The interrelationship between corruption and the shadow economy: a perspective on FDI and institutional quality

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Abstract

Purpose – This study explores the relationship between corruption and shadow economy (SE) by examining the potential links and interactions between these two phenomena to see whether it is a one-way or two-way relationship and a complementarity or substitution linkage.

Design/methodology/approach – Using a dataset comprised of 145 countries all over the world between 1996 and 2015, the authors apply the simultaneous two-step system generalized method of moments approach to address the research question.

Findings – The study findings support a positive bidirectional relationship between corruption and SE. As such, this study has provided evidence supporting the complementarity association. In the authors' further analyses, they point out that several factors can moderate this positive bidirectional linkage. In particular, while Foreign Direct Investment (FDI) inflows strengthen it, it is weakened by other institutional factors such as civil liberties and political rights. Finally, by splitting the full sample into three different subsamples and then examining countries at varying stages of economic development, the authors can gain valuable insights into the evolving dynamics of the relationship between corruption and SE. Specifically, while the authors observe that the positive direction of corruption to SE remains unchanged across different nations, they observe that the positive influence of SE on corruption is strongest among developed economies only.

Practical implications – The study findings provide an important policy implication. This study highlights the synergistic relationship between SE and corruption, indicating that reducing corruption will reduce the size of the SE. Consequently, this reduction in the SE can mitigate the adverse effects of corruption on economic development.

Originality/value – This paper is among the first empirical studies that critically investigate the interrelationship between SE and corruption. It then explores how this two-way linkage is conditional on some factors, such as economic development levels and institutional quality indicators.

Keywords SE, Corruption, Two-way linkage, Simultaneous equation, Institutional quality

Paper type Research paper

1. Introduction

The informal economy and corruption have existed worldwide for a long time, but governments and researchers have encountered difficulties mitigating these issues (Pillay, 2004; Xin and Rudel, 2004; Bowman and Gilligan, 2007). The growth of institutions (such as e-government) and technology has contributed to some issues by creating new opportunities for abuse and forcing outdated laws and regulations to catch up. However, perceiving these

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activities as separate could ignore some of the spillovers, making it harder to govern them (e.g. Choi and Thum, 2005; Virta, 2010; Goel and Saunoris, 2014, 2019).

Therefore, the question of whether Shadow economy (SE) substitutes or complements corruption remains unanswered. Although there is anecdotal evidence for several options, a thorough study is required to address these problems and provide conclusive findings. The existence of the SE can make it simpler to conceal illicit profits. In this instance, the causal relationship would be from corruption to the SE, making the two complementary. Contrarily, the SE would replace corruption if the prevalence of corruption led certain businesses underground to escape being discovered and the rent-seeking of dishonest authorities (Buehn and Schneider, 2012).

When shadow investors pay governmental authorities to conduct shadow activities, it leads to the complementarity between the underground economy and corruption. However, large bribes may shrink the SE and lead to some replacement. There are several circumstances in which the two criminal behaviors can exist independently. For instance, underhanded business practices that involve underreporting revenue (such as tips by wait staff) and these small differences escape the attention of tax authorities, or favor-trading corruption occurs when there is no cash or other assets to hide.

When considering the causes of corruption and/or the SE and any potential connections between them (stability, quality and freedom), one must reflect on the existence and function of the government. Understanding that corruption and the SE do not occur in anarchy, where no rent seekers have the authority to exact rents, sheds light on the government's function in this situation. Corruption can be utilized by bribe givers or corrupt authorities seeking benefits.

Corruption is generally associated with many activities, such as requesting or providing governmental benefits regarding business project approvals, access to natural resources and tax and penalty reductions. Meanwhile, the SE develops due to criminal activities like smuggling and a desire to evade taxes and laws. Given that those who engage in criminal activities cannot come out willingly, one may consider them to exist "passively" in the underground economy. Another critical difference between corruption and the SE is that while corrupt authorities may lower a person's or an organization's tax liability through the undervaluation process, these authorities are unlikely to remove their tax obligation altogether. In contrast, participants in the SE are exempt from paying taxes. Similar relative disparities can also be found in other situations, such as pollution. One aspect of the interaction may be that corrupt authorities feel empowered to engage in the SE by operating unlicensed taxis as a side business. There is not much evidence of the prevalence or recognition of this aspect. Given all of this, the linkage between these two issues may be unidirectional or bidirectional due to the multifaceted structure of both phenomena.

Although the existing literature has shown that corruption may either complement (Dreher and Schneider, 2010; Berdiev *et al.*, 2018; Gillanders and Parviainen, 2018) or substitute (Choi and Thum, 2005; Vo *et al.*, 2015; Berdiev *et al.*, 2018) SE, the bidirectional causality between them remains formally unexplored. Furthermore, other studies have pointed out that the relationship may depend on other factors. As such, this research seeks to resolve this gap in the literature by concentrating on the direction of causality between corruption and SE across time. We utilize a simultaneous two-step system generalized method of moments (GMM) model to do this, considering the dynamics of the market and corruption and the official economy's impacts and institutional integrity. Any research that employs a static model may only provide a partial understanding of the total process.

Our study can contribute to the existing literature in several aspects. First, although the current literature has acknowledged the connection between corruption and SE, no study has considered the possibility of bidirectional causality or complementarity between them. Our study is among the first to attempt to reveal new evidence that there is indeed a mutual

reinforcement between these two economic phenomena. Corruption leads to the growth of SE, and simultaneously, SE increases the levels of corruption. Second, we contribute to the literature in terms of methodology by using GMM estimation to establish the two-way linkage between corruption and SE while controlling for potential endogeneity problems.

Additionally, we add to the existing body of literature by demonstrating that the interaction between corruption and SE is contingent upon several channels, such as FDI inflows, civil liberties (CL) and political rights (PR). By advancing the understanding of the correlation between corruption and SE by applying GMM estimation, the study enhances the existing literature on corruption, informal economies and the broader socioeconomic implications. It provides valuable insights for policymakers, researchers and practitioners interested in combating corruption, reducing the magnitude of the SE and promoting transparent and accountable economic systems.

Our research findings indicate a positive bidirectional relationship between corruption and SE, thus supporting the association of complementarity between the two economic phenomena. Furthermore, our additional analyses reveal that various factors can influence this positive association. Specifically, FDI inflows strengthen the link, while other institutional factors, such as CL and PR, weaken it. Moreover, we gain further insights by dividing our complete sample into three distinct subgroups based on economic development – developed countries, developing countries and transition countries. Specifically, we observe that the positive influence of corruption on SE remains consistent across different nations. However, the positive impact of SE on corruption is most pronounced only in developed economies.

The subsequent sections of this study are structured as follows: an overview of the literature is outlined in Section 2. Section 3 describes the empirical methodology and data, and Section 4 concludes.

2. Literature review

Government failings and the informal economy (SE) are frequently deeply entwined (Buehn and Schneider, 2012). Since corruption is one type of government failure, it should be no surprise that these two phenomena may be positively or negatively associated. Unfortunately, the mechanism behind this complementarity or substitutability relationship is still unclear.

At first instance, some argue that corruption and SE exhibit complementarity and share a positive relationship. Corruption acts as a "tax" on the official sector, promoting the output in the unauthorized sector. For instance, individuals are motivated to engage in underground activities when corrupt government officials demand bribes for licenses and permissions, leading to a shift from the official sector to the shadow sector. This perspective suggests that corruption drives businesses underground, and the shadow sector production replaces that of the official sector. Previous scholars (e.g. Johnson *et al.*, 1997; Friedman *et al.*, 2000; Hibbs and Piculescu, 2005) have pointed out that one channel of this positive association is through the labor force as employees participate in both the official and unofficial economy to escape regulations and deal with dishonest government officials. These studies indicate a causal link between corruption and SE.

Conversely, a contrary link may occur when larger shadow economies motivate dishonest public authorities to demand bribes from shadow players who want to remain undetected, covert or avoid paying taxes and other regulations. The fact that both effects reinforce one another suggests a two-way linkage. Empirically, Buehn and Schneider (2012) discovered a positive bidirectional association, although the effect is stronger for the impact of SE on corruption. SE protects from government distortions brought on by corruption, restricting corrupt authorities' ability to amass wealth. In other words, SE encourages trade freedom and

supports the formal economy by reducing corruption levels. Additionally, when considering government centralization, the theoretical framework developed by Echazu and Bose (2008) suggests that corruption may replace SE. Furthermore, by taking institutional quality into account, Dreher *et al.* (2009) demonstrate that while corruption and SE may coexist, the quality of institutional factors lowers these two phenomena.

On the other hand, if dishonest authorities seek out shadow actors for bribes, the SE would find it increasingly difficult to flourish and eventually disappear, resulting in its decline. As pointed out in the "grease the wheels" theory, corruption acts as a conduit for eliminating bureaucratic red tape, thus speeding up the process of approving projects and providing access to natural resources. In this case, corruption supports the productivity of the official sector. The theoretical model of heterogeneous entrepreneurs constructed by Choi and Thum (2005) confirms that entrepreneurs' migration to SE restrains government corruption, suggesting that these two factors can be mutually substituted or interchanged. Two-way substitutability may also occur when both adverse effects are amplified. Finally, it is possible that corruption may not be correlated with SE, as suggested by Dreher and Schneider (2010).

Empirically, Dreher and Schneider's (2010) study based on a panel dataset of 98 nations demonstrates the complementarity between corruption and SE, showing that people can hold corrupt leaders responsible in high-income nations with robust legal systems. For instance, the official sector uses the typically low corruption levels among developed nations to win government contracts. In contrast, corruption is frequently required in low-income nations to cover up illegal economic activities (Goel and Saunoris, 2014). Despite discovering considerable geographical spillovers, they also find a minor negative (substitutability) effect of the shadow economy on corruption, contrasting with the complement association. Others have reached contradictory conclusions about corruption and SE's fundamental connection (Batrancea *et al.*, 2018).

It is worth noting that there is a chance that none of those aforementioned theories will be true, and corruption is, in fact, not related to SE. The two may be treated as distinct when creating measures to contain or eradicate them, which would also be instructive. Additionally, the directional corruption–SE nexus may remain inconclusive. This is because when corruption pushes individual underground, corruption may initially positively impact SE. However, as more participants enter the underground economy, bribe opportunities decrease. This relationship may alter over time, shifting from complementarity to substitutability, as SE can expand or constrain corrupt authorities.

2.1 Research hypothesis

In our study, we initially suggest that corruption plays a prominent role in promoting and enabling the emergence of SE through diverse channels and mechanisms. We posit that corruption acts as a catalyst for informal and clandestine economic endeavors, ultimately fueling the growth of the SE. The hypothesis suggests that elevated levels of corruption motivate individuals and businesses to partake in unlawful activities like tax evasion, bribery and money laundering, thereby fostering the growth of SE. First, according to the institutional capture argument, corruption enables some people or organizations to seize control of official institutions and use them for their financial advantage. In this situation, corruption might help the SE expand by fostering a climate encouraging illegal and covert activity. These actions frequently try to get around laws and acquire unfair benefits.

Second, rather than emphasizing the production of new wealth, the rent-seeking behavior paradigm advocates pursuing personal benefit by redistributing available resources. Corruption may encourage rent-seeking behavior, which might encourage people and companies to engage in illegal activities within the SE. Bribery, embezzlement and fraud are some of the actions that may happen, and they all help the SE grow. Third, according to the

theory of the informal economy as a reaction to corruption, the SE may occasionally be viewed as a reaction to extreme levels of corruption inside formal institutions. When corruption is pervasive, and official institutions are seen as untrustworthy or unfair, people and enterprises may choose to do business through informal channels. This may entail participating in shady business dealings, unreported employment or illegal business dealings, which would support the SE's growth. Fourth, the idea of bribery and informal networks emphasizes how bribery and corrupt transactions frequently depend on informal networks. These networks act as means for doing business outside the established channels, enabling people and companies to function inside the SE. These informal networks are further strengthened by endemic corruption, which also helps the SE to expand. The study hypothesis contends, in light of these theoretical stances, that corruption contributes to the growth of SE. Corruption creates an atmosphere favorable for the development and spread of the SE, together with other elements such as institutional capture, rent-seeking behavior, informal reactions to corruption and bribery within informal networks.

Based on these theoretical perspectives, the research hypothesis suggests that corruption has a favorable effect on the expansion and prominence of the SE. Corruption, in conjunction with factors like institutional capture, rent-seeking behavior, informal responses to corruption and bribery within informal networks, establishes an environment conducive to the growth and proliferation of the SE. As such, we test the following hypothesis:

H1. Corruption exerts a favorable influence on the growth of SE.

Our second hypothesis is that the existence of an SE has a favorable effect on the incidence and pervasiveness of corruption. This implies that a more extensive SE supports and facilitates corrupt behaviors by creating a favorable atmosphere. As the absence of transparency, accountability and effective regulation weakens formal institutions and encourages corrupt behavior, the hypothesis suggests that the informal and unregulated structure of the SE creates possibilities for corruption to flourish. Numerous theories lend support for our second hypothesis emphasizing the possible beneficial impact of the SE on corruption. First, according to the institutional void theory, the development of SE is driven by deficiencies in formal institutional frameworks, such as poor governance, too much red tape and inefficient regulation. The SE solves unmet economic demands in these situations as an alternate system. However, the absence of official monitoring and responsibility inside the SE fosters a corrupt atmosphere.

Second, the theory of informal networks and social capital contends that the SE frequently relies on these networks, marked by individuals' social ties, mutual trust and reciprocity. While these networks support economic activity outside of the regulated industry, they also have the potential to support corrupt behavior. As a result, informal networks can undermine fairness and openness by acting as conduits for corruption, nepotism and favoritism. Third, as the moral disengagement theory contends, people and organizations in the SE frequently use moral disengagement mechanisms to justify their participation in illegal actions. They could disregard morality in favor of seeing corruption as a vital tool for survival or upward mobility in the unorganized sector of the economy. This lack of moral engagement can strengthen and spread unethical behavior. Finally, the theory of informality and lack of accountability, which holds that the SE is informal because there are no formal contracts, records or transparency, contends that this lack of formality fosters an atmosphere where corrupt behavior may go unreported and unpunished. Since people may conduct illegal activities without worrying about the repercussions of their acts, the absence of accountability systems promotes the growth of corrupt behaviors. Based on these theoretical viewpoints, we propose the following hypothesis.

H2. SE has a positive effect on the prevalence of corruption.

3. Data, sample overview and the simultaneous equations model

In this study, we used the World Development Indicators database, which the World Bank puts together, to get information on corruption and other macroeconomic aspects. Additionally, information about SE was achieved from Medina and Schneider's (2018) study. Instead of simply depending on gross domestic product (GDP), Medina and Schneider (2018) used a light intensity method as a substitute indicator variable. They also ran several robustness tests to establish the validity of their findings. Furthermore, properly calibrating the Multiple Indicators Multiple Causes (MIMIC) estimates of the shadow economy has been the subject of a protracted and heated controversy. The study's authors used the predictive mean matching (PMM) method, an independent technique, to overcome these difficulties. This technique improved the shadow economy's size estimations and impact accuracy and dependability.

This approach helps mitigate the issues associated with estimating the shadow economy. In summary, the study conducted by Medina and Schneider (2018) stands out as one of the pioneering attempts to incorporate the light intensity approach as an indicator variable in the MIMIC framework. Additionally, they used the PMM method to provide shadow economy estimates for 158 countries worldwide from 1991 to 2015, addressing early criticisms. Unfortunately, these data are only available until 2015, resulting in our studied period spanning 1996 to 2015. Table 1 includes a complete list of variables' names, definitions and sources; meanwhile, Tables 2 and 3 offer descriptive statistics and a correlation matrix, respectively. After removing any observations with insufficient information, our final sample consisted of 2359 observations from 145 countries.

Given the fact that both corruption and SE can be endogenous variables, and to examine the dynamic two-way causal link between them, we utilize the simultaneous two-step system GMM equation as follows:

$$\begin{aligned} Corruption_{it} = {} & \beta_0 + \beta_1 Shadow\ Economy_{it} + \beta_2 Trade\ Openess_{it} + \beta_3 Population\ Density_{it} \\ & + \beta_4 Telecommunication_{it} + \beta_5 Domestic\ Investment_{it} + \beta_6 Land\ Size_{it} \\ & + Country\ \&\ Year\ FEs + \mu_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} Shadow\ Economy_{it} = {} & \alpha_0 + \alpha_1 Corruption_{it} + \alpha_2 Trade\ Openess_{it} \\ & + \alpha_3 Population\ Density_{it} + \alpha_4 Telecommunication_{it} \\ & + \alpha_5 Domestic\ Investment_{it} + Country\ \&\ Year\ FEs + \varepsilon_{it} \end{aligned} \tag{2}$$

Variables	Definition	Sources
Corruption	The corruption index, of which a value of 0 represents non-corruption and 100 means a completely corruption	World Bank
SE	The share of the SE to GDP	Medina and Schneider (2018)
Trade Openness	The ratio of (total exports + total imports) to GDP	World Bank
Population Density	Natural logarithm of total population per square kilometer	World Bank
Telecommunication	Natural logarithm of total telephone lines (fixed and mobile) per 100 people in the host country	World Bank
Domestic Investment	Ratio of gross capital formation to GDP	World Bank
Land Size	The natural logarithm of a country's total land area	World Bank

Table 1. Variable description

Source(s): Authors' own work

The ordinary least squares estimate can exhibit significant bias when the number of time periods is small, as highlighted by Baltagi and Baltagi (2008). This bias arises due to the correlation between the lagged values of the dependent variable and the fixed effects. To address this issue, Arellano and Bond (1991) propose a GMM estimator, the difference GMM, which eliminates fixed effects through a differencing transformation. However, the difference transformation introduces a challenge known as the weak instrument problem when the dynamic terms are close to unity. To overcome this limitation, Arellano and Bover (1995) and Blundell and Bond (1998) introduce a system of two equations called system GMM, which incorporates both levels and first differences in the analysis. This approach provides a more robust estimation method to account for the presence of fixed effects and the potential weakness of instruments. Following these authors, we simultaneously estimate models (1) and (2) by employing the two-step system GMM estimator since *Corruption* and *SE* represent the endogenous variables on the right-hand side of each specification in our specifications. Doing so can address potential concerns related to endogeneity and omitted variables.

In our model, instrumental variables were utilized, including lagged dependent and independent variables up to lag 4 and differenced country-specific control variables up to the lag 5. Our results from columns 1 and 2 of Table 4 show that corruption and SE are simultaneously determined. Regarding other control variables, we calculate *Trade Openness* is quantified as the ratio of the aggregate value of total exports and total imports to the GDP; *Population Density* is the share of the total population in the middle year with total land area calculated in square kilometers; *Telecommunication* indicates the development of infrastructure in a country and is determined by the total number of telephone lines, encompassing both fixed and mobile lines, per 100 individuals; *Domestic Investment* is a binary variable that takes on a value of one to indicate that an investment originates from the domestic market and zero if not; *Land Size* is quantified using the logarithm of a nation's land area. Finally, *Country & Year FEs* are country- and year-fixed effects included in the model to control for characteristics that are constant over time and specific to each country.

Variable	N	Mean	SD	p25	p50	p75	Min	Max
SE	2359	0.3038	0.1258	0.2103	0.3063	0.3901	0.0783	0.6379
Corruption	2359	0.5083	0.2898	0.2732	0.5220	0.7644	0.0049	0.9854
Trade Openness	2359	0.8769	0.4967	0.5524	0.7729	1.0595	0.2157	3.3413
Population Density	2359	10.9541	1.4081	10.0461	11.0971	11.8021	7.7842	14.1258
Telecommunication	2359	3.7810	1.5189	3.2084	4.3388	4.9041	−1.3117	5.2754
Domestic Investment	2359	0.7840	2.3300	0.0165	0.0634	0.4350	0.0003	17.5000
Land Size	2359	0.1199	0.0200	0.1078	0.1219	0.1327	0.0577	0.1605

Source(s): Authors' own work

Table 2.
Summary statistics

	Variables	1	2	3	4	5	6	7
1	SE	1						
2	Corruption	0.6759	1					
3	Trade Openness	−0.179	−0.1999	1				
4	Population Density	−0.0659	−0.0732	0.139	1			
5	Telecommunication	−0.5065	−0.4658	0.222	0.1013	1		
6	Domestic Investment	−0.3714	−0.2572	−0.2136	0.0993	0.2072	1	
7	Land Size	0.0176	0.1839	−0.4977	−0.5676	−0.0798	0.3366	1

Source(s): Authors' own work

Table 3.
Correlation matrix

Variables	(1) SE	(2) Corruption
Corruption	*0.157***	
	(0.034)	
SE		*1.843***
		(0.354)
Trade openness	−0.050***	0.062
	(0.014)	(0.043)
Population Density	−0.005	0.044**
	(0.008)	(0.021)
Telecommunication	−0.022***	−0.006
	(0.003)	(0.013)
Domestic Investment	−0.000***	−0.000
	(0.000)	(0.000)
Land Size	−0.906	5.748***
	(0.706)	(1.653)
Constant	0.504***	−1.234***
	(0.150)	(0.419)
Observations	2,359	2,359
Number of Countries	145	145
Country FEs	YES	YES
Year FEs	YES	YES
AR(1)	−2.11 (0.009)	−2.37 (0.018)
AR(2)	1.57 (0.115)	1.26 (0.794)
Sargan test (p-value)	69.65 (0.000)	92.36 (0.000)

Note(s): Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

Table 4.
Corruption and SE – a two-way linkage

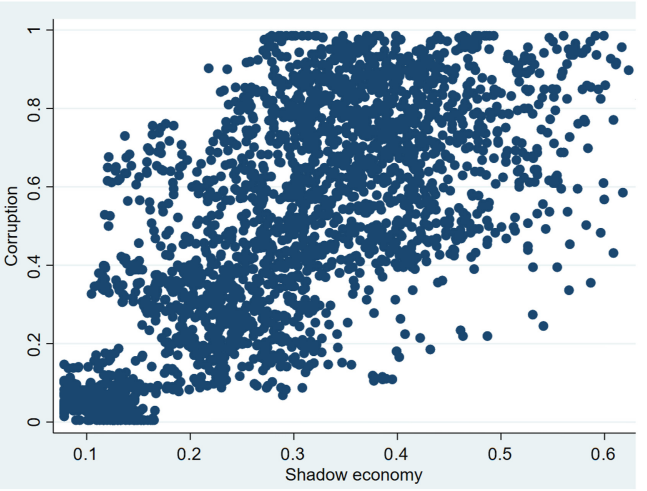
4. Empirical results

4.1 Corruption and SE: a two-way relationship

Figure 1 offers preliminary evidence suggesting a positive correlation between corruption and the shadow economy, while Table 4 provides the regression findings for model (1), which investigates the linkage between our two main variables of interest. In particular, the results regarding the influence of corruption on the SE are presented in the first column of the table, while the reverse influence of the latter on the former is then illustrated in column 2 of the table. The estimated corruption coefficient is positive and statistically significant, suggesting that a higher level of corruption is positively linked to SE. Thus, our results lend support for a complementary association.

Similarly, we observe a positive and statistically significant coefficient for *SE* in the second column of the table. Thus, our result reveals the critical finding that a higher ratio of SE to GDP in a specific nation promotes an elevated level of corruption in that country. Economically significant, a one-standard-deviation increase in *SE* will lead to a rise in corruption level in a country by 1.843%.

Our results for control variables also provide several insights. The findings reveal that the coefficient of trade ratio is negative and statistically significant, implying that a higher level of trade openness reduces SE. One possible reason is that people are less likely to operate in the underground economy when trade openness brings more opportunities for economic growth. Since people are more optimistic about economic development and their countries' prosperity, they tend to engage in less illegal business activities. Similarly, we find that a more developed telecommunication infrastructure and a higher proportion of domestic



Source(s): Authors' own work

Figure 1.
Scatterplot illustrating the positive association between corruption and the shadow economy

investment will lead to a smaller size of SE, as indicated by the negative sign of the coefficients of the *Telecommunication* and *Domestic Investment* variables, respectively. Concerning the corruption equation, we find that a rise in population density and increased land size make corruption more prevalent.

The diagnostic tests involve conducting a Sargan test on overidentifying restrictions and test for the presence of an autoregressive process of first and second order. The results, as indicated in the three final lines of Table 4, demonstrate that the Sargan test does not reject the validity of the instruments at a significance level of 1%. Furthermore, the tests for serial correlation of the residuals indicate that we can reject the first-order autoregressive process, while we cannot reject the second-order autoregressive process, which aligns with the theoretical expectations.

4.2 Developed and developing countries' subsamples

The factors in our research design may not adequately account for structural differences between developed and developing countries. Therefore, in the next section, we are motivated to look for disparities between high- and low-income nations using World Bank (2003) classifications (Dreher and Schneider, 2010). Accordingly, we re-estimate model (1) for three subsamples of developed, developing and transition countries. Our findings for these subsamples are then demonstrated in columns 1–6 of Table 5. Overall, our research findings highlight the importance of geographic factors in affecting the linkage between corruption and SE. First, our analysis demonstrates that the positive influences of corruption are unchanged across the three samples. Second, we show that the positive effect of SE for the developed countries group only, or in other words, the two-way complementarity relationship, is more pronounced for developed countries.

4.3 The role of FDI

The existing literature (e.g. Leff, 1964; Wheeler and Mody, 1992; Bardhan, 1997; Cuervo-Cazurra, 2008; Barassi and Zhou, 2012) has pointed out that corruption is a way of generating "lubricants" in countries having inefficient legal systems so that investors can use it to gain

Variables	SE (1) Developed	(2) Developing	(3) Transition	Corruption (4) Developed	(5) Developing	(6) Transition
Corruption	*0.145**	*0.108***	*0.189***			
	(0.075)	*(0.045)*	*(0.091)*			
SE				*2.419****	0.499	0.894
				(0.341)	(0.360)	(0.598)
Trade Openness	−0.048***	−0.050**	−0.085**	0.086**	0.050	0.028
	(0.016)	(0.022)	(0.039)	(0.042)	(0.058)	(0.078)
Population Density	0.005	−0.011	−0.032*	0.032*	0.023	−0.004
	(0.007)	(0.010)	(0.017)	(0.019)	(0.028)	(0.052)
Telecommunication	−0.039***	−0.018***	−0.024***	0.037	−0.025**	−0.046
	(0.010)	(0.003)	(0.008)	(0.025)	(0.011)	(0.032)
Domestic	−0.000	−0.000***	−0.000**	0.000	−0.000	−0.000
Investment	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Land Size	−1.777*	−0.368	−1.675	5.314**	3.667*	5.559
	(0.915)	(0.812)	(1.124)	(2.416)	(2.111)	(3.446)
Constant	0.547***	0.529***	0.924***	−1.483***	−0.194	−0.134
	(0.178)	(0.173)	(0.312)	(0.505)	(0.591)	(0.986)
Observations	589	1,402	401	589	1,402	401
Number of Countries	35	86	24	35	86	24
Country FEs	YES	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES	YES
AR(1)	−1.61	−1.16	−2.51	−2.53	−2.93	−2.07
	(0.008)	(0.001)	(0.007)	(0.000)	(0.003)	(0.002)
AR(2)	1.85	1.08	2.51	2.43	1.02	1.27
	(0.165)	(0.278)	(0.571)	(0.990)	(0.307)	(0.205)
Sargan test	68.67	62.80	66.07	69.65	59.60	61.03
(*p*-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 5.
Developed, developing and transition countries subsamples

Note(s): Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

market penetration, resource access and business efficiency. Furthermore, previous studies (e.g. Chiarini *et al.*, 2013; Ali and Bohara, 2017) have also documented FDI as a determinant of SE. Accordingly, foreign investors tend to invest in countries with an immense SE to benefit from the potential tax evasion. Under these circumstances, we are motivated to explore whether the two-way linkage between the two factors mentioned above that has been found in earlier parts undergoes alterations when considering the existence of FDI. As such, in this section, we incorporate the variable *FDI* and its two interaction terms *FDI* × *Corruption* and *FDI* × *SE* into the baseline model. *FDI* is quantified as the logarithm of the amount of FDI inward flows into a country. We then illustrate our results in Table 6. As shown in the first and second columns of the table, the coefficients of both interaction terms *FDI* × *Corruption* and *FDI* × *SE* are positive and significant. Thus, this finding suggests that FDI has strengthened the positive two-way association between corruption and SE.

4.4 The role of civil law and political right

Enhancing institutions play a critical role in reducing the size of the SE and addressing corruption. Therefore, it is essential to direct attention to the government's role and regulations and the quality of institutions, such as CL and PR, to tackle corruption effectively.

Variables	(1) SE	(2) Corruption
Corruption × FDI	*0.040***	
	(0.017)	
SE × FDI		*0.324****
		(0.109)
Corruption	−0.119	
	(0.143)	
SE		−0.786
		(0.851)
FDI	−0.022**	−0.128***
	(0.009)	(0.034)
Trade Openness	−0.025*	0.110***
	(0.013)	(0.032)
Population Density	−0.003	0.059***
	(0.008)	(0.018)
Telecommunication	−0.023***	−0.007
	(0.004)	(0.011)
Domestic Investment	−0.000	0.000
	(0.000)	(0.000)
Land Size	−0.766	7.267***
	(0.645)	(1.507)
Constant	0.623***	−0.589
	(0.172)	(0.507)
Observations	2,244	2,244
Number of Countries	145	145
Country FEs	YES	YES
Year FEs	YES	YES
AR(1)	−2.80 (0.005)	−3.19 (0.001)
AR(2)	1.99 (0.147)	1.14 (0.967)
Sargan test (*p*-value)	89.81 (0.005)	91.35 (0.000)

Note(s): Standard errors in parentheses
***$p<0.01$, **$p<0.05$, *$p<0.1$
Source(s): Authors' own work

Table 6.
The role of FDI

As such, whether better institutional factors may weaken the positive relationship between corruption and SE or not has become essential and interesting, yet unanswered. For this reason, we are encouraged to examine the moderating role of these factors further. As such, we add to our baseline model the variable CL and its two interaction terms: *Corruption × CL* and *SE × CL*. CL are the indexes that reflect information about the freedom of belief, organizational rights, rule of law and individual rights. Data on CL are obtained from the Freedom House database. Similarly, we also incorporate into the model the variable *PR* that reflects the PR index and its two interaction terms that are *Corruption × PR* and *SE × PR*. The variable *PR* is used to control for factors including the electoral process, political participation and government function, and its data are also collected from the Freedom House database.

Our findings on the moderating role of CL and PR are then illustrated in Table 7 and Table 8, respectively. Accordingly, regarding CL, we find negative and significant coefficients of *Corruption × CL* and *SE × CL*. Therefore, our results indicate that CL has weakened the positive two-way linkage between corruption and SE. Concerning the PR variable, we find a significant result for a weakening effect of *PR* on the impact of SE only.

Variables	(1) SE	(2) Corruption
Corruption × CL	*−0.047**	
	(0.028)	
SE × CL		*−0.259***
		(0.102)
Corruption	0.305***	
	(0.091)	
SE		1.677***
		(0.399)
CL	0.027*	0.143***
	(0.015)	(0.033)
Trade Openness	−0.033**	0.029
	(0.016)	(0.040)
Population Density	−0.010	0.038**
	(0.008)	(0.015)
Telecommunication	−0.022***	−0.021*
	(0.003)	(0.011)
Domestic Investment	−0.000**	−0.000*
	(0.000)	(0.000)
Land Size	−0.708	5.062***
	(0.808)	(1.379)
Constant	0.450**	−1.138***
	(0.181)	(0.329)
Observations	2,022	2,022
Number of Countries	145	145
Country FEs	YES	YES
Year FEs	YES	YES
AR(1)	−2.81	−2.57
	(0.005)	(0.011)
AR(2)	1.10	1.67
	(0.270)	(0.194)
Sargan test (*p*-value)	109.22	95.34
	(0.000)	(0.000)

Note(s): Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

Table 7.
The role of civil liberties (CL)

5. Conclusion

This study investigates the association between corruption and SE to see whether it is a one-way or two-way relationship and a complementarity or substitution linkage. Based on a panel dataset comprised of 145 countries all over the world between 1996 and 2015, we apply the simultaneous two-step system GMM approach to address the endogeneity concern. Our findings have shown that corruption and SE are a positive two-way linkage. As such, our study has provided evidence supporting the complementarity association. In our further analyses, we point out that several factors can moderate this positive bidirectional linkage. In particular, while FDI inflows strengthen it, it is weakened by other institutional factors such as CL and PR. Finally, we can obtain further insights by splitting our full sample into three distinct subgroups with different levels of economic development, namely developed countries, developing countries and transition countries. We show that corruption has a favorable impact on SE that is constant across different countries. However, we notice that SE only significantly impacts corruption in developed economies.

Variables	(1) SE	(2) Corruption
Corruption × PR		−0.001
		(0.037)
SE × PR	*−0.173***	
	(0.080)	
Corruption		0.162
		(0.135)
SE	1.477***	
	(0.329)	
PR	0.104***	0.005
	(0.026)	(0.019)
Trade Openness	−0.001	−0.042***
	(0.037)	(0.015)
Population Density	0.031**	−0.003
	(0.015)	(0.008)
Telecommunication	−0.023***	−0.021***
	(0.009)	(0.003)
Domestic Investment	−0.000**	−0.000***
	(0.000)	(0.000)
Land Size	4.219***	−0.479
	(1.160)	(0.728)
Constant	−0.821***	0.414**
	(0.312)	(0.170)
Observations	2,022	2,022
Number of Countries	145	145
Country FEs	YES	YES
Year FEs	YES	YES
AR(1)	−3.51 (0.00)	−3.53 (0.008)
AR(2)	1.92 (0.358)	1.64 (0.125)
Sargan test (*p*-value)	92.47 (0.000)	90.51 (0.000)

Note(s): Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

Table 8.
The role of political rights (PR)

The results of our study have significant policy recommendations for governments. First, given how closely SE and corruption are related, it is essential to prioritize and intensify measures to fight corruption. This entails establishing and upholding solid legal frameworks, encouraging openness and accountability in the public and private sectors and ensuring that the corrupt activity is effectively investigated and prosecuted. Second, officials should concentrate on regulating and formalizing informal economic activity in light of the SE's impact on corruption. This may be done by simplifying bureaucratic processes, cutting back on unnecessary restrictions and offering incentives for informal enterprises to move into the formal economy. The SE's size and influence might be reduced to lessen the likelihood of corruption. Third, combating corruption and the SE requires strengthening governance and fostering institutional integrity. This calls for advancing open decision-making procedures, enhancing the efficiency and impartiality of regulatory agencies and enhancing public sector administration. The motivation to engage in corrupt behavior inside the SE can be lessened by developing a culture of trust and accountability. Fourth, strengthening financial controls and transparency can help limit the potential for corruption inside the SE. This entails bolstering financial intelligence systems, tightening anti-money laundering laws and encouraging global collaboration to counteract illegal financial flows. Corrupt actions can be

prevented by limiting illicit cash flow and strengthening financial control. Fifth, it is essential to educate the public about the adverse effects of corruption and SE through public awareness initiatives. These programs must raise public understanding of the ethical, social and economic repercussions of engaging in unethical behavior and the SE. Individuals and companies may be more likely to shun dishonest behavior and support established economic institutions if an environment of integrity and openness is promoted.

A thorough and varied strategy is needed to address the beneficial bidirectional link between corruption and SE. Governments may try to reduce corruption and mitigate the detrimental effects of SE on socioeconomic growth by enacting the aforementioned legislative measures. Societies may aim to reduce corruption and ensure sustainable economic growth by enacting specific laws. These policies should regulate the SE, improve governance, combat corruption and promote financial transparency. The availability and quality of data on corruption and the SE can limit the study's conclusions. Getting accurate and complete data on these complex and frequently hidden events can be challenging, which could lead to measurement issues and analytical constraints. Furthermore, while endogeneity is possible, determining a causal link between corruption and SE might be challenging.

Future research might investigate the underlying processes and determine elements supporting the reciprocal relationship between corruption and the socioeconomic environment (SE). This might include looking at specific routes, such as unofficial networks and behaviors related to rent-seeking, and how these aspects mediate the link. Additionally, future research is needed to assess the impact of policy interventions to address the bidirectional association between corruption and SE. By evaluating the results of anti-corruption measures, regulatory changes and enhancements in governance, researchers can identify effective strategies and formulate policy suggestions to diminish corruption and restrain SE. By pursuing these future research directions and addressing the limitations, scholars can enhance our comprehension of the intricate bidirectional relationship between corruption and SE. This knowledge can subsequently inform evidence-based policies and interventions to mitigate the adverse impacts of corruption and the SE.

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