S. – KAUFMANN, D. – SHLEIFER, A. – GOLDMAN, M. I. – WEITZMAN, M. L. (1997): The Unofficial Economy in Transition. Brookings Papers on Economic Activity, No. 2, pp. 159 – 239.

KAO, C. (1999): Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. Journal Of Econometrics, *90,* No. 1, pp. 1 – 44.

KELMANSON, B. – KIRABAEVA, K. – MEDINA, L. – MIRCHEVA, B. – WEISS, J. (2019): Explaining the Shadow Economy in Europe: Size, Causes and Policy Options. [No. 19/278.] Washington, DC: International Monetary Fund.

KHAN, S. – HAMID, B. A. – REHMAN, M. Z. (2021): Determinants of Shadow Economy in OIC and Non-OIC Countries: The Role of Financial Development. International Journal of Emerging Markets. DOI: 10.1108/IJOEM-02-2020-0193.

KRELLE, W. (2000): Problems of Transition from a Planned to a Market Economy. [Bonn Econ. Discussion Papers, No. 4/2000.]

LACKÓ, M. (2000): Hidden Economy – An Unknown Quantity? Comparative Analysis of Hidden Economies in Transition Countries, 1989 – 1995. Economics of Transition, *8*, No. 1, pp. 117 – 149.

LEE, D. (2013): How Does Social Capital Reduce the Size of the Shadow Economy? Global Economic Review, *42*, No. 3, pp. 251 – 268.

MADDALA, G. S. – WU, S. (1999): A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. Oxford Bulletin of Economics and Statistics, *61*, No. S1, pp. 631 – 652.

MARA, E. R. (2021): Drivers of the Shadow Economy in European Union Welfare States: A Panel Data Analysis. Economic Analysis and Policy, *72*, pp. 309 – 325.

MAVROTAS, G. – KELLY, R. (2001): Old Wine in New Bottles: Testing Causality between Savings and Growth. The Manchester School, *69*, pp. 97 – 105.

MAZHAR, U. – MÉON, P. G. (2017): Taxing the Unobservable: The Impact of the Shadow Economy on Inflation and Taxation. World Development, *90*, pp. 89 – 103.

MEDINA, L. – SCHNEIDER, F. (2017): Shadow Economies around the World: New Results for 158 Countries Over 1991 – 2015. [CESifo Working Paper, No. 6430.]

MEDINA, L. – SCHNEIDER, F. (2019): Shedding light on the Shadow Economy: A Global Database and the Interaction with the Official One. [CESifo, No. 7981.]

MEDINA, L. – SCHNEIDER, F. (2021): The Evolution of Shadow Economies through the 21st Century. The Global Informal Workforce: Priorities for Inclusive Growth. Washington, DC: International Monetary Fund, pp. 10 – 69.

NARAYAN, P. K. – NARAYAN, S. (2005): Estimating Income and Price Elasticities of Imports for Fiji in a Cointegration Framework. Economic Modelling, *22,* No. 3, pp. 423 – 438.

NGUYEN, C. P. – SCHINCKUS, C. – THANH, D. S. (2020): Economic Fluctuations and the Shadow Economy: A Global Study. Global Economy Journal, *20*, No. 03, pp. 1 – 24.

PANG, J. – LI, N. – MU, H. – JIN, X. – ZHANG, M. (2022): Asymmetric Effects of Urbanization on Shadow Economy Both in Short-Run and Long-Run: New Evidence from Dynamic Panel Threshold Model. Technological Forecasting and Social Change, *177*, pp. 121514.

PEDRONI, P. (1999): Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. Oxford Bulletin of Economics and Statistics, *61*, No. S1, pp. 653 – 670.

PEDRONI, P. (2004): Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis. Econometric Theory, *20*, No. 3, pp. 597 – 625.

PHILLIPS, P. C. (1995): Fully Modified Least Squares and Vector Autoregression. Econometrica: Journal of the Econometric Society, pp. 1023 – 1078.

PHILLIPS, P. C. – HANSEN, B. E. (1990): Statistical Inference in Instrumental Variables Regression with I(1) Processes. The Review of Economic Studies, *57*, No. 1, pp. 99 – 125.

REININGER, T. – WALKO, Z. (2020): A Sleeping Beauty or a Dead Duck? The State of Capital Market Development in CESEE EU Member States. Focus on European Economic Integration Q3, pp. 7 – 35.

ROSSER JR, J. B. – ROSSER, M. V. – AHMED, E. (2000): Income Inequality and the Informal Economy in Transition Economies. Journal of Comparative Economics, *28*, No. 1, pp. 156 – 171.

SAIKKONEN, P. (1991): Asymptotically Efficient Estimation of Cointegration Regressions. Econometric Theory, *7*, No. 1, pp. 1 – 21.

SCHNEIDER, F. (2004): The Size of the Shadow Economies of 145 Countries All over the World: First Results over the Period 1999 to 2003. [IZA, No. 1431.] Bonn: Institute of Labor Economics.

SCHNEIDER, F. (2005): Shadow Economies around the World: What do We Really Know? European Journal of Political Economy, *21*, No. 3, pp. 598 – 642.

SCHNEIDER, F. (2009): The Size of the Shadow Economy for 25 Transition Countries over 1999/00 to 2006/07: What Do We Know? Linz, Austria: Johannes Kepler University of Linz, pp. 1 – 13.

SCHNEIDER, F. (2011): The Shadow Economy and Shadow Economy Labor Force: What Do We (Not) Know? [IZA, No. 5769.] Bonn: Institute of Labor Economics.

SCHNEIDER, F. (2015): Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2014: Different Developments? Journal of Self-Governance and Management Economics, *3*, No. 4, pp. 7 – 29.

SCHNEIDER, F. (2016): Estimating the Size of the Shadow Economies of Highly-Developed Countries: Selected New Results. CESifo DICE Report, *14*, No. 4, pp. 44 – 53.

SCHNEIDER, F. (2022): New COVID-related Results for Estimating the Shadow Economy in the Global Economy in 2021 and 2022. International Economics and Economic Policy, *19*, No. 2, pp. 299 – 313.

SCHNEIDER, F. – BUEHN, A. – MONTENEGRO, C. E. (2011): Shadow Economies All over the World: New Estimates for 162 Countries from 1999 to 2007. In: Handbook on the Shadow Economy. Cheltenham, UK: Edward Elgar Publishing.

SCHNEIDER, F. – ENSTE, D. H. (2013): The Shadow Economy: An International Survey. Cambridge: Cambridge University Press.

SCHNEIDER, F. – MEDINA, L. (2017): Shadow Economies around the World: New Results for 158 Countries over 1991 – 2015. [Working Paper, No. 1710.]

SCHNEIDER, F. – RACZKOWSKI, K. – MRÓZ, B. (2015): Shadow Economy and Tax Evasion in the EU. Journal of Money Laundering Control, *18*, No. 1, pp. 34 – 51.

STOCK, J. H. – WATSON, M. W. (1993): A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. Econometrica: Journal of the Econometric Society, pp. 783 – 820.

SU, D. T. – NGUYEN, P. C. – CHRISTOPHE, S. (2019): Impact of Foreign Direct Investment, Trade Openness and Economic Institutions on Growth in Emerging Countries: The Case of Vietnam. Journal of International Studies, *12*, No. 3, pp. 243 – 264.

TAFENAU, E. – HERWARTZ, H. – SCHNEIDER, F. (2010): Regional Estimates of the Shadow Economy in Europe. International Economic Journal, *24*, No. 4, pp. 629 – 636.

TODA, H. Y. – YAMAMOTO, T. (1995): Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. Journal of Econometrics, *66*, No. 1 – 2, pp. 225 – 250.

TORGLER, B. – SCHNEIDER, F. (2007): What Shapes Attitudes Toward Paying Taxes? Evidence from Multicultural European Countries. Social Science Quarterly, *88*, No. 2, pp. 443 – 470.

TORGLER, B. – SCHNEIDER, F. (2009): The Impact of tax Morale and Institutional Quality on the Shadow Economy. Journal of Economic Psychology, *30*, No. 2, pp. 228 – 245.

TUDOSE, B. M. – CLIPA, R. I. (2016): An Analysis of the Shadow Economy in EU Countries. CES Working Papers, *8*, No. 2, pp. 303 – 312.

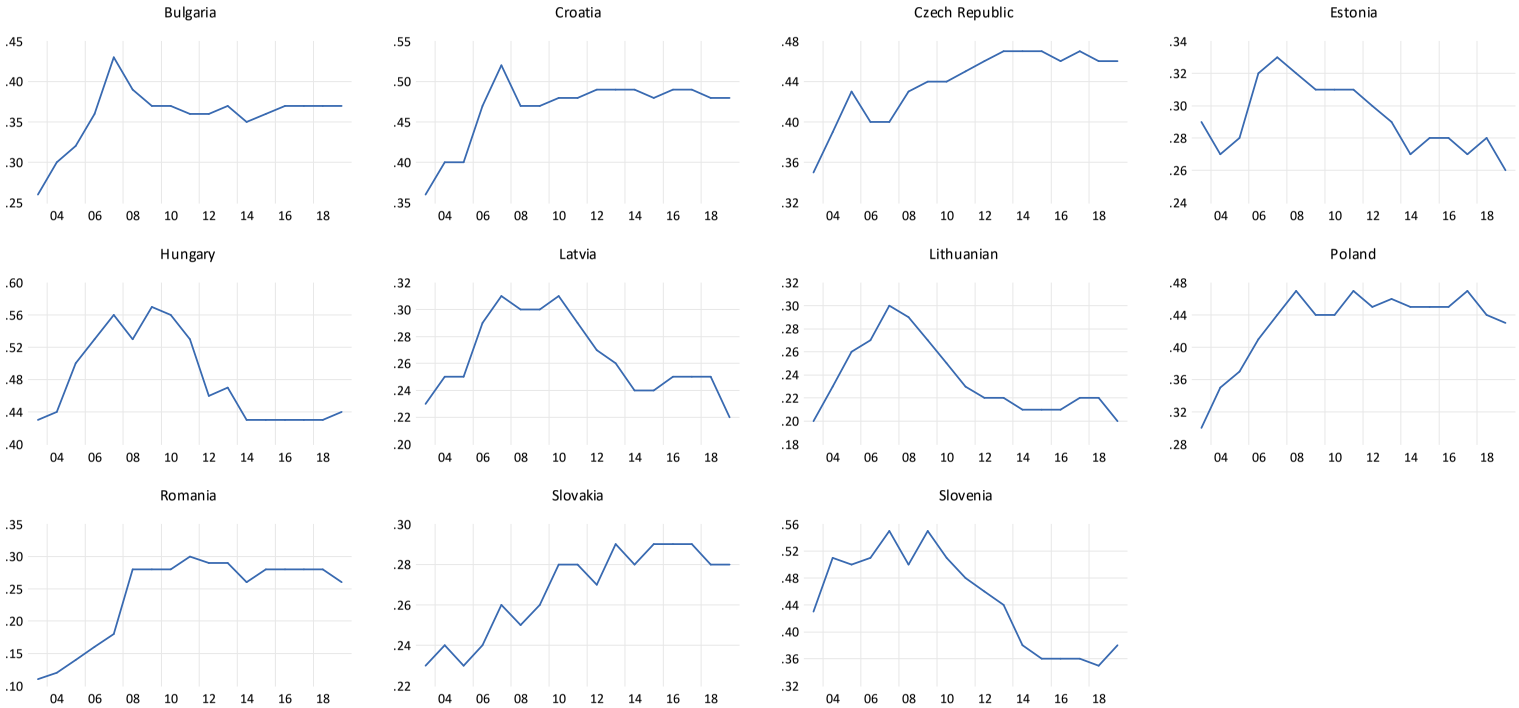
XU, T. – LV, Z. – XIE, L. (2018): Does Country Risk Promote the Informal Economy? A Cross-National Panel Data Estimation. Global Economic Review, *47*, No. 3, pp. 289 – 310.

ZAPATA, H. O. – RAMBALDI, A. N. (1997): Monte Carlo Evidence on Cointegration and Causation. Oxford Bulletin of Economics and Statistics, *59*, No. 2, pp. 285 – 298.

Appendix

Figure 1

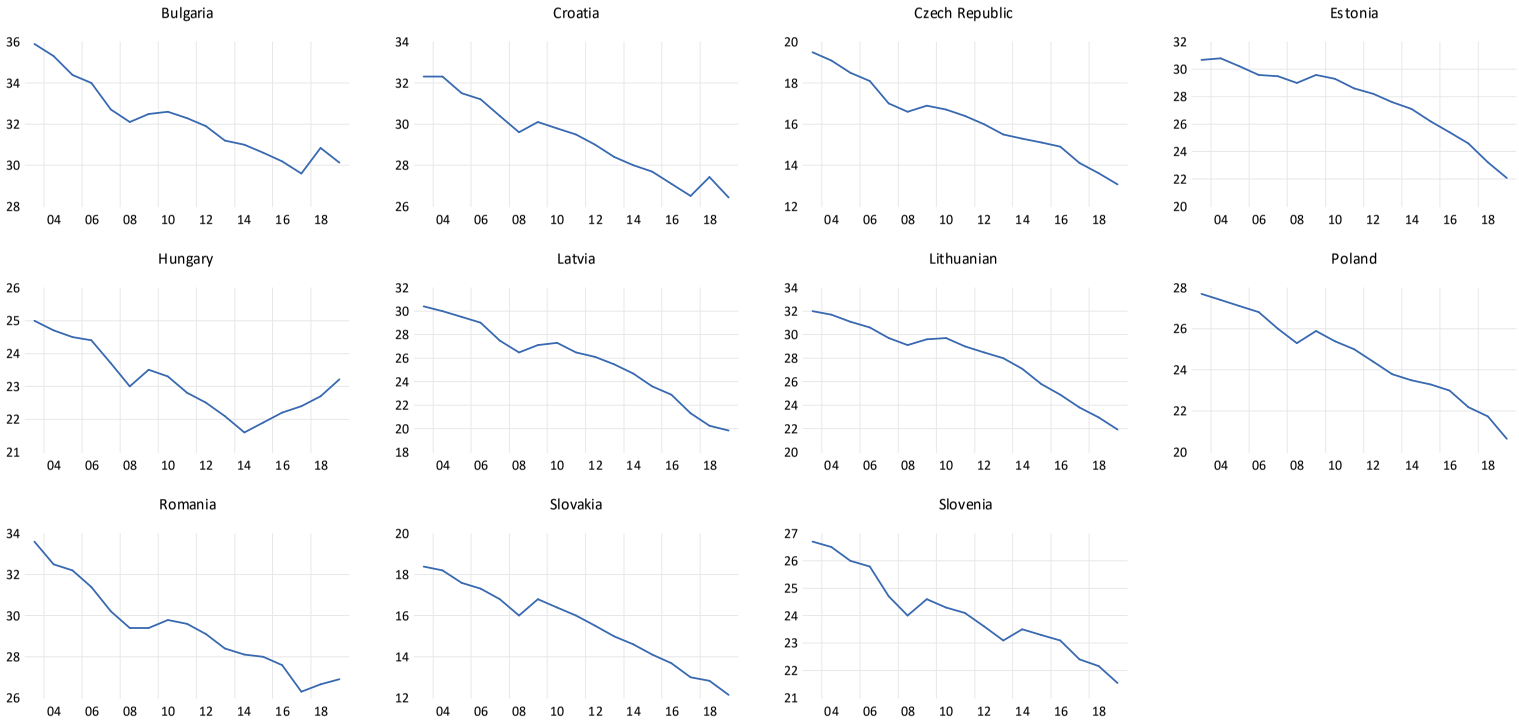
CESEE Countries Financial Development



Source: Authors' figure using International Monetary Fund's financial development index database.

Figure 2

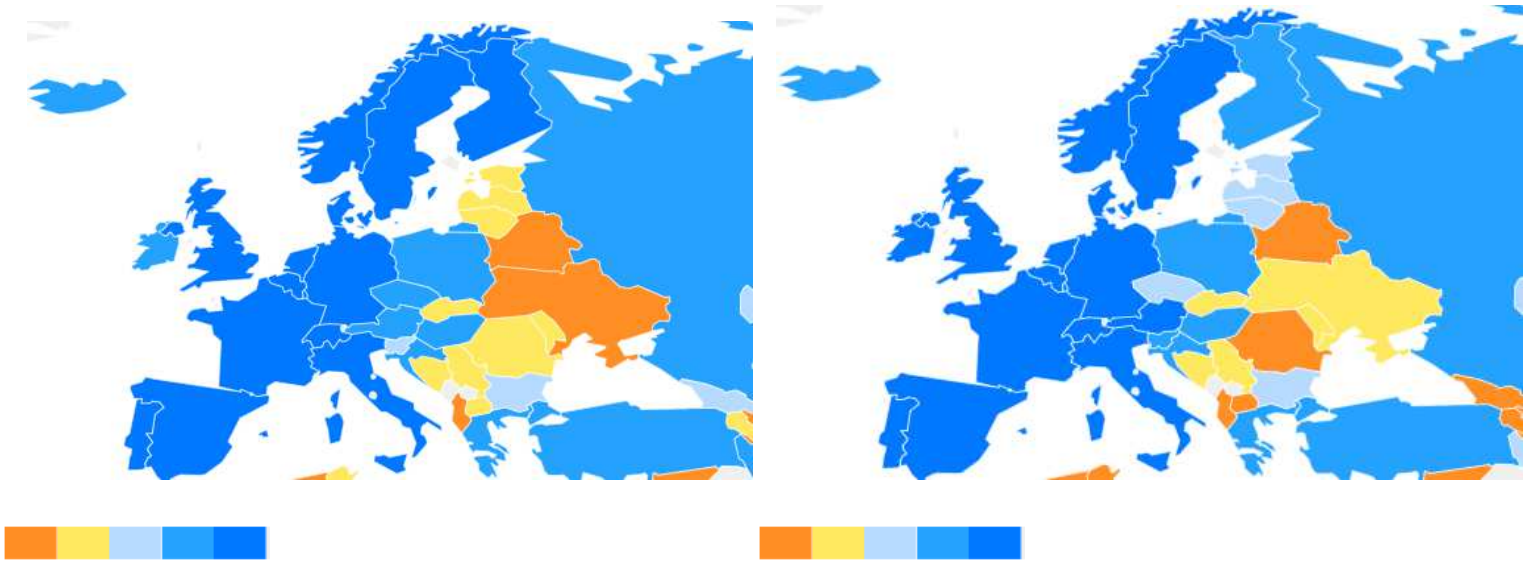
CESEE Countries Shadow Economy



Source: Authors' figure using Schneider's (2022) data.

Figure 3

CESEE Countries Financial Development, Comparison between 2007 and 2020



Note: From left to right, colors represent a higher level of financial development.

Source: <https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b&sId=1485894037365>.