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Salih Türedi and Tunahan Hacıimamoğlu

Are Corruption and the Shadow Economy Complementary in Low Income Countries?

1 Introduction

Although they might vary in terms of the form and size between countries today, corruption and the shadow economy are two global phenomena that are observed in all countries throughout the world, and involve illegal activities. Even though there are different definitions of corruption in the literature, those made by Transparency International and the World Bank come to the forefront. According to Transparency International, corruption is defined as '*the abuse of entrusted power for private gain*' (T*ransparency* International, 2021), whereas the World Bank defines corruption, which includes various behaviours from bribery to stealing the public funds, as '*the abuse of public office for private gain*' (Worldbank, 2020). Corruption has important social, political and economic costs. It complicates access to education, health and justice services ,and especially negatively affects the poor, which is the most vulnerable segment of the society. It weakens democracy, degrades the rule of law and corrodes the trust in government. Moreover, it also results in wastage and misallocation of resources. It deteriorates the efficient functioning of market mechanisms, such as fair competition, and increases the cost of doing business. It also causes decreases in domestic and foreign investment and, consequently, results in reductions in economic growth and employment and increases inequality (OECD, 2014; Worldbank, 2021; Ferguson, 2018: 9). On the other hand, it is very difficult to make an exact definition of the shadow economy, which is also named the hidden, unofficial, informal and underground economy (Schneider and Enste, 2013: 6). According to a common definition, the shadow economy includes all the economic activities contributing to officially calculated GDP, but hidden from the official authorities due to certain monetary, regulatory and institutional reasons (hereby unregistered) (Schneider, 2012: 4–5; Medina and Schneider, 2018: 4). Not taxing the revenues generated by the shadow sector diminishes the tax revenues of governments and causes budget deficits and borrowing. Thus, the shadow economy negatively affects not only the main macroeconomic indicators but also the economic welfare of individuals (Batrancea et al., 2018: 1120). The link between the shadow economy and corruption, which have

common characteristics such as being global, pervasive, illegal and unobservable, has been investigated in academic circles for a long time, at both theoretical and empirical levels.

In theoretical literature, there are two different approaches to the relationship between these variables. According to the first approach, claiming that there is a complementary (positive) relationship between corruption and shadow economy, the high level of the tax burden, besides the heavy bureaucracy and excessive regulations, forces the firms to go outside the economy. The firms comply with paying a reasonable tax, but they do not want to bear constant and arbitrary requests. Thus, the presence and increase of corruption (bribe requests) that functions as an extra tax leads firms to transfer their activities underground and, consequently, increases the size of shadow economy (Johnson et al., 1997: 169; Johnson et al., 1998: 387; Friedman et al., 2000: 460). Contrary to the first approach, the second approach claims that there is a substitution (negative) relationship between corruption and the shadow economy. For instance, according to Choi and Thum (2005), an entrepreneurs' option to go underground limits the corrupted government officer's corruption (requests for a bribe) for his/her private gains. For this reason, by decreasing corruption, one of the government-induced distortions, the shadow economy leads to an increase in activities in the formal economy. Examining how the institutional quality affected the relationship between the shadow economy and corruption, Dreher et al. (2009) also reported a similar result. Since it enables easier detection of illegal activities in formal economy, the increase in institutional quality and also the firms' option to go underground when facing a high bribe request decreases the level of public officers' corruption requests. In the presence of the shadow economy, the level of corruption is lower and the size of the formal economy is larger. Hence, the shadow economy and corruption are substitutes.

Finally, it was also emphasized in the theoretical literature that the relationship between corruption and the shadow economy varies depending on the income level of the countries. Dreher and Schneider (2006) stated that, if shadow economic activities in high-income countries are detected, giving a bribe to government officials is rarely an option. Moreover, since the firms/entrepreneurs can call corrupt government officials to account via the courts, they do not have to pay a bribe. Hence, corruption and the shadow economy might become independent of each other in high-income countries. Besides that, Schneider (2007) states that corruption, which is at low levels in high-income countries and is generally seen in the form of bribery, is an instrument of achieving certain advantages/making things easier, such as getting a huge contract from the public sector in the formal economy. In other words, in these countries bribery does not

merely sustain the shadow economic activities, it produces more activity in the formal economy. Thus, the increase in the size of formal economy by corruption indicates that they are substitutes in high-income countries. Finally, Schneider (2007) and Vo et al. (2015), who had a similar approach, stated that detecting such activities in low-income countries, where all the firms are involved in underground (unregistered) activities, is easy. For this reason, in order to avoid being detected by the government, paying tax and being punished, they pay bribes to officials. Thus, the expansion of shadow economic activities brings more corruption. In conclusion, these two phenomena are complementary (positively correlated) in low-income countries.

The objective of this study is to test the relationship between corruption and shadow economy in seventeen countries, which are classified as low-income according to the classification of the World Bank for the period between 2002 and 2017. This study's contributions to the literature can be summarized as follows. First of all, this study tests the validity of the theoretical assumption that '*corruption and shadow economy are complementary in low-income countries*' because there are few studies that examine the relationship between these variables specifically in low-income countries. Second, corruption and the shadow economy are two important problems that make economic development more difficult in low-income countries, which needs to be effectively fought. Within this context, the results obtained from the present study might provide important clues for governments of countries struggling with these two phenomena. Third, the second-generation test methods considering the cross-sectional dependence and heterogeneity and providing more robust and consistent results when compared to the first-generation tests from this aspect are used in the empirical analyses. The rest of the paper is organized as follows. The previous studies on this subject are discussed in the second section, whereas the data and model used in this study are presented in the third section. The fourth section, where the econometric methodology is explained, is followed by the fifth section, where the empirical results are reported. Conclusions and suggestions are presented in the sixth and final section.

2 Literature Review

Besides the theoretical literature, the relationship between corruption and the shadow economy is also an important and current research field in the empirical literature. The studies carried out using different countries (or country groups), periods, and econometric approaches reported different results. In other words, some of the studies reported a substitution (negative) relationship between

corruption and the shadow economy, whereas some studies reported a complementary (positive) relationship. Although there is no consensus about the relationship between these variables, it can be stated that the majority of empirical studies reported results indicating a complementary relationship between corruption and the shadow economy. For instance, in their study carried out on forty-nine countries in three different regions of the world (Latin America, the OECD and the former Soviet Bloc), Johnson et al. (1998) reported that there was a strong relationship between the shadow economy and corruption, and the level of the shadow economy was higher in countries with a higher level of corruption. Aiming to determine the global-scale determinants of the shadow economy, Chowdhury (2005), who conducted a study on ninety-six countries, discovered in cross-sectional regression analysis that corruption is one of the significant determinants of the shadow economy. Performing a cross-sectional analysis for 120 countries and panel data analysis for 70 countries, Dreher and Schnider (2006) and Schnider (2007), who conducted a panel data analysis for 145 countries (including developing, transition and highly developed OECD economies), determined that the shadow economy and corruption have a substitution relationship in high-income countries and a complementary relationship in low-income countries. In other words, the shadow economy decreases the level of corruption in high-income countries, but increases it in low-income countries. Virta (2010) aimed to show how the geographical location of a country affects the relationship between corruption and the shadow economy. For this purpose, the author used the Bootstrapping and IV regressions estimation and, according to the findings, it was determined that corruption doesn't affect the shadow economy outside the tropics. Instead, the increase in the shadow economy as a result of corruption is proportional to the size of country's tropic area. Manolas et al. (2013) investigated the determinants of the shadow economy in nineteen OECD countries by using a panel regression analysis for the period of 2002–2008, and they found that the improvements in control of corruption (a decrease in the level of corruption) had the effect of decreasing the size of the shadow economy. According to the results obtained by Vo et al. (2015), in a study performed for the period 1995–2014 on ASEAN countries (excluding the two high-income countries – Singapore and Brunei); (i) there was a complementary relationship between corruption and the shadow economy and (ii) the effect of corruption on the shadow economy was stronger than the effect of shadow economy on corruption. Emphasizing that the link between the shadow economy and corruption was investigated mainly at the country level, Gillanders and Parviainen (2015) examined the relationship between these variables at the regional level for Sub-Saharan Africa (thirty-six countries), Europe and Central Asia (twenty-six

countries), Latin America and the Caribbean (twenty-three countries), and the rest of the world (fourteen countries). According to the results, there was a statistically significant and positive nexus between the shadow economy and corruption at a regional level.

Using cross-sectional regression analysis on twenty-eight European Countries (EU) in an empirical study, Borlea et al. (2017) revealed that there was a high and positive relationship between corruption and the shadow economy and, thus, a higher level of corruption includes a higher level of shadow economy. Using data from 193 countries and regions in their study carried out with moderation analysis, Batrancea et al. (2018) indicated that the shadow economy and corruption are complementary. Bayar et al. (2018) investigated the effect of corruption on the shadow economy in eleven transition economies, which are located in Central and Eastern Europe and are also members of the EU, by employing the cointegration test of Westerlund and Edgerton (2007) and causality test of Konya (2006). After determining that there was a long-term relationship between two variables, the cointegration coefficients were estimated using fully modified ordinary least squares (FMOLS) and dynamic seemingly unrelated regression (DSUR), which showed that this relationship was a complementary one. Moreover, according to the results of causality analyses, it was found that there was a bilateral causality between the shadow economy and corruption in all the countries. In another study, Navickas et al. (2019) performed a panel regression analysis for EU-member Eastern European countries (ten countries) and reported results similar to those specified by Bayar et al. (2018). In other words, for the period of 2003–2016, corruption was a significant determinant of the shadow economy and there was a positive (complementary) relationship between these variables. One unit increase in the level of corruption would increase the level of shadow economy by 0.2054%. The effect of the tax burden on the shadow economy was empirically examined by Unver and Koyuncu (2019) for the period of 1999–2013 and 154 countries by Kutbay (2020) for the period of 2000–2017, and sixteen emerging market economies. Incorporating corruption into their estimated regression models as a control variable, the authors reported that corruption has a positive effect on the shadow economy. In an empirical analysis using static (OLS, fixed effect) and dynamic (GMM) panel data estimators for thirty-four OECD-member countries, Baklouti and Boujelbene (2020) found that there was a complementary relationship between corruption and the shadow economy. Finally, in the panel regression analysis carried out by Gokcekus and Schnider (2020), considering fifty states in the USA for the period of 2001–2008, it was determined that the relationship between corruption and the shadow economy varied depending on the size of the shadow

economy; there was a substitution relationship in states with a small shadow economy and a complementary relationship in the states with a large shadow economy. According to the estimation of the authors, it can be stated that the point where the relationship turns from negative to positive is where the shadow economy equals to 7.61% of state GDP.

3 Data and Model

In this study examining the relationship between corruption and shadow economy, the 2002–2017 annual data of seventeen low-income countries[1] were classified according to the income classification of World Bank.[2] In the estimation models, besides the *shadow economy* (shadow) and *control of corruption* (corrupt) used as the indicator of corruption, *trade openness* (trade), *foreign direct investment* (FDI), *unemployment* (unemp) and *GDP per capita growth* (growth) were included as control variables. The shadow economy data was obtained from Medina and Schneider (2019). The data of all other variables was procured from the World Bank's World Development Indicators database. The details of the variables used with natural values in the analysis are presented in Table 1.

Tab. 1: *The Variables and Definitions*

Variable	**Definitions**
Shadow	Size of the shadow economy (% of GDP)
Corrupt	Control of corruption index. (An increase in index value indicates a decrease in corruption)
Trade	Total foreign trade volume, import + export (% of GDP)
FDI	Foreign direct investment, net inflows (% of GDP)
Unemp	Unemployment rate (% of the total labour force)
Growth	GDP per capita growth (annual%)

1 Burkina Faso, Burundi, Chad, Gambia, Guinea, Haiti, Central African Republic, Liberia, Madagascar, Malawi, Mozambique, Niger, Rwanda, Sierra Leone, Tajikistan, Togo and Uganda.

2 World Bank classifies countries by their level of income per capita. According to this classification, the countries with an income per capita below $1,036 fall into the class of low-income countries.

In this study, the relationships between the variables were estimated using the models (1) and (2) below:

$$Shadow_{it} = \alpha_0 + \beta_1 Corrupt_{it} + \beta_2 Trade_{it} + \beta_3 FDI_{it} + \beta_4 Unemp_{it} + \beta_5 Growth_{it} + \mu_{it} \quad (1)$$

$$Corrupt_{it} = \alpha_0 + \beta_1 Shadow_{it} + \beta_2 Trade_{it} + \beta_3 FDI_{it} + \beta_4 Unemp_{it} + \beta_5 Growth_{it} + \mu_{it} \quad (2)$$

In Model (1), $Shadow_{it}$ is the dependent variable referring to the size of shadow economy of the *i*th country at the time t. In Model (2), $Corrupt_{it}$ is the dependent variable referring to the level of corruption in the *i*th country at the time t. Moreover, μ_t refers to error term, *i* to model's cross-sectional size, and *t* to the time dimension of model. In this study, where a balanced panel dataset was used, the empirical analyses were performed using the Gauss 20 program.

4 Econometric Methodology

4.1 Cross-Sectional Dependence and Homogeneity Tests

Breusch and Pagan (1980) developed the Lagrange multiplier (LM) test for testing the cross-sectional dependence (CD). LM test statistics is calculated as follows:

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}^{2} \quad (3)$$

where $\hat{p}_{ij}$ is the estimated correlation coefficient of residuals obtained from OLS estimation in Equation (3). The *LM* test is more suitable for the panels with relatively small *N* and sufficiently large *T*. For the panels with $T \to \infty$ and $N \to \infty$, Pesaran (2004) introduced a scaled version of *LM* test. CD_{LM} test that has a normal distribution with *N(N-1)/2* degree of freedom and asymptotic chi-square (χ^2) character:

$$CD_{LM} = \left(\frac{1}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{p}_{ij}^{2} - 1\right) \quad (4)$$

The discussions on the homogeneity of slope coefficients date back to Swamy (1970). Since the Swamy test was developed for $N<T$ panels, it is claimed that it cannot yield reliable results for the slope coefficient homogeneity in $N>T$ panels. In the Delta $\left(\tilde{\Delta}\right)$ test, a modified version of Swamy (1970) test is considered first:

$$\hat{S}=\sum_{i=1}^{N}\left(\hat{\beta}_i-\hat{\beta}_{WFE}\right)'\frac{X_i'M_\tau X_i}{\hat{\sigma}_i^2}\left(\hat{\beta}_i-\hat{\beta}_{WFE}\right) \tag{5}$$

$$\hat{\sigma}_i^2=\frac{\left(y_i-X_i\hat{\beta}_i\right)'M_\tau\left(y_i-X_i\hat{\beta}_i\right)}{\left(T-k-1\right)} \tag{6}$$

Swamy statistics $(\hat{S})$ show asymptotic chi-square distribution with $k(N-1)$ degree of freedom. $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ tests' standardized distribution statistics are defined as follows:

$$\tilde{\Delta}=\sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{2k}}\right) \tag{7}$$

Based on the condition that $(N,T)\to\infty$, $\tilde{\Delta}$ test has asymptotic standard normal distribution as long as $\sqrt{N/T}\to\infty$ and error terms have a normal distribution. The $\tilde{\Delta}$ test has small sample characteristics, whereas $\tilde{\Delta}_{adj}$ has been adjusted to include large sample characteristics.

$$\tilde{\Delta}_{adj}=\sqrt{N}\left(\frac{N^{-1}\tilde{S}-E\left(\tilde{z}_{iT}\right)}{\sqrt{Var\left(\tilde{z}_{iT}\right)}}\right);\ E\left(\tilde{z}_{iT}\right)=k, var\left(\tilde{z}_{iT}\right)=\frac{2k\left(T-k-1\right)}{T+1} \tag{8}$$

4.2 Panel Unit Root Test

The CADF test was developed by Pesaran (2007) by including the lagged cross-sectional averages into ADF regression. CADF regression, which can be used with $T>N$ and $N>T$ and considers the cross-sectional dependence and heterogeneity, can be expressed as follows:

$$\Delta y_{it} = \alpha_i + b_i y_{i,t-1} + c_i \overline{y}_{t-1} + d_i \Delta \overline{y}_t + e_{it} \tag{9}$$

CIPS (Cross-Sectionally IPS) panel unit root statistics obtained using the unit root statistics of each cross-section in CADF regression can be defined as follows:

$$CIPS(N,T) = t-bar = N^{-1}\sum_{i=1}^{N} t_i(N,T) \tag{10}$$

where t_i (N,T) is the CADF test statistic for each cross-section in the CADF regression (Pesaran, 2007: 276).

4.3 Panel Cointegration Test

Cross-sectional dependence is considered in Durbin-Hausman cointegration test developed by Westerlund (2008) and, on the condition that the dependent variable is I(1), independent variables are allowed to be I(0) or I(1). In this test, two different test statistics as (DH_p) and (DH_g) are proposed based on the homogeneity and heterogeneity of panel coefficients, respectively (Westerlund, 2008: 205).

Panel means (DH_p) and group means (DH_g) statistics are shown in the equations below, respectively:

$$DH_p = \hat{S}_n \left(\widetilde{\varnothing} - \widehat{\varnothing}\right)^2 \sum_{i=1}^{n}\sum_{t=2}^{T} e_{it-1}^2 \tag{11}$$

$$DH_g = \sum_{i=1}^{n} \hat{S}_i \left(\widetilde{\varnothing}_i - \widehat{\varnothing}_i\right)^2 \sum_{t=2}^{T} e_{it-1}^2 \tag{12}$$

(DH_p) statistic is calculated by summing (n) individual terms before multiplying them, whereas (DH_g) statistic is calculated by first multiplying and then summing various terms (Westerlund, 2008: 203).

4.4 Long-Term Coefficient Estimation Test

The long-term coefficient estimator, which was developed by Pesaran (2006) for estimating the panel data models with multifactorial error structure in general and named common correlated effects (CCE), allows potential cross-sectional dependence arising from multiple unobservable common factors. Moreover, the slope coefficient in the factors is sensitive to the heterogeneity and possible unit root (Pesaran, 2006: 969). CCE mean group (CCEMG) and CCE pooled (CCEP) estimators are derived as follows:

$$\hat{b}_{MG} = N^{-1}\sum_{i=1}^{N}\hat{b}_i \tag{13}$$

$$\hat{b}_i = (X_i'\bar{M}_w X_i)^{-1} X_i'\bar{M}_w y_i \tag{14}$$

CCEMG estimator is a simple mean of individual-specific CCE estimators $(\hat{b}_i)$. When the cross-section-specific slope coefficients (β_i) are the same, the efficiency gains are obtained by integrating the observations on the units from the same cross-section. Based on the assumption of $\beta_i = \beta$ and $\sigma_i^2 = \sigma^2$, the slope coefficient of common effects is allowed to vary alongside the *i*. Expressed with CCEP, the pooled β estimator is formulated as follows:

$$\hat{b}_P = \left(\sum_{i=1}^{N}\theta_i X_i'\bar{M}_w X_i\right)^{-1}\sum_{i=1}^{N}\theta_i X_i'\bar{M}_w y_i \tag{15}$$

$$\theta_i = \sigma_i^{-2} / \sum_{j=1}^{N}\sigma_j^{-2} \tag{16}$$

5 Empirical Results

5.1 CD and Homogeneity Test Results

The CD and homogeneity test results are presented in Table 2. According to the CD test results, the null hypothesis that there is no cross-sectional dependence was rejected at the significance level of 1%, and it was found that there was cross-sectional dependence in all the variables. Besides that, the presence of cross-sectional dependence was also detected in the results obtained from the models. Within this context, it was concluded that a shock in any country has an effect on the other countries. Based on the results of homogeneity test, the null hypothesis that the slope coefficients are homogeneous was rejected at the significance level of 1% for both models. Thus, it was determined that both panel data models are heterogeneous.

Tab. 2: *CD and Homogeneity Test Results*

CD Test	**Breusch and Pagan (1980) LM**	**Pesaran (2004) CD_{lm}**
Shadow	218.711***	5.015***
Corrupt	258.585***	7.433***
Trade	258.585***	7.433***
FDI	243.034***	6.49***
Unemp	568.514***	26.225***
Growth	268.711***	8.047***
Model (1)	159.033*	1.397*
Model (2)	163.32*	1.657**
Homogeneity test	**Delta Tilde**	**Delta Tilde$_{adj}$**
Model (1)	7.821***	10.197***
Model (2)	6.373***	8.309***

***, **, and * refer to statistical significance at 1%, 5%, and 10%, respectively.

5.2 Panel Unit Root Test Results

Since the cross-sectional dependence and heterogeneity were determined in variables and models using the relevant tests, the examination of the stationarity of variables was continued with the CIPS test, one of the second-generation panel unit root tests, which considers the heterogeneity and cross-sectional dependence. According to the test results, the null hypothesis assuming the presence of

unit root was not rejected for *Shadow, Corrupt, Trade, and Unemp* variables, and it was found that these variables had unit root at the level. On the other hand, the null hypothesis was rejected for *FDI* and *Growth* at the significance level of 1%, and it was found that these variables were stationary at the level. In conclusion, determining that the stationarity levels of variables were different, it was decided to use a cointegration test considering this situation (Table 3).

Tab. 3: *CIPS unit root test results*

	Shadow	**Corrupt**	**Trade**	**FDI**	**Unemp**	**Growth**
Level	-2.171	-1.830	-1.048	-2.563***	-1.795	-3.160***
First difference	-3.484***	-2.873***	-2.512***	-2.228**	-2.497***	-3.286***

*** and ** refer to statistical significance at the level of 1% and 5%, respectively. The maximum lag is 3. Schwarz information criterion is used in calculating the optimal lag. The CIPS statistics critical values for the model with constant are -2.45, -2.22, and -2.11, for 1%, 5%, and 10%, respectively.

5.3. Panel cointegration test results

In order to determine the long-term relationship between the variables after the unit root test, the Durbin-Hausman panel cointegration test, considering the stationarity of variables at different levels, was applied and the results are presented in Table 4. Since Model (1) and Model (2) are heterogeneous, the DHg (group) test statistics were considered. Accordingly, since the DHg test statistics' value of probability was lower than 1% in both models, the null hypothesis assuming that there is no cointegration relationship was rejected and it was found that there was a cointegration relationship for some cross-sectional units. As a result, there is a long-term significant relationship between the variables in both models.

Tab. 4: *DH Cointegration Test Results*

Durbin-Hausman Test	**Model (1)**	**Model (2)**
DHg (Group)	6.392***	43.411***
DHp (Panel)	-0.324	7.005

*** refers to statistical significance at the level of 1%. kmax is 5. Schwarz information criterion is used.

5.4 Long-Term Coefficient Estimation Test Results

Finally, in the analysis, the long-term coefficients of the variables were estimated using an CCE estimator that can be used in heterogeneous panels. Given the results of Model (1), it can be seen that the coefficient of *corrupt* is significant and negative (-0.1037). Considering that a decrease (increase) in *control of corruption* index, that is used as an indicator of corruption, means an increase in the level of corruption (decrease), it can be stated that the increase in the level of corruption increases the size of the shadow economy in low-income countries. On the other hand, the negative and significant coefficients of *Trade* and *Growth* variables indicate that the increase in trade openness and economic growth causes an effect that decreases the shadow economy in low-income countries. Finally, unemployment and foreign direct investment inflows in these countries create no significant effect on the shadow economy. According to the results obtained from Model (2), the coefficient of the *Shadow* variable is significant and negative (-0.0202). This finding indicates that an increase in the size of the shadow economy in low-income countries causes a higher level of corruption. However, control variables create no significant effect on corruption. Considering all the findings within the scope of study, it can be stated that corruption and the shadow economy are complementary in low-income countries.

Tab. 5: *CCE Estimation Results*

Model (1) Dependent variable: Shadow	**coefficient**	**Model (2) Dependent variable: Corrupt**	**coefficient**
Corrupt	-0.1037**	Shadow	-0.0202**
Trade	-0.0667**	Trade	-0.0004
FDI	0.0344	FDI	0.0088
Unemp	3.2778	Unemp	0.1604
Growth	-4.9798**	Growth	0.1690

** refers to statistical significance at the level of 5%.

6 Conclusions and Suggestions

In this study, the relationship between corruption and the shadow economy, seen in all countries throughout the world but at different levels and forms, was investigated for low-income countries. Detecting the relationship between these

two important global problems complicated sustainable development due to their significant social, political and economic costs, which is important since it guides governments in their efficiency struggle with these problems. On the other hand, in the relevant literature (theoretical and empirical), it was emphasized that the relationship between corruption and the shadow economy varies depending on factors such as countries' institutional development and income levels – complementary (positive) or substitution (negative) – and, hence, this relationship is uncertain. According to Dreher and Schneider (2010), these variables have a substitution relationship in high-income countries and a complementary one in low-income countries. In this study, which was carried out on seventeen low-income countries for the period 2002–2017 using panel data methods such as Westerlund (2008) cointegration test and CCE estimator, the aim was to contribute to the literature by answering the question '*if corruption and shadow economy are complementary*'. According to the empirical results obtained; (i) corruption and the shadow economy have a long-term relationship, (ii) corruption and the shadow economy positively affect each other, but the effect of corruption on the shadow economy is stronger than the effect of the shadow economy on corruption, and (iii) in parallel with the theoretical expectations, corruption and the shadow economy are complementary. Based on these findings, which are consistent with the results reported by Schneider (2007), Dreher and Schneider (2010), and Vo et al. (2015), it can be specified that the governments in low-income countries should incorporate policies that aim to decrease the shadow economy (*corruption*), in their strategy to fight against corruption (*shadow economy*).

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