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Nexus of Shadow Economy and Corruption Control: Evidence from Developing Country's Sample

Muhammad Farhan Riaz[1], Muhammad Azmat Hayat[2]

[1] Assistant Professor, Government Shalimar Graduate College, Higher Education Department, Government of the Punjab, Lahore, Pakistan. Email: m.farhan.scholar@gmail.com
[2] Associate Professor, Department of Econometrics and Quantitative Methods, School of Economics, University of the Punjab, Lahore, Pakistan. Email: azmathayat.eco@pu.edu.pk

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ABSTRACT

The current literature shows the ambiguous relationship between corruption and shadow economy, specifically in the case of developing countries, because most of the earlier research system on judicial corruption was not incorporated while measuring different corruption indices. This study has used dynamic judicial indicators to observe corruption control as a latent variable to contribute to an advanced analysis of the nexus between shadow economy and corruption. It has employed an unbalanced panel data of 65 developing countries from 2000-2019 to investigate this relationship empirically. Confirmatory Factor Analysis and Multiple Indicator and Multiple Causes Models are used to estimate the magnitudes and signs of various dimensions and causes of corruption control, shadow economy, and their nexus. The results of this study suggest that robust judicial indicators and a more independent judicial system significantly reduce corruption and consequently shrink the shadow economy. Thus, it supports the maxim that the shadow economy and corruption, particularly those in developing countries, are complementary while empirically contradicting the notion that the shadow economy and corruption are substitutes. This study finds a substantial and positive connection between cash holdings and labor force participation rate with shadow economic activities and also predicted an inverse relationship between GDP per capita with the shadow economy.

Corresponding Author's Email: m.farhan.scholar@gmail.com

1. Introduction

Shadow economy includes economic activities that are not counted in the country's gross domestic product (GDP). The activities that drive income by avoiding government regulation, taxation, or observation operate under shadow economy (Smith, 1994). In many developing countries, increased burden of regulations, less business freedom, poor quality of public goods and services, and unstable GDP are the leading causes and indicators of shadow economic activities. Corruption is the use of publicly authorized rights and authority for personal benefit. It entails criminal acts that result from violations of the rule of law and poor governance and judicial system. Bad governance breeds corruption, lowering governance quality (Blackburn & Forgues-Puccio, 2009). Estimating corruption levels across nations is challenging due to the vast diversity of corrupt activities and manifestations of corruption. Previous research used different estimation methods on different sample sizes to assess the impact of corruption on the shadow economy or vice versa. For example, Johnson, Kaufmann, Shleifer, Goldman, and Weitzman (1997) discovered that corruption has a positive impact on the shadow economy (while hurting the official economy) in a sample of only 15 nations.

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Bribing government officials caught operating in the shadow market is hardly an option in high-income nations. Thus, corruption should not be related to the scale of the shadow economy. According to Choi and Thum (2005), the shadow economy can alleviate government-induced inefficiencies. Entrepreneurs in developed countries do not pay bribes due to a robust judicial system where they can bring government officials to court quickly. In low-income nations, on the other hand, entrepreneurs involved in the shadow economy might expect to avoid incarceration if their illicit activity is discovered. In exchange for a bribe, officials conspire with entrepreneurs (Hindriks, Keen, & Muthoo, 1999). According to Hibbs Jr and Piculescu (2005), corrupt bureaucrats might exploit economic possibilities in the informal sector by collaborating with entrepreneurs. The extent to which corruption and the shadow economy complement or substitute one other is likely to differ between wealthy and low-income economies, where in rich developed nations judicial system is working more efficiently than in underdeveloped countries. Furthermore, the evidence now available is inconsistent and inadequate.

There is general perception that corruption is greatly linked with the shadow economy (Friedman, Johnson, Kaufmann, & Zoido-Lobaton, 2000). The use of perception-based corruption indexes (formal models) has recently been brought into question. One issue with these indexes is unclear what they truly measure. Citizens' attitudes in nations with various institutional settings may differ according to their subjective interpretations. According to Abramo (2008), corruption is not a determinant of bribery. Similarly, Mocan (2008)also believes that once other relevant factors are accounted for, perceived corruption becomes irrelevant to the crime. The literature suggests many indexes are developed and used to measure corruption, including the Corruption Perception Index, Control of Corruption Index, and International Country Risk Guide. At the same time, studies also showed no relationship between corruption and the shadow economy. The study conducted by Dreher and Schneider (2010) developed a new corruption index by using structural equation model (SEM) and showed shadow economy and corruption as complements. To empirically investigate the relationship between two variables, another improved method of corruption measurement that is not reliant on perceptions is required. As a result, we shall utilize corruption control estimates in this article to reflect the freedom of corrupt activities in developing nations. International institutions such as the World Bank and IMF require that developing countries should control corruption. It is compulsory to address the relationship between crime and the shadow economy for successful anti-corruption measures in developing countries.

This study contributes to the existing literature by using vital judicial indicators to observe corruption control as a latent measure to check the relationship between shadow economy and corruption in developing nations. This paper will empirically explore that corrupted features of the judicial system, the rule of law, and a wobbly state of the official economy are major reasons for shadow economic activity. In addition, this paper will also empirically investigate various causes of the shadow economy and corruption control, as it is not easy to gather information about the causes of these illegal activities and quantify them for reasonable policy recommendations. The present study has estimated corruption control and shadow economy variables as latent variables through SEM as measured by Berdiev, Goel, and Saunoris (2018); Buehn and Schneider (2008) and Johnson et al. (1997). This study used a panel data set of 65 developing nations from 2000 to 2019. This sample of developing countries is based on the availability of data and all the missing values from the developing countries sample have been removed from the data.

2. Literature Review

During the past two decades, many studies empirically tried to determine the concept of shadow economy and corruption. Various studies have used several methods to estimate both variables quantitatively. Choi and Thum (2005)discussed that the shadow economy reduces distortions in the formal economy and prevents officials from achieving personal benefits as substitutes. Buehn and Schneider (2008) used the EMIMIC model and estimated the cointegrated equilibrium relationship for the long run. They concluded that this statistical method would benefit future researchers and policymakers in the context of the shadow economy only. Their research concentrates only on statistical applications rather than discovering new causes and indicators of the shadow economy. Again Buehn and Schneider (2009) measured corruption and shadow economy concepts through SEM and found a positive

and significant relationship between the two variables. Furthermore, corruption influences the shadow economy less than the shadow economy influences corruption.

Most importantly, Dreher and Schneider (2010) criticized that the shadow economy has no robust relationship with different perception-based indices of corruption. However, when they employed a SEM, their outcomes showed shadow economy and corruption as complement for low-income countries and high-income countries. Batrancea, Nichita, Batrancea, and Gaban (2018) used data from 193 countries and examined the ambiguous relationship between shadow economy and corruption. They quoted several previous studies that tried to answer this unclear relationship. Their findings confirmed the results of the study conducted Buehn and Schneider (2009) that showed complementarily between the shadow economy and corruption. Ultimately this current study also considers these variables in the empirical analysis, such as judicial independence, business freedom, and institutional quality as reliable public services.

Similarly, Berdiev et al. (2018) estimated a bi-directional causality analysis of corruption and shadow economy. They concluded that both variables are substitutes for one another. They believed that, among other methods, the MIMIC method for estimating shadow economy is more reliable for computing longer period variability. Gillanders and Parviainen (2018) empirically investigated the link between shadow economy and corruption at the sub-national level. They used World Bank Enterprise (ES) data of firms to measure corruption and the size of the shadow economy in four regions of the world. They concluded that these illicit phenomena are significantly positively correlated. They believed that the intensity of the relationship between shadow economy and corruption varies in different regions. They used the ordinary least square technique, which is the main flaw in their research. Their methodology limits them to the association between shadow economy and corruption rather than conducting a proper causality analysis.

It has been observed in previous studies that differentiation between causes and indicators of these unobservable variables remained a challenging task for researchers (Buehn & Schneider, 2008). The authors aimed to understand several causes and indicators of the shadow economy and corruption and applied SEM to measuring the shadow economy in Italy. Dell'Anno and Schneider (2003) detect Italy's and other OECD countries' shadow economies similarly. Dell'Anno (2007) quantified the shadow economy of Portugal from 1977 to 2004 using multiple indicators and the multiple causes (MIMIC) model based on his prior research. He claimed this approach could not resolve endogeniety and other time-series data problems. He also emphasized data availability constraints. However, Schneider and Medina (2017) used light intensity in place of GDP as an indicator of the Shadow Economy. Their results were not so different from previous studies. Vo and Ly (2014) determined the size of the shadow economy and its trend in ASEAN. Their results showed a negative effect on the tax rate and a positive impact of labor freedom and business freedom on the size of the shadow economy.

Moreover, Mai and Schneider (2016) studied the development of the shadow economies of 157 countries for the period from 1999 to 2013. They use institutional quality as a cause of shadow economy, but it would be more suitable if it is taken as a cause of corruption. Interestingly, authors used labor force participation rate (LFPR) as a proxy of shadow economy that make self-employment an indicator, not a cause. From the literature, it can be derived that very few studies have check the empirical relationship between corruption and the shadow economy, specifically in developing countries. Moreover, in most of the previous research, the corrupt judicial system was not incorporated while measuring different corruption indices. Therefore, the precise relationship between the shadow economy and corruption is still blurred. This study will try to fill the above research gap in previous literature.

3. Methodology

SEM has been used to construct corruption control and the shadow economy variables. We experimentally investigated their connection through covariance structures between the measurement variables indicators. In the first stage, we constructed a CFA model[1] to determine the correlation and direct influence of corruption and the shadow economy on one another as latent variables. Then, to investigate the various causes of the shadow economy

[1]See Bollan (1989)

and corruption, we estimated MIMIC models[2].The MIMIC approach is based on the mathematical concept of immeasurable variables. In the first step, it links the measurement variables and latent variables. Therefore, the MIMIC model simultaneously specifies a feature with the design model. In this sense, the MIMIC model tests the consistency of the "structural" theory in detail and is, therefore, more of a guarantee than a test procedure. The economic theory is thus tested to examine the inconsistency of actual data and the assumed relationship between intangible (hidden) or feature and apparent variable (measurable). In general, the analysis of the validation factor has two purposes: (i) to measure parameters such as coefficients and variations; and (ii) to assess the model's suitability.

3.1. Indicators of Shadow Economy

3.1.1 GDP Per Capita

GDP Per Capita is a measured by dividing a country's GDP by its population. It denotes the country's publicly declared official economy and reported average income. An official economy significantly negatively indicates the size of shadow economy (Tafenau, Herwartz, & Schneider, 2010).

3.1.2. Cash Holdings

Payments in the shadow economy are made in cash because this facilitates shadow economic activities. As a result, more cash holdings positively reflect the shadow economy's activities (Dreher & Schneider, 2010). According to the definition of money supply, M0 and M1 are examples of narrow money, including coins, currency, and demand deposits. Thus, cash holding in a specific economy is represented by their ratio.

3.1.3. Labor Force Participation Rate

It refers to the proportion of the total population available for work. As an important indicator, it empirically reflects that changes in the LFPR generate a flow of resources between the official and shadow economies. In the previous literature, however, the expected sign of the relationship between the shadow economy and LFPR is ambiguous. Some studies concluded that the high LFPR reflects a shift in the workforce from the office to the shadow economies as a positive indicator Giles and Caragata (1998), while others agreed with the opposite indication (Buehn & Schneider, 2009; Dreher & Schneider, 2010).

3.2. Causes of Shadow Economy

3.2.1 Government Spending/Size

Government spending refers to the expenditure of the government on provision of public goods and services and is used as a proxy for regulatory burden. More expenditure implies a larger government and a more significant tax burden and revenue. Most developing nations have insufficient tax collecting systems that are riddled with bribes, kickbacks, and the regulatory burden. This might result in an upsurge in shadow economy activity (Dreher & Schneider, 2010). Hence, a large size of government spending/size (over regulatory burden) will cause an increase in the shadow economy.

3.2.2 Business Freedom

The quantitative business freedom score is generated from various assessments of the difficulties of the beginning, operating, and ending of a firm. Each country's business freedom score ranges from 0 to 100, with 100 being the most open and friendly business climate. The business freedom score is calculated by taking into account several aspects of a company's life cycle. The ease with which a business may start, operate, and close is considered. It also comprises the procedures, time, and money required to start, run, and terminate a business. A business-friendly environment is one with an effective government regulatory structure and, as a result, a smaller shadow economy (Dell'Anno, 2007; Giles & Caragata, 1998). Therefore, a higher level of business freedom will negatively affect the shadow economic activities.

3.2.3. Regulatory Quality

Regulatory quality assesses the government's enforcement of rules and regulations to support private sector development. This involves regulatory compliance as well as inefficiency and obfuscation in the bureaucracy. Because regulatory burdens differ by sector, its scoring

[2]Frey et al., (1984), and (Buehn & Schneider, 2009)

gives more weight to sectors that contribute the most to the economy. There is a possibility that routine company activities may become more expensive as a result of a flawed regulatory environment. Therefore poor regulations would raise the size of the shadow economy (Bayar, 2016). Hence, Regulatory quality hurts the shadow economy.

3.2.4. Unemployment Rate

The shadow economy is also affected by unemployment levels. A high unemployment rate induces the masses to look for affordable goods and services in the shadow economy. However, the masses also have less money to spend due to the high unemployment rate, even in the shadow economy. So the relationship is not specific. The income and substitution effect determines whether unemployment positively or negatively affects the shadow economy. A negative relationship develops when the income effect outweighs the substitution effect. The relation is positive if the substitution impact exceeds the income effect (Buehn & Schneider, 2009). While according to Sahnoun and Abdennadher (2019), unemployment hurts the shadow economy in developing countries; and for the case of developed nations, it is positive. As a result, the impact of high unemployment on the shadow economy is unclear.

3.2.5. Economic Globalization

It refers to the economic integration and reliance on the foreign goods, services and technology through international trade. The globalization process took pace due to trade, technology, media and MNCs (Jadoon, Batool, & Sarwar, 2018).This study is based on the findings of Dreher (2006) on economic globalization measures. Economic globalization may limit the development of the shadow economy through many routes, such as raising productivity and extending the formal sector, increasing salaries, and lowering tariffs rates (Farzanegan & Hassan, 2017). Hence, a more economically globalized country would harm its shadow economy.

In this paper, we will develop a corruption control estimate to reflect the level of corruption in developing countries. A high projected score for corruption control indicates a reduced level of corruption. A smaller value of this latent estimate, on the other hand, indicates a safe harbor for corrupt office holders. The indicators and causes of corruption control are explained below:

3.3. Indicators of Corruption Control

3.3.1 Rule of Law

It refers to the limitation of arbitrary authority exercised through the subordination of legislation to well-defined and established laws. Its score varies from 2.58 to 2.48, with higher scores indicating greater corruption control and lower values representing inadequate corruption control. Encouraging political competition and improving accountability and openness can decrease the scope of bribes and prevent corruption (Buehn & Schneider, 2009; Dreher & Schneider, 2010). Therefore, the rule of law is an essential indicator of corruption control and positively indicates corruption control.

3.3.2. Law and Order (Crime Rate)

This indicator reflects two distinct aspects, law and order, with each element scoring from 0 to 3 points. The strength and impartiality of the judicial system are evaluated while assessing the "Law" aspect. The "Order" aspect, on the other hand, is an appraisal of public adherence to the law. Thus, a nation with a high rating of 3 in its legal system might have more corruption control, but a low rating of 1 if it has a very high crime rate and low corruption resistance. A crime victim is likelier to face bribe demands (Chatterjee & Ray, 2014), implying that more law and order (low crime rate) significantly indicates corruption control.

3.3.3. Judicial Accountability

This indicator describes how often judges are removed from their positions or otherwise penalized in the corrupt accountability process when they are found liable for significant wrongdoing. It varies from 0 (Never) to 4 (Always). Thus, higher importance of judicial accountability means greater control over corruption and vice versa. This phrase acknowledges the fact that judges are solely accountable for the choices they make. Meanwhile, the internal structure of the judiciary allows judicial officers to engage in individual corrupt acts because they are seldom held fully accountable for their actions (Gong, 2004). The judiciary is meant

to be an independent body responsible for delivering justice, and upholding the constitution's integrity implies that judicial accountability positively indicates more corruption control and vice versa.

3.3.4. Judicial Corruption Decisions

This statistic index indicates how many undocumented people or companies make additional payments or bribes so that proceedings are accelerated or delayed, or a favorable judicial judgment is reached. Its values vary from 0 (Always) to 4 (Never). It is, therefore, an essential indication for measuring the control of corruption. A smaller variable value indicates a more corrupt nation, while an increase in value shows better control over corrupt practices. The judiciary's structural reliance enhances the likelihood of political corruption when judicial officers bow to external political or economic pressure, compromising legal norms and professional integrity (Gong, 2004). Thus, a higher value of Judicial corruption decisions indicates more corruption control and vice versa.

3.4. Causes of Corruption Control

3.4.1. Government Spending/Size

Government spending refers to the expenditure of the government on provision of public goods and services including health, education and infrastructure. Most developing nations have insufficient political structures and big governments and thus are riddled with bribes, kickbacks, and corrupt activities (Li'an & Jing, 2009; Themudo, 2014).

3.4.2. Bureaucratic Quality

Bureaucratic quality score measures the quality of the bureaucracy as another shock absorber that tends to reduce policy changes when governments change. Countries that lack the strong influence of a robust bureaucracy feel frustrated when the government changes. Eventually, this tends to be stressful for office holders in terms of day-to-day administrative duties and creates an opportunity for corruption. Thus, a high bureaucratic quality causes more corruption control and vice versa.

3.4.3. Government Effectiveness

Government effectiveness is measured through the Government Effectiveness Index, which ranges from -2.5 (least effective) to 2.5 (most effective). It is one of several government quality indicators. As a result, increased government efficacy leads to greater control over corrupt instances and vice versa (Buehn & Schneider, 2009). Therefore, government effectiveness has a positive effect on corruption control.

3.4.4. Democratic Accountability

It includes the ways in which masses indulge in public policy making and share responsibility with policy makers of the country where both held responsible for the policy change. This reveals that democratic accountability has a positive impact on corruption control.

3.4.5. Transparent Laws and Predictable Enforcement

It refers to the degree to which the executive and public authorities predictably implement laws. This indicator comprises the executive's adherence to constitutional requirements, the availability of transparent laws, the strength of predictable law enforcement by bureaucracy, and rule observance in the public sector. Its value varies from 0 to 1, with a higher value resulting in more corruption control and vice versa (Villanueva, 2020). So, a system of transparent law and predictable enforcement has a positive impact on corruption control.

3.4.6. Regularity Quality

Regulatory quality reflects assessments of the government's capacity to design and enforce effective rules and regulations that allow and support private sector development. This involves regulatory compliance as well as corruption in the bureaucracy. Because regulatory loads differ between sectors, scoring should give more weight to industries that contribute the most to the economy. According to Drebee, Razak, and Shaybth (2020), adequate regulatory quality and improved governance increase the chances of curbing corruption. Hence, higher regulatory quality scores positively cause more corruption control and vice versa.

3.5. Structural Equations Model Frameworks

Once causes and indicators have been selected, Figure 1 shows both the CFA correlational and direct causal effect model framework between shadow economy and corruption control. In Figure 1, indicators are shown in the squares that are attached through arrows with their relevant latent variables in the circles. Each arrow contains an expected hypothetical sign of the relationship between latent variables and its factor loading. In this Figure 1, corruption control and its indicators are shown on the left, and shadow economy and its indicators are on the right.

Figure 1: CFA Correlation and Direct Effects Model of Corruption Control and Shadow Economy

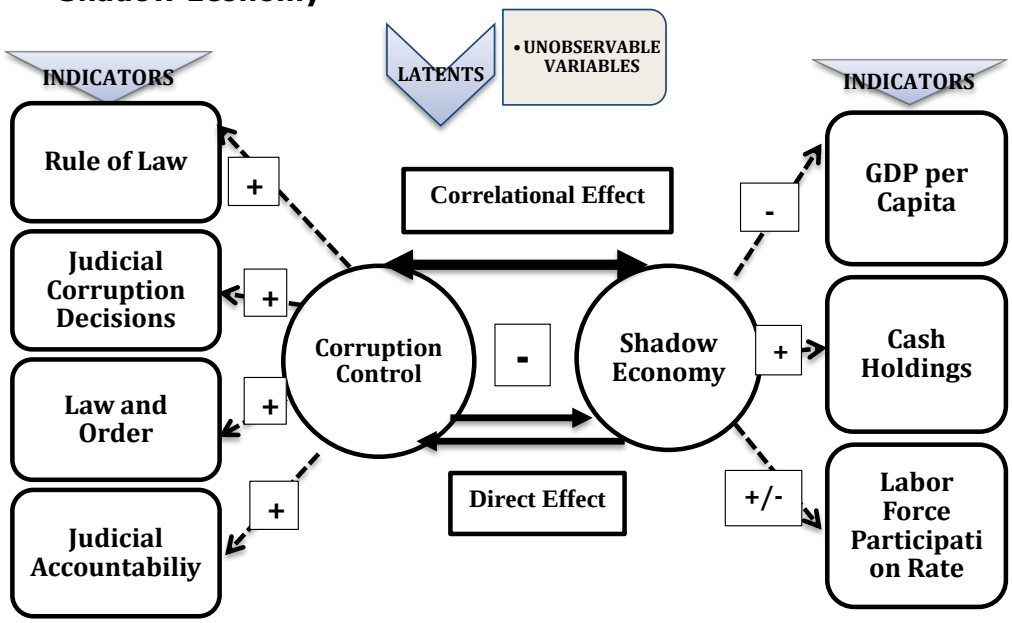
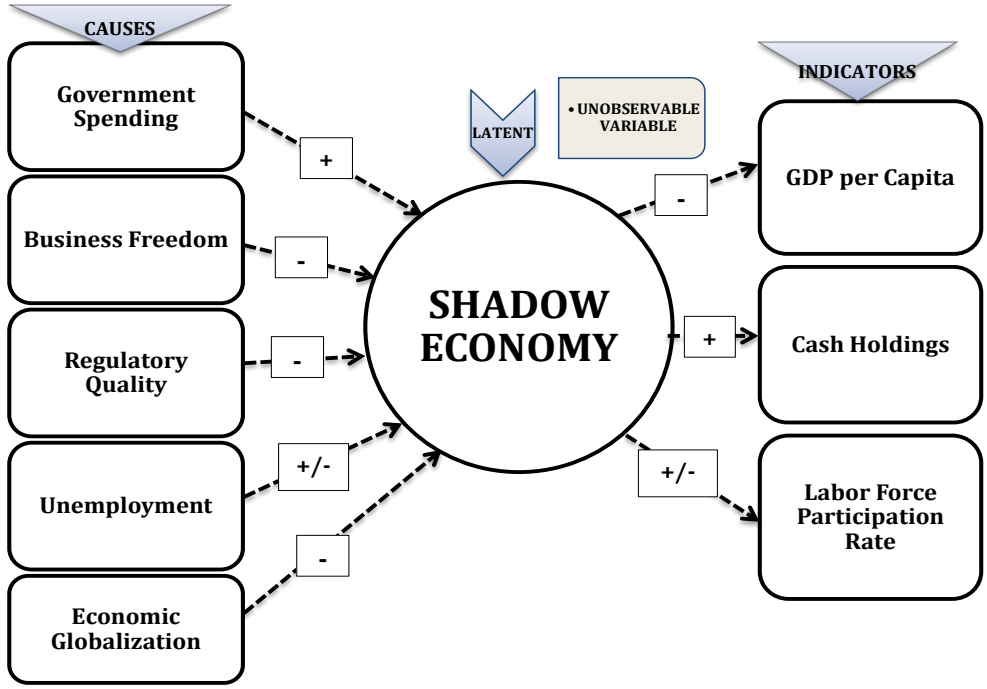


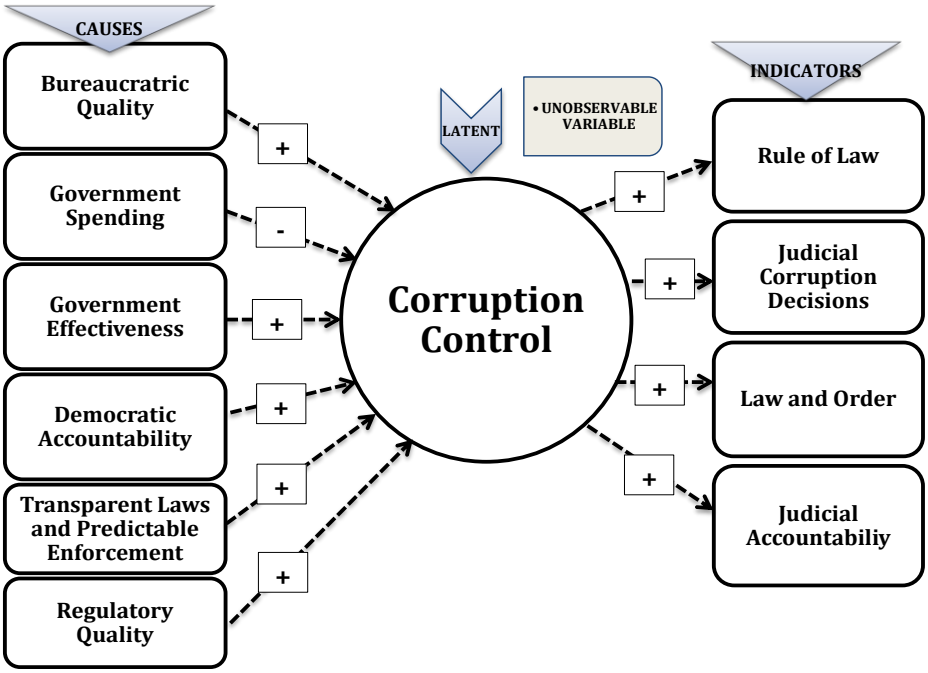
Figure 2 is representing the MIMIC model framework which is elaborating the theoretical connections of the selected causes and indicators of shadow economy.

Figure 2: Shadow Economy MIMIC Model Framework



In Figure 3, the MIMIC model framework of corruption control is shown with its relevant indicators and causes.

Figure 3: Corruption Control MIMIC Model Framework



In MIMIC models, Figure 2 and Figure 2 of the shadow economy and corruption control, all the indicators are the same as in Figure 1 of the CFA Model. Each cause of shadow economy and corruption control shows it's hypothesized expected sign of a relationship in Figures 2 and 3 above. In the above MIMIC models, all the cause variables are in the left side squares while all the unobservable variables are on the right side.

4. Results and Discussion

We have taken a sample of 65 developing countries and panel data from 2000-2019. All data variables used in this study are collected from different publically available data sources[3]. As a result, in different model specifications, we set the GDP per capita coefficient to -1 and cash holdings to +1 for the shadow economy. Similarly, the rule of law to +1 is based on our theoretical concerns in sections 2 and 3. Table 1 and Table 2 demonstrate the estimated results of CFA, while Table 3 and Table 4 present the estimations of the MIMIC model.

Estimated results of the correlational CFA are given in Table 1. In comparison, Table 2 shows the direct effect of CFA estimation results on the causal relationship between two variables. There are four model specifications in Tables 1 and 2. From CFA model 1 through CFA model 3, each specification uses a different mix of the selected indicators for both latent variables. In the CFA model 4 specification, all the specified indicators of the shadow economy and the control of corruption are used for the estimation.

Table 1: CFA Correlation Effect between Shadow Economy and Corruption Control

Model Specification	Specification[4] 1 3-2-3		Specification 2 2-2-3		Specification 3 3-2-2		Specification 4 3-2-4	
Indicator/Latent	**SE**	**CI**	**SE**	**CI**	**SE**	**CI**	**SE**	**CI**
Judicial Accountability		0.61*** (26.46)						0.56*** (21.99)
Judicial Corruption Decisions		0.77*** (36.85)		0.60*** (19.10)		0.74*** (26.71)		0.72*** (28.49)
Law and Order				0.37*** (14.58)				0.32*** (9.79)
Rule of Law		0.76*** (37.20)		0.99*** (25.54)		0.80*** (28.06)		0.86*** (35.32)
GDP Per Capita	-0.70*** (10.10)		-0.57*** (10.79)		-0.57*** (11.94)		-0.58*** (11.65)	

[3]WDI, WGI, ICRG, IMF), and Govdata3600 World Bank data sources.
[4]CFA model specifications in Table 1 and 2 are representing (Number of indicators of Shadow Economy=Number of both latent variables=Number of indicators of Corruption Control) respectively.

Cash Holdings		0.33*** (8.64)	0.34*** (9.28)	0.33*** (8.75)
LFPR	0.30*** (7.71)		0.26*** (6.75)	0.28*** (7.26)
Covariance Shadow Economy and Corruption Control	-0.56*** (9.37)	-0.60*** (8.99)	-0.77*** (12.98)	-0.71*** (12.35)
Degree of Freedom	**4**	4	4	13
CFI	0.964	0.903	0.930	0.809
SRMR	0.03	0.05	0.04	0.06
R^2	0.88	0.98	0.82	0.87

*, **, *** shows significance at 10, 5 and 1%. Value of CFI and SRMR shows model is a good fit. The value of R^2near to 1 depicts that model is perfect fit (Kline, 2005). For Model identification degree of freedom should be ≥ 0.

The predicted standardized coefficients of the shadow economy and corruption control in Table 1 and 2 are significant with hypothesized signs as in Figure 1 and 2, respectively. In both Table 1 and 2, judicial accountability and corruption decisions are highly significant and positively indicate corruption control.

Table 2: CFA Direct Effect between Shadow Economy and Corruption Control

Model Specification	**Specification 1 2-2-3**		**Specification 2 2-2-3**		**Specification 3 2-2-3**	
Indicator/Latent	SE	CI	SE	CI	SE	CI
Judicial Accountability		0.58*** (24.06)				0.61*** (26.46)
Judicial Corruption Decisions		0.75*** (31.57)		0.60*** (19.10)		0.77*** (36.85)
Law and Order		0.29*** (8.62)		0.37*** (14.58)		
Rule of Law		0.82*** (34.87)		0.99*** (25.54)		0.78*** (37.20)
GDP Per Capita	-0.51*** (11.34)		-0.57*** (10.79)		-0.70*** (10.10)	
Cash Holdings	0.38*** (9.81)		0.33*** (8.64)			
LFPR					0.30*** (7.71)	
Corruption Control Shadow Econ and Shadow Econ Corruption Control		-0.75*** (12.39)		-0.60*** (8.99)		-0.56*** (9.37)
Degree of Freedom	8		4		4	
CFI	0.855		0.903		0.964	
SRMR	0.05		0.05		0.03	
R^2	0.84		0.98		0.81	

*, **, *** shows significance at 10, 5 and 1%. Value of CFI and SRMR shows model is a good fit. The value of R^2 near to 1 depicts that model is perfect fit (Kline, 2005).

The empirical results suggest that a robust judicial accountability system and more independent judicial corruption rulings will reduce corruption. Furthermore, the coefficients of law and order and the rule of law show that both indicators substantially and positively indicate corruption control. We observed significant and positive connections between cash holdings and LFPR in the shadow economy. Furthermore, we empirically predicted an inverse relationship between GDP per capita (official economy) and the shadow economy. As a result, the correlational correlations between the shadow economy and corruption control in Table 1 have a significant negative sign. Similarly, all of the estimated coefficients in table 2 show a highly substantial negative direct causal effect of corruption control on the shadow economy. Similarly, our findings of shadow economic observable variables in all CFA and MIMIC model result tables validate the conclusions of other theoretical and empirical studies mentioned in Section 2.

Table 3: Multiple Indicator and Multiple Causes[5] Standardized Estimates[6] of Shadow Economy

Variables/Specs	Specification[7] 1 4-1-3	Specification 2 3-1-3	Specification 3 4-1-2	Specification 4 3-1-2
Causes				
Government Spending/Size	0.33*** (8.16)	0.30*** (7.57)	0.32*** (7.80)	0.32*** (7.60)
Business Freedom	-0.47*** (8.98)	-0.48*** (10.22)	-0.47*** (8.65)	-0.56*** (11.20)
Regulatory Quality	-0.17*** (3.21)		-0.18*** (3.28)	
Unemployment Rate	-0.52*** (9.93)			
Economic Globalization		-0.30*** (6.86)	-0.20*** (3.77)	-0.28*** (6.07)
Indicators				
GDP Per Capita	-0.49*** (13.65)	-0.65*** (16.11)	-0.63*** (15.41)	-0.60*** (15.59)
Cash Holdings (M_0/M_1)	0.13*** (4.32)	0.16*** (4.21)		
LFPR Rate	0.45*** (14.54)	0.36*** (11.77)	0.34*** (10.53)	0.36*** (11.11)
CFI	0.677	0.840	0.912	0.983
SRMR	0.06	0.04	0.03	0.02
R^2	0.99	0.65	0.72	0.75
Degree of Freedom	27	27	20	14
Observations	1196	1196	1196	1196

*, **, *** shows significance at 10, 5 and 1%. Value of CFI and SRMR shows model is a good fit (Kline, 2005).

Table 4: Multiple Indicator and Multiple Causes Standardized Estimates of Corruption Control

Variables/Specs	Specification 1 4-1-3	Specification 2 4-1-3	Specification 3 3-1-3	Specification 4 4-1-4
Causes				
Bureaucratic Quality		0.41*** (18.34)		
Government Spending/Size		-0.13*** (5.66)	-0.15*** (5.40)	-0.06*** (3.84)
Government Effectiveness	0.60*** (24.69)		0.54*** (11.57)	0.56*** (22.76)
Democratic Accountability	0.06*** (3.19)	0.17*** (6.27)		
Transparent Laws and Predictable Enforcement	0.25*** (14.11)	0.50*** (21.76)		0.29*** (13.46)
Regularity Quality	0.21*** (7.67)		0.09* (1.90)	0.25*** (9.70)
Indicators				
Rule of Law	0.94*** (124.23)	0.81*** (56.30)		0.98*** (108.18)
Law and Order(Crime Rate)			0.19*** (5.91)	0.35*** (12.59)
Judicial Accountability	0.52*** (24.14)	0.65*** (33.02)	0.57*** (23.29)	0.49*** (21.57)
Judicial Corruption Decisions	0.63*** (37.12)	0.72*** (41.46)	0.84*** (32.76)	0.62*** (32.46)
CFI	0.911	0.946	0.897	0.834
SRMR	0.05	0.03	0.04	0.07
R^2	0.86	0.66	0.43	0.80

[5]It is essential to understand that these MIMIC models only give an indication of the trend in the magnitude of the shadow economy and corruption control. It simply tells us about variations in the shadow economy index and the corruption control index from year to year.
[6]The maximum likelihood (ML) approach will be used to estimate the standardized parameters of the MIMIC models.
[7]MIMIC model specifications in Table 3 and 4 are representing (Number of causes of Shadow Economy=Number latent variable=Number of indicators of Shadow Economy) respectively.

Degree of Freedom	27	27	20	35
Observations	1196	1196	1196	1196

*, **, *** shows significance at 10, 5 and 1%. Value of CFI and SRMR shows model is a perfect fit. R^2 near to 1 depicts that model is perfect fit (Kline, 2005).

As shown in Tables 3 and 4, several MIMIC specifications are estimated to assess the magnitude and impact of various causative factors on the shadow economy and corruption control in a sample of developing nations. In Table 3, we can see that the government size has a positive (theoretically predicted) and statistically significant impact on the shadow economy. The results show that if there is a substantial regulatory burden due to bigger government size, it will flourish the shadow economic activities. However, on the flip side of the coin, a quality-oriented regulatory system will reduce the size of the shadow economy. It is evident from the estimated parameter that the regulatory quality variable is positive and highly significant. Moreover, the coefficient of unemployment rate is also found significant with the negative sign similar to Sahnoun and Abdennadher (2019). This implies that even in shadow economy, if people get unemployed they will not have enough money to purchases even less valued commodities. This restrains shadow economy business activities due to decreased demand, and eventually, a negative relationship prevails. The business freedom index has the expected negative sign and is statistically highly significant. Moreover, economic globalization is also significant and has negative sign. This negative sign suggests that economic globalization may limit the development of the shadow economy by raising productivity and extending in the formal sector.

Similarly, in Table 4, MIMIC estimations of Corruption control, it is evident that the government size has a negative (theoretically expected) sign and is statistically significant at the 1% confidence level. Thus, if there is a bigger government size (over regulatory burden), there will be a paradise for corruption and vice versa. However, on the contrary, an increase in the government effectiveness, regulatory quality, and bureaucratic quality indices will reduce corruption with comprehensive control over it. It is also evident from the estimated parameters where government effectiveness, regulatory and bureaucratic quality variables have the theoretically expected positive sign and are statistically significant at the 1% confidence level. The estimated coefficients of democratic accountability, transparent laws, and predictable enforcement are statistically significant and have a positive sign as expected. Democratic accountability empirically shows that if a government is more responsive toward its people in delivering public services with a transparent application of rules and laws, there will be a lesser chance for corruption in the system.

5. Conclusion

The present study adds to the discussion concerning the link between corruption control and the shadow economy by using SEM. We have employed CFA and MIMIC estimating techniques for estimating different parameters of observed indicators ad causes of the shadow economy and corruption control. Thus, our findings support the maxim that the shadow economy and corruption, particularly those in developing countries, are complementary (Batrancea et al., 2018; Buehn & Schneider, 2009; Dreher & Schneider, 2010; Gillanders & Parviainen, 2018). While empirically contradicting the notion that the shadow economy and corruption are substitutes (Berdiev et al., 2018; Choi & Thum, 2005). Firms and people in developing countries with weak corruption control rely seriously on shadow economic activity. They pay authorities to escape investigation, taxes, and penalties. Furthermore, regulatory burdens with less business freedom and worse regulatory quality diminish the incentives to remain in the official economy.

Most importantly, controlling corruption is exacerbated by weak legal and judicial systems and inadequate bureaucratic and regulatory quality. A robust judicial system is an utmost requirement for curtailing the uprising corruption, especially in developing countries. Finally, corruption leads individuals to the shadow economy without an efficient government with adequate accountability and a transparent law and enforcement system. Given these findings, it is clear that every government must implement incentive-based economic policies in order to make the formal sector more appealing for economic activities. Over time, the successful implementation of such policies may result in a decrease in corruption and the shadow economy.

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Appendix

List of Developing Countries		
Albania	Guinea	Nigeria
Algeria	Guinea-Bissau	Pakistan
Angola	Haiti	Paraguay
Armenia	India	Peru
Azerbaijan	Iran	Philippines
Bangladesh	Jamaica	Romania
Belarus	Jordan	Russia
Bolivia	Kazakhstan	Senegal
Botswana	Libya	Serbia
Brazil	Malawi	Sierra Leone
Bulgaria	Malaysia	South Africa
Burkina Faso	Mali	Sri Lanka
Cameroon	Mauritania	Sudan
Colombia	Mexico	Tanzania
Congo	Moldova	Thailand
Costa Rica	Mongolia	Togo
Cote d'Ivoire	Morocco	Tunisia
Ecuador	Mozambique	Turkey
Ethiopia	Myanmar	Uganda
Gabon	Namibia	Ukraine
Gambia	Nicaragua	Zambia
Ghana	Niger	