Economic Freedom, Globalization, and the Shadow Economy in the European Union Transition Economies: a Panel Cointegration Analysis

Yılmaz Bayar (Corresponding author)

Usak University Faculty of Economics and Administrative Sciences
Department of Economics, Usak, Turkey
yilmaz.bayar@usak.edu.tr

Ömer Faruk Öztürk

Usak University Faculty of Economics and Administrative Sciences
Department of Public Finance, Usak, Turkey
omerfaruk.ozturk@usak.edu.tr

Abstract. *The presence of the shadow economy differs considerably among the countries. Therefore, determination of factors behind the differences in the size of cross-country shadow economy becomes more of an issue for designing and implementing the right policies to combat the shadow economy. This study investigates the influence of economic freedom and globalization on the size of the shadow economy in the European Union transition economies employing panel data analysis for the period of 2000–2015. The empirical analysis indicates that economic freedom reduces the size of the shadow economy in the long term in the overall panel, but globalization also has a relatively smaller detractive effect on the shadow economy in some countries.*

Keywords: shadow economy, economic freedom, globalization, panel data analysis

1. Introduction

The shadow economy includes the economic units of households and firms operating outside formal economy, and the decision to go underground mainly depends on cost-benefit analysis between working in formal and informal economies. The firms'

main benefits of working in the shadow economy are avoiding the taxes, transaction costs, social security spending and other costs resulting from the regulations, but the main costs are missing the cheaper formal financing and relatively lower productivity (Berdiev & Saunoris, 2018). Therefore, the shadow economy is a widespread problem of a varying dagree in all the countries. It was calculated that, on average, the shadow economy amounted to 31.9% of GDP in 158 countries during the 1991–2015 period (Medina & Schneider, 2018). However, the dimension of the shadow economy varies considerably among the countries depending on social, cultural, institutional, and economic development levels of the countries. For instance, the size of the shadow economy in 2015 was 6.94% in Switzerland, and 7.0% in the United States, while the shadow economy was 67% in Zimbabwe and 56.38% in Haiti (Medina & Schneider, 2018).

In this context, the researchers have concentrated on the factors behind cross-country differences in the size of the shadow economy considering its unfavorable social, institutional, and economic implications. The relevant literature has elicited that tax and social security burden, regulations, corruption, institutional and legal quality, GDP per capita, inflation, unemployment, and financial sector development are the major factors contributing to the survival of the shadow economy (Ruge, 2010; Bose et al., 2012; Mara & Sabău-Popa, 2013; Remeikiene et al., 2014; Buček, 2017). However, relatively fewer researchers have explored the influence of economic freedom and globalization, two prominent properties of the global economy during the past four decades.

Economic freedom is a composite index consisting of government size, legal system quality and property rights protection, sound money, trade freedom, and regulation (Fraser Institute, 2018). So improvements in economic freedom (lower taxes and regulations, higher institutional quality and business freedom) may contribute to the contraction of the shadow economy. On the other hand, globalization may lower the size of the shadow economy through improving institutions, decreasing trade barriers, raising the convergence of the countries in terms of economic development and governmental policies (Berdiev & Saunoris, 2018).

The European Union (EU) transition countries, the study sample, have made an institutional and economic transformation together with EU membership negotiations as of Berlin Wall fall. The rise in economic freedom and globalization accompanied the decrease in the shadow economy in the EU transition states as seen in Table 1.

The purpose of the article is to analyze the influence of economic freedom and globalization on the volume of the shadow economy in the sample of EU transition economies experiencing considerable improvements in economic freedom and globalization over the period of 2000–2015 employing second generation econometric tests taking cognizance of cross-sectional dependence and heterogeneity. The literature on determinants of the shadow economy generally has focused on tax and social security burden, regulations, corruption, institutional and legal quality, GDP per capita, inflation, unemployment, and financial sector development, but a lot fewer articles have ques-

tioned the influence of economic freedom and globalization on the shadow economy size. In this regard, the paper will make a contribution to the limited literature.

TABLE 1. **Shadow Economy, Economic Freedom and Globalization in EU Transition Economies (1995, 2015)**

Country	Shadow economy size (% of GDP)		Economic freedom index		Globalization index	
	1995	2015	1995	2015	1995	2015
Bulgaria	32.93	20.83	4.82	7.40	62.03522	80.12831
Croatia	37.33	22.96	5.08	7.04	50.0238	80.06304
Czech Republic	16.81	10.47	5.76	7.49	69.99019	85.11556
Estonia	30.51	18.49	6.23	7.93	63.21937	83.62048
Hungary	30.18	20.49	6.17	7.19	70.47316	85.11945
Latvia	28.65	16.62	5.68	7.72	53.8493	76.12053
Lithuania	32.49	18.65	5.47	7.86	56.23113	80.29535
Poland	29.54	16.67	5.28	7.36	64.45012	81.13687
Romania	33.40	22.94	4.15	7.70	57.61455	79.23736
Slovak Republic	17.92	11.18	5.42	7.24	61.04082	83.0855
Slovenia	28.17	20.21	5.31	7.08	54.97357	80.94021

Source: Medina & Schneider, 2018; Fraser Institute, 2018; KOF Swiss Economic Institute, 2018

The next section sums up the empirical literature on interaction among economic freedom, globalization, and the shadow economy. The dataset and analysis method is explained in Section 3, and empirical analyses are carried out in Section 4. The article ends up with Conclusion.

2. Literature Review

The unfavorable social, institutional, and economic effects of the shadow economy have encouraged the scholars to explore the causes in the differences of cross-country shadow economy. The scholars have generally focalized on the influence of tax and social security burden, regulations, corruption, institutional and legal quality, unemployment, and financial sector development on the size of the shadow economy as seen in Table 2. The tax and social security burden and labor regulations, corruption, unemployment, and trade liberalization from the aforementioned factors positively affect the shadow economy, while financial development, institutional and legal development negatively affect the size of the shadow economy.

TABLE 2. **Literature Summary on the Determinants of the Shadow Economy**

Determinant of the Shadow Economy	The Impact of the Determinant on the Shadow Economy Size		
	Positive	Negative	Insignificant
Tax and social security burden and labor regulations	Kanniainen et al. (2004), Manolas et al. (2013), Schneider and Williams (2013), Stankevičius and Vasiliauskaitė (2014), Gasparėnienė et al. (2016), Buček (2017)		
Unemployment	Boeri and Garibaldi (20 02), Dell'Anno and Solomon (2008), Buček (2017)	Sahnoun and Abdennadher (2019)	
Financial development		Blackburn et al. (2012), Bayar and Ozturk (2016)	
Trade liberalization	Ghosh and Paul (2008), Fugazza and Fiess (2010)		
Institutional development		Thießen (2010), Alm and Embaye (2013), Petreski (2014), Bayar and Ozturk (2016), Bayar (2016)	
Legal development		Torgler and Schneider (2009), Thießen (2010), Bayar (2016), Bayar et al. (2018)	
Corruption	Manolas et al. (2013), Albulescu et al. (2016), Borlea et al. (2017), Bayar et al. (2018)		Dreher and Schneider (2010)

As seen in Table 2, few researchers have investigated the influence of economic freedom and globalization on the size of the shadow economy., although both globalization and economic freedom are the prominent features of the economies, especially during the past four decades. The studies on the economic freedom – shadow economy nexus generally conclude that economic freedom reduces the shadow economy (e.g., Razmi et al., 2013; Remeikiene et al., 2014; Remeikiene & Gaspareniene, 2015; Schneider, 2016; Goel & Saunoris, 2017; Berdiev et al., 2018). The empirical studies on the nexus of globalization – shadow economy generally find that the globalization process decreases the shadow economy (Farzanegan & Hassan, 2017; Blanton et al., 2018; Berdiev & Saunoris, 2018).

Razmi et al. (2013) analyzed the interaction between institutional quality indicators and the shadow economy in 51 Organization of Islamic Cooperation states over the period of 1999–2008 with dynamic regression analysis and disclosed that economic freedom decreased the shadow economy. Manolas et al. (2013) researched the determinants of the shadow economy in 19 OECD states over the period of 2003–2008 with regression analysis and revealed that labor and product market deregulation decreased the shadow economy, while credit market deregulation raised the shadow economy. Zarra-Nezhad et al. (2014) researched the influence of economic freedom and globalization on the greatness of the shadow economy with dynamic regression analysis and disclosed that economic freedom and globalization decreased the shadow economy.

Remeikiene et al. (2014) also explored the determinants of the shadow economy in Greece during the period of 2005–2013 and discovered that business freedom had no significant effects on the shadow economy. Remeikiene and Gaspareniene (2015) used regression analysis to research the determinants of the shadow economy in Lithuania during the 2000–2011 period and revealed that improvements in business freedom decreased the shadow economy size. Schneider (2016) explored the major determinants of the shadow economy in different country groups and discovered that economic freedom components had a detractive influence on the shadow economy.

Goel and Saunoris (2017) researched the influence of economic freedom on the greatness of the shadow economy in the study investigating the unemployment – shadow economy nexus considering the gender differences in a panel of over 100 countries during 1990–2006 and disclosed that economic freedom reduced the shadow economy. Ouédraogo (2017) investigated the influence of economic freedom on the shadow economy in 23 Sub-Saharan countries using regression analysis and revealed that economic freedom had no significant effects on the shadow economy, but increase in fiscal freedom and business freedom, components of economic freedom index, raised the shadow economy, while increase in monetary freedom decreased the shadow economy. Sweidan (2017) also analyzed the influence of economic freedom on the shadow economy in 112 nations for the duration of 2000–2007 through regression analysis and disclosed that economic freedom decreased the shadow economy size.

Tekin et al. (2018) examined the influence of economic freedom on the tax evasion in 63 countries and found out that economic freedom affected the tax evasion negatively. Lastly, Berdiev et al. (2018) employed regression analysis to investigate the effect of economic freedom and the main components of economic freedom on the shadow economy in a panel of over 100 countries during the years 2000–2015 and disclosed that economic freedom and its main components reduced the shadow economy.

Aleman-Castilla (2006) analyzed the effect of NAFTA (North American Free Trade Agreement) on the shadow economy in Mexico and disclosed that reductions in import duties reduced the informality through raising the profitability for the firms. Farzanegan and Hassan (2017) investigated the influence of economic globalization on the shadow economy in Egypt during the 1976–2013 period with VAR analysis

and disclosed that economic globalization had a decreasing influence on the shadow economy. Blanton et al. (2018) researched the influence of economic openness on the shadow economy size in 145 countries for the 1971–2012 period and concluded that economic openness decreased the shadow economy size. Lastly, Berdiev and Saunoris (2018) researched the influence of main globalization types on the shadow economy in 119 nations over 2000–2007 by regression analysis and discovered that globalization, economic, and political globalization reduced the shadow economy.

3. Data and Method

This study employs Westerlund (2008) co-integration test to investigate the influence of economic freedom, and globalization on the size of shadow economy in the European Union transition economies over the period of 2000–2015.

3.1. Data

The shadow economy is represented by the size of the shadow economy calculated with the Multiple Indicator Multiple Cause method (MIMIC) by Medina and Schneider (2018). Economic freedom is represented by Fraser Institute's (2018) economic freedom index. The economic freedom index is composed of five dimensions such as government size, legal system and property rights, sound money, internationally trade freedom, and regulation. The five main dimensions include 24 components, and the components consist of sub-components. So the index totally includes 42 variables provided from third party sources such as the World Bank and the International Country Risk Guide. Each main and sub-component takes a rating between 0 and 10 (higher grades represent higher economic freedom). The component ratings in each main dimension are averaged to derive ratings of the five main dimensions. Then, the ratings of the five main dimensions are averaged to derive the economic freedom index of the countries (see Fraser Institute (2018) for detailed information about measurement of economic freedom index).

Lastly, globalization was substituted with the globalization index of KOF Swiss Economic Institute (2018), which comprises economic, social, and political globalization dimensions with equal weights. Economic globalization consists of trade and financial globalization, while social globalization consists of interpersonal, informational and cultural globalization. KOF Swiss Economic Institute calculates both de facto globalization based on actual international flows and activities and de jure measures of globalization based on policies and conditions which enable the international flows and activities. However, the KOF Globalization Index is the average of de facto and de jure globalization (see Gygli et al., 2018) for detailed information for detailed information about globalization index). All the series are calculated on an annual basis.

TABLE 3: **Variable Definitions and Data Sources**

Variables	Definition	Source
SHA	Shadow economy size (% of GDP)	Medina and Schneider (2018)
EF	Economic freedom index	Fraser Institute (2018)
GI	Globalization index	KOF Swiss Economic Institute (2018)

The objective of the study was to examine the influence of economic freedom and globalization on the greatness of the shadow economy. The cross-section dimension of the study was formed from 11 EU transition economies experiencing a considerable social, institutional, and economic transformation (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia), and the study covers the period of 2000–2015. The data availability determined the sample and time duration of the paper. Lastly, the empirical analysis was conducted via Stata 14.0 and Eviews 10 software.

The following econometric model was established to investigate the influence of econometric freedom and globalization on the size of the shadow economy. We expected the growth of economic freedom and globalization to negatively affect the size of the shadow economy regarding the relevant theoretical considerations and empirical literature.

$$SHA_{it} = \beta_0 + \beta_1 EF_{it} + \beta_2 GI_{it} + e_{it} \tag{1}$$

3.2. Method

At first, cross-sectional dependence was tested with the Breusch and Pagan (1980) LM test, Pesaran (2004) LM CD test, and Pesaran et al. (2008) LM_{adj} test taking account of dataset characteristics. Then, the slope coefficients' homogeneity was tested with the Pesaran and Yamagata (2008) adjusted delta tilde test.

The integration levels of the series were researched with second generation unit root test of Pesaran (2007) regarding cross-sectional dependence. Then, the Durbin-Hausman co-integration test developed by Westerlund (2008) was utilized to analyze the co-integration relationship between the shadow economy, economic freedom, and globalization. The Durbin-Hausman co-integration test takes cognizance of cross-sectional dependence and heterogeneity. Further, the dependent variable should be I(1) in order to apply the test, but the independent variables can have different integration levels. Two test statistics are calculated while applying the test, called as Durbin Hausman panel statistic and group statistic (Westerlund, 2008). The group statistic posits that the autoregressive parameters are heterogeneous and is calculated as follows:

$$DH_g = \sum_{i=1}^{n} \tilde{S}_i \left(\tilde{\phi}_i - \hat{\phi}_i \right)^2 \sum_{t=2}^{T} \hat{e}_{it-1}^2 \tag{2}$$

The panel statistic posits the autoregressive parameters are homogenous and is calculated as follows:

$$DH_p = \hat{S}_n(\tilde{\emptyset}_i - \hat{\emptyset}_i)^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \hat{e}_{it-1}^2 \tag{3}$$

The mean group (MG) estimator (Pesaran & Smith, 1995), the Pesaran (2006) CCEMG (common correlated effects mean group) estimator and the AMG (augmented mean group mean) estimator (Eberhardt & Teal, 2010) are the major estimators of co-integration coefficients. However, panel AMG takes cognizance of heterogeneity and cross-sectional dependence, while other estimators regard only heterogeneity. Panel AMG estimators consider the cross-sectional dependence by including the common dynamic effect to the regression equation. The AMG estimator decomposes the variables in the following way:

$$y_{it} = \beta_i^l x_{it} + u_{it} \tag{4}$$

$$u_{it} = \alpha_i + \lambda_i^l f_t + \varepsilon_{it} \quad (i = 1 \dots N, \ t = 1 \dots T, \ m = 1 \dots k) \tag{5}$$

$$x_{mit} = \pi_{mi} + \delta_{mi}^l g_{mt} + \rho_{1mi} f_{1mt} + \cdots + \rho_{nmi} f_{nmt} + v_{it} \tag{6}$$

$$f_t = \tau^l f_{t-1} + \varepsilon_{it} \ ve \ g_t = \Psi^l g_{t-1} + \Omega_{it} \tag{7}$$

where x_{it} represents the vector of observable covariates in the above equations, f_t and g_t are the unobserved common factors, and the λ_i are the country-specific factor loadings.

4. Empirical Analysis

The pretests of cross-section dependence and homogeneity among the variables are crucial for the identification and application of the right econometric tests of unit root and co-integration. Hence, the cross-section dependence was questioned by the Breusch and Pagan (1980) LM test, Pesaran (2004) LM CD test, and Pesaran et al. (2008) LM_{adj} test, and the results are shown in Table 4. The null hypothesis in favor of cross-sectional independence was rejected because the probability values were less than 5%. Therefore, the findings of the three tests showed a cross-sectional dependence between the series. Consequently, use of second-generation unit root and co-integration tests will yield more robust results, because the second generation test takes cognizance of cross-section dependence and heterogeneity.

TABLE 4: **Cross-sectional Dependence Tests Results**

Test	Test statistic	Prob.
LM	159.8	0.0000
LM adj*	18.38	0.0000
LM CD*	8.137	0.0000

*two-sided test

Furthermore, the slope coefficients homogeneity was analyzed by means of Pesaran and Yamagata's (2008) homogeneity tests, and the findings are shown in Table 5. The null hypothesis in favor of homogeneity was rejected because the probability values were less than 5%. So the co-integration coefficients were revealed to be heterogeneous.

TABLE 5: **Homogeneity Tests Results**

Test	Test statistic	Prob.
$\tilde{\Delta}$	7.221	0.000
$\tilde{\Delta}_{adj.}$	8.258	0.000

The question of a unit root in the series was investigated with the CIPS (Cross-Sectional IPS (Im-Pesaran-Shin, 2003)) unit root test of Pesaran (2007) while taking into consideration the presence of cross-sectional dependence, and the results are displayed in Table 6. The null hypothesis in favor of unit root's presence cannot be rejected at level values of the series, but the null hypothesis was rejected after the first differencing, because the probability values were less than 5%. So the results revealed that SHA, EF, and GI were I(1).

TABLE 6: **CIPS Unit Root Test Results**

Variables	Constant		Constant+Trend	
	Zt-bar	p-value	Zt-bar	p-value
SHA	−1.934	0.127	0.688	0.754
d(SHA)	−0.778	0.018	1.349	0.011
EF	−0.660	0.255	−0.834	0.202
d(EF)	−3.768	0.000	−2.024	0.021
GI	−1.524	0.164	−1.655	0.149
d(GI)	−2.772	0.003	−1.109	0.034

The co-integration relationship among the shadow economy, economic freedom, and globalization was questioned with Westerlund's (2008) co-integration test while taking cognizance of cross-section dependence and heterogeneity among the series, and the results are shown in Table 7. The group statistic was taken into consideration by the reason of existing heterogeneity, and the null hypothesis in favor of nonavailability of co-integration relationship was rejected at the 10% significance level, because the

probability values were found to be less than 10%. Consequently, we reached the end of the presence of co-integration relationship.

TABLE 7: **Results of Westerlund (2008) Co-integration Test**

	Statistic	p-value
Durbin-Hausman Group Statistic	0.957	0.069
Durbin-Hausman Panel Statistic	−0.853	0.803

The slope coefficients were forecast by the panel AMG estimator of Eberhardt and Teal (2010) while taking notice of the cross-sectional dependence and heterogeneity. The test results are presented in Table 8. The panel co-integration coefficients revealed that economic freedom decreased the shadow economy size considerably because the probability value was found to be less than 5%, but globalization process had no significant effects on the size of the shadow economy in overall panel because the probability values were higher than 10% significance level. However, the individual co-integration coefficients disclosed that economic freedom negatively influenced the shadow economy in Bulgaria, Czech Republic, Latvia, Poland, and Slovenia. The impact of economic freedom on the shadow economy size was the largest in Czech Republic with 7%, then in Slovenia and Poland with 3.5%, while the least impact of economic freedom on the shadow economy was observed in Bulgaria with 1.7%. Furthermore, globalization had a decreasing influence on the shadow economy in Bulgaria, Croatia, and Latvia, but a positive influence on the shadow economy only in Poland. The decreasing effect of globalization on the shadow economy was 2% in Croatia and 0.6% in Bulgaria. Furthermore, economic freedom was more effective on the shadow economy in the sample and also had much greater effect on the shadow economy when compared with the effect of globalization on the shadow economy.

TABLE 8: **Co-integration Coefficients Estimation**

Countries	EF	P-value	GI	P-value
Bulgaria	−1.766228	0.099	−0.6027677	0.078
Croatia	−4.276711	0.288	**−2.054425**	**0.008**
Czech Republic	**−7.414848**	**0.053**	−0.0353754	0.894
Estonia	−5.975449	0.067	0.4403792	0.072
Hungary	1.236634	0.293	−0.0324894	0.781
Latvia	−2.490584	0.004	−0.439137	0.017
Lithuania	−1.514709	0.410	0.0369133	0.835
Poland	−3.509901	0.044	0.4387346	0.000
Romania	**2.410783**	**0.014**	−0.1738189	0.407
Slovak Republic	−0.6771052	0.479	−0.0078419	0.934
Slovenia	**−3.575528**	**0.099**	−0.1739716	0.455
Panel	**−2.504877**	**0.004**	−0.236709	0.248

The findings of the co-integration analysis disclosed that the improvements in economic freedom mainly resulting from the processes of transition and EU membership decreased the size of the shadow economy substantially in both overall panel and individual countries in harmony with related theoretical considerations and empirical findings. However, globalization had a decreasing effect on the shadow economy size in most of the countries, while statistically it was significant only in Bulgaria and Croatia. Both economic freedom and globalization affect the shadow economy through similar channels. Therefore, we can conclude that the effect of economic freedom dominates the effect of globalization. Furthermore, the EU transition economies are generally in relation with other EU member states.

5. Conclusion

The shadow economy is an extensive problem for all the nations to a varying degree and has many adverse social and economic implications for the nations. So, the countries always struggle with the shadow economy to keep it within a reasonable size. In this context, specification of possible common and country-specific determinants behind the shadow economy will be very useful to devise and realize the appropriate policies. This study researches the influence of economic freedom and globalization on the size of the shadow economy, two prominent characteristics of the global economy in EU transition economies over the period of 2000–2015, which are generally ignored in the relevant literature.

The co-integration analysis disclosed that economic freedom had a considerable decreasing influence on the shadow economy size in most of the countries, but the globalization reduced the shadow economy relatively less only in Bulgaria and Croatia. This finding can be explained by the fact that the EU transition states generally are in relation with the other member states. In an economically free, in other words, liberal society, the governments have a protective function for the economic units, and in turn economic units give their decisions freely. In this context, government size, legal system and property rights, sound money, internationally trade freedom, and regulation are designed in a way to provide a relatively economically free society and thus make a contribution to decreasing the shadow economy size. In this regard, the findings of the study for the EU transition economies also verify the aforementioned theoretical considerations. Consequently, structuring the public administration to protect property rights and provide a limited number of public goods such as national defense and sound money and establishing the efficiently market-oriented mechanisms will also make a significant contribution to decreasing the shadow economy.

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