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The asymmetric influence of corruption on financial development: fresh evidence from BRICS economies

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1. Introduction

The importance of financial development in any economy is well known and extensively discussed as an important factor of economic growth and development (Lee, 2013; Mishra and Narayan, 2015; Chiu and Lee, 2019). Financial development helps with savings and supports their distribution into profitable investments by promoting industrial trades (Cooray and Schneider, 2018). Financial development fosters economic growth by facilitating the overall development process of a country (Greenwood and Smith, 1997; King and Levine, 1993; Levine, 2005). Similarly, lack of savings, lesser investments and poor distribution of limited resources during the 2008–2009 financial crises had adverse impacts on economic development (Hale, 2012; Bordo et al., 2010). Nascent literature is focusing on the correlation between corruption and financial development, parallel to the literature of financial development and economic growth link. Many scholars have proved the relationship between corruption and financial development through different methods (Song et al., 2021; Altunbaş and Thornton, 2012; Shahbaz et al., 2013 among others).

According to Song et al. (2021), corruption occurs throughout every phase of development in all governments. Early researchers in the field have experienced difficulties in measuring the precise impact of corruption on different variables. This is due to their reliance on country level case studies in absence of dominant corruption related data (Song et al., 2021). The world today is not unaware of corruption, the advent of the international country risk guide (ICRG), in addition to other corruption indexes [1], has played an important role in bringing corruption to the global policy agenda and provided a useful platform for cross-country research in the field (Peyton and Belasen, 2012). Corruption, an abuse of entrusted public power for private benefits, is a globally prevalent social, political and economic phenomenon. This has become pervasive in emerging economies (Peyton and Belasen, 2012) such as Brazil, Russia, India, China and South Africa (BRICS). Corruption has grown throughout these five countries in different ways, but their increasing relevance in the world economic system now makes them more

prevalent than ever. Although some BRICS countries are better at coping with the corruption [2], Transparency International (2020) still ranks them mid to high in the list [3]. However, the role of corruption in financial development may not be as simple as previously assumed. While prior literature provides evidence for the impact of corruption in emerging economies, these do not offer clear insight around the beneficial or deteriorating effect of corruption on financial development.

The existing literature confirms that corruption fosters development under certain settings. This wave of literature argues that corruption spurs the economic growth and development by becoming the “grease” in the wheels of development, which was first introduced by Leff (1964). The prevalent understanding is that corruption enhances the possibility of constructive transactions which would not take place otherwise. The mechanism that drives this benefit are individuals creating efficiencies illegally via corruption such as bribery. The alternate view in the literature believes that a significant negative correlation exists between the presence of corruption and the development processes of an economy. A representative study is Mauro (1995), who has found a notable negative correlation between corruption and profitable investments. He further argued that corruption primarily hinders private investment, which leads to the decrease of economic growth.

Extensive empirical literature supports both hypotheses of corruption, “grease the wheels” (Leys, 1965; Leff, 1964; Méon and Weill, 2010; Arif et al., 2020) and “sand in the wheels” (Mauro, 1995; Del Monte and Papagni, 2007). Therefore, the impact of the corruption on financial development is still uncertain. Beneficial and detrimental impacts of corruption on financial development blend together and blur the lines of greasing the wheels and sand in the wheels until it becomes unclear how corruption affects the financial development overall. This blurred relationship of corruption with financial development motivates us to revisit this connection in the context of BRICS economies.

Prior empirical literature assumes that the level of corruption has symmetric effects on financial development. Hence, this assumption implies that positive changes in corruption boosts or degrades financial development, and conversely, negative changes in corruption must degrade or boost financial development with an equal magnitude. However, Alfada (2019) and Ali et al. (2020) suggest that the impact of corruption on the financial system and overall economic activities is of a nonlinear nature. Additionally, the contemporary study by Zangina and Hassan (2020) confirms that the impact of corruption on FDI inflows is asymmetric while studying Nigeria. Thus, we extend the literature by investigating the asymmetric impact of corruption on the financial development in the BRICS context from 1991 to 2018. To achieve this, we adopt the

novel PNARDL proposed by Shin et al. (2014). Building on prior literature, broad money (M2) and newly constructed financial development index (FD) by the International Monetary Fund (IMF) are used as proxies of financial development. Likewise, we consider the ICRG control of corruption index as a proxy of corruption, alongside macro controls.

As prior research discussed the impact of corruption on financial development with inconsistent results, this study makes multiple contribution in the corruption-financial development related literature. To the best of our knowledge, no study has examined asymmetric influence of corruption on financial development. This study makes the novel contribution by developing insight on how corruption asymmetrically impacts financial development. As we know, this is the first attempt to use the PNARDL of Shin et al. (2014), which breaks down the main independent variable (corruption) into positive and negative shocks. The PNARDL approach is a dynamic robust estimate that controls for the problem of endogeneity, which is a common phenomenon in such studies. Moreover, we believe that the findings are very important for policy makers, scholars, and practitioners. The final contribution of this study lies with its context and period. BRICS, is a group of five major emerging economies which make up 42% of the global population, with 23% of the global GDP, and more than 16% participation in the global trade (World Investment Report, 2017). Finally, we use the most recent available data set covering a period from 1991 to 2018.

In the next section, we review the grease and sand in the wheel hypotheses and the relevant empirical findings. We then present our data, model and method in Section 3. In Section 4, we report our empirical findings and discuss the results. We then conclude our study with policy implications and future research in Section 5.

2. Literature review

Prior literature supports two opposing hypotheses regarding corruption. One prominent theory in the literature is the idea that corruption “greases the wheels” of financial development while another school of thoughts supports the opposing philosophy that corruption is “sand in the wheels” of financial and economic development. In this section, we discuss both contradictory hypotheses and related empirical literature.

2.1 Grease the wheels hypothesis

The “grease the wheels” hypothesis presumes that corruption helps mitigate the malfunctioning institutions in the developing world (Huntington, 1968; Leff, 1964; Leys, 1965;

Méon and Weill, 2010). This hypothesis views bribery, a medium of corruption, as a significant factor in influencing activities that account for economic development. It argues that players of economic development avoid bureaucratic processes and red tape, to enhance their efficiency when they engage in corrupt practices (Méon and Weill, 2010). According to Dreher and Gassebner (2013), corruption helps bypass complex legislations of inefficient institutes, and fosters economic activities in emerging countries. Moreover, corruption may enhance investments in the private sector and serve as a buffer to counter poor strategies, thus fostering economic growth in countries with weak legal infrastructure (Leff, 1964; Cooray and Schneider, 2018).

Usage (e.g. consumption vs reinvestment) and destination (e.g. home vs abroad) of money generated by corrupt practices, such as bribery, also play a significant role in deciding the impact of corruption on an economy (Cooray and Schneider, 2018; Wedeman, 1997). “Looting”, “rent scraping” and “dividend collection” are three types of corrupt practices (Cooray and Schneider, 2018; Wedeman, 1997). Looting induces devastation that triggers investment of bribery payment on domestic projects or on foreign ventures. Similarly, rent scraping either creates capital outflow because of decline in capital gains or it helps initiates new or expanding projects. Dividend collecting relies on corporations' progress in profit-generation, which motivates policymakers to promote policies which support investment. Likewise, to avoid an enterprise's closure or seizure, businesses can resort to either bribery or building production units in countries with inadequate property laws (O'driscoll and Hoskins, 2006, 2003). Thus, based on the arguments above, corruption helps economic development when money generated by these practices remain at home for reinvestment in domestic projects. Moreover, Colombatto (2003) has found that corruption supports the use of “speed money” that reduces development impeding conditions in politically unstable developing countries where institutions are weak. According to Huang et al. (2013), among the 13 Asia-Pacific countries, economic development of China and South Korea show significant growth despite higher degrees of corruption. Similarly, Kato and Sato (2015) have found support for “grease the wheels” hypothesis in Indian firms. Moreover, Dreher and Gassebner (2013) argue that when corruption becomes an effective way of mitigating the adverse effects of complex and lengthy regulatory business policies operating in strongly controlled economies, it supports the philosophy of “grease the wheels”. Hence, we cannot disregard the positive relationship between corruption and financial development, based on the above literature.

2.2 Sand in the wheels hypothesis

In contrast, the “sand in the wheels” hypothesis proposes that corruption is detrimental to financial sector operations. For instance, while supporting the “sand in the wheels” hypothesis, prior studies have reported the diminishing impact of corruption on investments, growth and

economic certainty (Aghion et al., 2004; Blackburn et al., 2006; Lee and Ng, 2009). For example, De Rosa et al. (2010), have asserted that achieving a target production rate and evading administrative needs by offering bribes to officials is not the best solution. They have conducted a comprehensive study upon 11,000 firms from 28 emerging and developed economies and found an adverse impact of corruption on corporate performance. Similarly, according to Gächter and Schulz (2016), corrupt practices lead to a detrimental cycle of corruption (Arshad and Rizvi, 2013; Dike, 2005; Asiedu, 2003).

Increased government interference in controlling loans makes it harder for private enterprises to raise external funding (e.g. bank loans) in countries with weak supervisory authorities (Beck et al., 2006a; Beck et al., 2006b). Hence, businesses secretly bribe officials to prevent such complicated procedures and institutional obstructions. Researchers argue that poor monitoring procedures, insider trading, complex legislation and a lack of accountability are key to spreading corruption (Beck et al., 2006b; Barth et al., 2004; Wei, 2000), and such factors of corruption degrade overall operations of the financial sector.

Corruption diminishes financial development due to the involvement of many individuals in secret briberies for unlawful project authorizations (Cooray and Schneider, 2018; Shleifer and Vishny, 1993). Kaufmann (2010) discussed that corrupt practices reduce the level of accountability and transparency, which creates an ambiguity about the real financial status of an economy. Additionally, Wei and Sievers (1999) reported incidences of banking sector volatility in economies that permit corrupt practices.

Evidence has shown that banking sector profitability is more prone to the adverse impacts of corruption (Arshad and Rizvi, 2013). Therefore, widespread government control of banks enhance political involvement in the distribution of funds, which harms both economic growth and financial sector development of a country (Barth et al., 2004; La Porta et al., 2002). According to Aburime (2008), increases in corruption is linked with decreasing banking sector profitability in Nigeria. Similarly, Pagano (2008) has confirmed the impact of corruption on the distribution of bank credit rates in Latin America. Consequently, increased corruption is unfavorable for the financial system that supports the sand in the wheels hypothesis. Therefore, after reviewing the literature about the opposing impact of corruption, this study cannot disregard the “sand in the wheels” hypothesis of corruption on financial development.

There is still a lack of clarity on the relationship between corruption and financial development due to the contradictory evidence in the existing literature. Conceivably, the use of linear estimations is a potential reason these studies are indecisive on the direct impact of

corruption on development (Alfada, 2019; Ali et al., 2020). Furthermore, they argue that linear estimations indicate differences in the conditions of institutional efficiency and production arrangements, which might result in opposing impacts of corruption. Indeed, focusing only on linear effects and ignoring the possible presence of a nonlinear relationship might be a reason for the opposing evidence of corruption on different development variables. Alfada (2019) and Ali et al. (2020), respectively, investigated the impact of corruption on economic growth and banking stability by adopting the threshold models.

Considering the importance and potential existence of nonlinear impact of corruption, the current study extends the theoretical understanding about the opposing views by examining the direct relationship between corruption and financial development in emerging markets by empirically investigating the asymmetric impact of corruption on the financial development in the BRICS economies.

3. Data, model and methods

3.1 Data

This study used an annual panel data set ranging from 1991 to 2018 for the BRICS economies. Financial development is the dependent variable of our study. To capture this, we used two proxies to measure financial development. Aligned with prior literature, we used money supply (M2) as first proxy of financial development (Cooray and Schneider, 2018; Levine and Zervos, 1998). Then, we included the newly constructed financial development index (FD) by the IMF as second proxy of financial development. The FD index is a comprehensive measure as it covers depth, accessibility and efficiency of both financial institutions and financial markets.

The level of corruption is the main independent variable of concern in our research. Following the previous literature, we used the International Country Risk Guide (ICRG) control of corruption index as a measure of corruption (Cooray and Schneider, 2018). The ICRG control of corruption index ranges from 0 to 6, where higher values denote better control of corruption.

Finally, we included a set of macro level control variables in our analysis. For instance, GDP per capita growth, educational attainment, and institutional quality. We used GDP per capita growth (Ggrowth) that reflects the standard of living and also holds a considerable position in development measures (Cooray and Schneider, 2018). Moreover, according to Acemoglu and Robinson (2010), institutional quality is significant determinant of economic and overall development structure emerging countries. Therefore, we controlled for institutional quality as an

explaining factor of financial development of BRICS economies by using law and order index (lorder) and bureaucratic quality index (Bquality) of ICRG as two proxies of institutional quality. Educational attainment reflects people's ability to improve their living standards and prior literature have confirmed the contribution of educational attainment in the development and growth process. (Aghion et al., 2005; Gupta et al., 2009). Consequently, we controlled for educational attainment by taking average years of schooling (AYS) as a proxy.

We extracted our dataset from multiple reliable sources such as the World Bank, ICRG and IMF. Table 1 shows details regarding definitions and sources of all the variables.

3.2 Model and methods

Empirical research of corruption and financial development nexus has now arrived at a new route of asymmetric analysis. Hence, this study attempts to investigate the asymmetric impact of corruption on financial development in the context of BRICS economies. Based on the arguments in the data section and the well-established literature (Song et al., 2021; Cooray and Schneider, 2018), financial development (FD_{jt}) can be explained by corruption denoted by $Corruption_{jt}$, GDP per capita growth denoted by $Ggrowth_{jt}$, educational attainment denoted by HC_{jt} and institutional quality denoted by IQ_{jt} , respectively. The following is our base linear econometric model:

$$FD_{jt} = \alpha_0 + \alpha_1 Corruption_{jt} + \alpha_2 Ggrowth_{jt} + \alpha_3 HC_{jt} + \alpha_4 IQ_{jt} + \mu_{jt} \quad (1)$$

Based on the theoretical and empirical literature, we expect that an estimate of α_1 to be positive or negative, supporting either “sand in the wheels” or “grease the wheels” hypothesis. Additionally, prior empirical literature revealed that short and long run estimates of corruption can be of different magnitude, direction and significance (Al Qudah et al., 2020; Ewetan et al., 2020).

Table 1. Definitions and sources

Variables	Abbreviations	Definitions	Sources
Money supply	M2	Broad money (% of GDP).	World Bank
Financial development index	FD	An index that captures both financial institutions and financial markets development.	IMF
Corruption index	Corruption	Control of corruption index ranging from 0 denoting (maximum corrupt) to 6 (no corrupt).	ICRG
GDP per capita growth	Ggrowth	GDP per capita growth (annual %)	World Bank
Average years of schooling	AYS	Average years of schooling	World Bank
Law and order index	Lorder	Law and order index ranges from 0 to 6	ICRG
Bureaucratic Quality index	Bquality	Bureaucratic quality index ranges from 0 to 4	ICRG

However, equation (1) does not take into consideration both short-run and long-run estimates, thus we reconstructed the equation (1) in the format of error corrections as follows:

$$\begin{aligned}\Delta FD_{jt} = & \gamma + \sum_{p=1}^{n1} \gamma_{1p} \Delta FD_{jt-p} + \sum_{p=0}^{n2} \gamma_{2p} \Delta Corruption_{jt-p} + \sum_{p=0}^{n3} \gamma_{3p} \Delta Ggrowth_{jt-p} \\ & + \sum_{p=0}^{n4} \gamma_{4p} \Delta HC_{jt-p} + \sum_{p=0}^{n5} \gamma_{5p} \Delta IQ_{jt-p} + \pi_1 FD_{jt-1} + \pi_2 Corruption_{jt-1} \\ & + \pi_3 Ggrowth_{jt-1} + \pi_4 HC_{jt-1} + \pi_5 IQ_{jt-1} + \beta_1 \mathcal{E}_{jt-1} + \alpha_i + \mu_{jt}\end{aligned}\quad (2)$$

The above arrangements have now become panel ARDL proposed by Pesaran et al. (2001). In panel ARDL we can get short-run and long-run estimates in a single equation. While α_i is the group-specific effect and error-correction term $\mathcal{E}_{jt-1}$ captures the long-run equilibrium in the linear panel ARDL. A key assumption behind equation (2) is that a change in corruption has symmetric effects on financial sector development. This assumption implies that if a decrease in corruption improves financial development, an increase in corruption must worsen it or vice versa. However, institutional quality, political system and governance may react differently to high corruption versus low corruption, and therefore corruption could have asymmetric impacts on financial development. Thus, we break down our main independent variable, namely, corruption, into its positive and negative changes to determine whether the impact of corruption on financial development in the BRICS economies is asymmetric. For that purpose, we apply the partial sum procedure as shown below:

$$Corruption^+_{jt} = \sum_{n=1}^t \Delta Corruption^+_{jt} = \sum_{n=1}^t \max (\Delta Corruption^+_{jt}, 0) \quad (3)$$

$$Corruption^-_{jt} = \sum_{n=1}^t \Delta Corruption^-_{jt} = \sum_{n=1}^t \min (\Delta Corruption^-_{jt}, 0) \quad (4)$$

In the above specifications, $Corruption^+_{jt}$ represents a positive change or increase in corruption index and $Corruption^-_{jt}$ demonstrates a negative change or decrease in the corruption index. We then replace these partial sum variables in place of the original $Corruption_{jt}$ variable in equations (2) as follows:

$$\begin{aligned}
\Delta FD_{jt} = & \gamma + \sum_{p=1}^{n1} \gamma_{1p} \Delta FD_{jt-p} + \sum_{p=0}^{n2} \gamma_{2p} \Delta Corruption^+_{jt-p} + \sum_{p=0}^{n3} \gamma_{3p} \Delta Corruption^-_{jt-p} \\
& + \sum_{p=0}^{n4} \gamma_{4p} \Delta Ggrowth_{jt-p} + \sum_{p=0}^{n5} \gamma_{5p} \Delta HC_{jt-p} + \sum_{p=0}^{n6} \gamma_{6p} \Delta IQ_{jt-p} + \pi_1 FD_{jt-1} \\
& + \pi_2 Corruption^+_{jt-1} + \pi_3 Corruption^-_{jt-1} + \pi_4 Ggrowth_{jt-1} + \pi_5 HC_{jt-1} \\
& + \pi_6 IQ_{jt-1} + \beta_1 \mathcal{E}_{jt-1} + \alpha_i + \mu_{jt}
\end{aligned} \tag{5}$$

Equation (5) is known as the asymmetric panel ARDL model projected by Shin et al. (2014). According to Shin et al. (2014), the asymmetric model is subject to the base symmetric panel ARDL model. Salisu and Isah (2017) show that an asymmetric depiction of the dynamic heterogeneous panel data model is more appropriate for the modelling of the large time period (t) compared to cross-sectional (j), as in our study. The primary techniques used in the estimation of dynamic heterogeneous panel data are the Mean Group (MG) and Pooled Mean Group (PMG) estimators. The MG estimator takes averaging the coefficients and relies on estimating N time-series regressions, whereas the PMG estimator includes the combination of averaging and pooling of coefficients (Blackburne and Frank, 2007). The Hausman test is used to choose the estimators for the dynamic heterogeneous panel model.

4. Estimation framework

4.1 Data descriptive and diagnosis

There are few things to take care of before estimating our model. First, Table 2 provides the details about the mean, standard deviation, minimum and maximum value of each variable. The mean of M2, FD and corruption are 4.144, 0.507 and 2.542, while the standard deviations are 0.614, 0.142 and 0.909, respectively.

Next, we assess the existence of the multicollinearity problem. Table 3 reports the correlation matrix of our variables. The correlations between our independent variables do not impose any source of concern. According to prior literature, the problem of multicollinearity occurs when the correlation among variables exceeds 0.80 (Gujarati and Porter, 2003; Belkhaoui et al., 2020).

Furthermore, we have performed various stationary tests with regards to panel data which include Levin–Lin–Chu (LLC) unit root test by Levin et al. (2002), and Im-Pesaran-Shin (IPS) unit root test of Im et al. (2003). LLC is a preferable option if the number of periods falls from 5 to 250. The IPS assumes that the data has a normal distribution, finite heterogeneous variance and zero

mean. The values of these tests are provided in Table 4, which suggests that variables are either stationary at level or in first difference, implying that PNARDL is a suitable technique.

4.2 Results and discussions

This study focuses on the asymmetric impacts of corruption on financial development in BRICS economies. First, we discuss the non-linear estimates of the baseline model reported in Table 5. From the long-run estimates, we see that the positive changes in the corruption index have an insignificant and positive influence on M2 and FD in models (1) and (2). Conversely, negative changes of corruption index suggest that a one-point decrease in corruption index has a significantly negative impact on M2 and FD and the magnitudes of the impacts are 0.108 and 0.049. In simple words, our findings suggest that as corruption goes up, financial development decrease in BRICS economies. In general, these findings support the “sand in the wheel” hypothesis according to which the higher level of corruption has an adverse impact on the financial development (Beck et al., 2006a; Beck et al., 2006b; Cooray and Schneider, 2018; Wei, 2000), which in turn affects overall economic activity. According to Cooray and Schneider (2018), corruption is a rent-seeking activity that will divert the flow of cash from productive activities to non-productive ones, hindering economic activities. Moreover, due to corruption, most of the funds will be taken away by the most affluent class of society and most of the working class will remain empty-handed and as a result, the overall welfare of the society is compromised at the benefit of a few people.

Apart from the main variable, some control variables are also included. Models (1) and (2), related to M2 and FD, is augmented with GDP per capita growth (Ggrowth), average years of schooling (AYS) and law and order (Lorder). The long-run estimated coefficient (0.006) of Ggrowth, in model (2), has a positive and significant effect on FD implying that increased economic activity boosts the financial development in BRICS. This upheld the hypothesis of “demand-following” supported by Gurley and Shaw (1967), Goldsmith (1969) and Jung (1986) according to which a positive growth of the economy pushes the demand for financial services, improving the financial development (Calderón and Liu, 2003).

Furthermore, as average years of schooling, in models (1 and 2) rises by 1-point, M2 moves upward by 0.076%. From these findings, we can confer that as people become more educated, financial development surges due to increased financial awareness and literacy (Cooray and Schneider, 2018). Finally, our results suggest that one-point improvement in law-and-order index enhances both M2 and FD by 0.090 and 0.046%, respectively. Thus, consolidating the legal and institutional structures and presenting a competent supervisory atmosphere to ease financial

inclusion will help speed up the process of financial growth (Abubakar et al., 2020). This positive role of governance in improving financial development is also supported by most of the previous studies as pointed out by Sayilir et al. (2018).

Table 3. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) M2	1						
(2) FD	0.773	1					
(3) Corruption	-0.181	-0.404	1				
(4) Ggrowth	0.570	0.459	-0.260	1			
(5) Lorder	0.194	0.135	-0.111	0.537	1		
(6) Bquality	0.094	-0.394	0.598	-0.046	0.086	1	
(7) AYS	-0.039	0.165	-0.146	-0.322	-0.520	-0.499	1

Table 4. Unit root tests

		M2	FD	Corruption	Ggrowth	AYS	Lorder	Bquality
LLC	I(0)	-3.567***	-1.270	-3.241***	-3.184***	1.504	0.131	-3.131***
	I(1)		-4.680***			-3.048***	-2.579***	
	Decision	I(0)	I(1)	I(0)	I(0)	I(1)	I(1)	I(0)
IPS	I(0)	-0.954	-2.785**	-2.125*	-3.165***	-0.556	-3.920***	-2.440**
	I(1)	-5.252***				-3.319***		
	Decision	I(1)	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)

Notes: *, **, and ***, denotes the level of significance at the 10, 5 and 1 %, respectively

Table 5. Nonlinear panel ARDL estimates

	Coefficient	M2			Coefficient	FD Index		
		S.E	t-Stat	P-value		S.E	t-Stat	P-value
Long-run estimates								
Corruption ⁺	0.020	0.045	0.453	0.651	0.010	0.012	0.818	0.415
Corruption ⁻	-0.108***	0.015	-6.987	0.000	-0.049***	0.004	-11.65	0.000
Ggrowth	-0.002	0.006	-0.256	0.799	0.006***	0.002	3.752	0.000
AYS	0.076***	0.018	4.151	0.000	0.007	0.006	1.206	0.231
Lorder	0.090***	0.029	3.090	0.003	0.046***	0.009	5.039	0.000
Short-run estimates								
ECMt-1	-0.217*	0.130	-1.669	0.100	-0.457*	0.257	-1.778	0.079
Δ Corruption _t ⁺	0.037	0.041	0.908	0.366	-0.015	0.012	1.232	0.221
Δ Corruption _t ⁻	0.055	0.043	1.296	0.198	0.013	0.015	0.913	0.364
Δ Ggrowth _t	0.001	0.005	0.220	0.826	-0.001	0.001	-0.974	0.333
Δ AYS _t	-0.097***	0.034	-2.892	0.005	-0.040**	0.016	2.448	0.016
Δ Lorder _t	0.052	0.042	1.216	0.227	-0.008	0.005	-1.475	0.144
C	0.680	0.435	1.564	0.121	0.092	0.061	1.512	0.134
No. of cross-sections		5				5		
No. of Obs.		130				130		
Log likelihood		220.1				332.7		

Notes: *, **, and ***, denotes the level of significance at the 10, 5 and 1 %, respectively

These long-run results are valid only if the estimate attached to $ECMt-1$ is negatively significant, which is the case in both models. This implies that long-run results are co-integrated, meaning they are supporting reliability.

One of the advantages of the PNARDL methodology is that we do not need to put any extra effort to get the short-run estimates and they are available besides the long-run results by estimating a single equation. In short-run estimates, positive and negative components of corruption do not have a significant effect either on M2 nor FD. Among the control variables, only ΔAYS significantly and negatively affected the M2 and FD in models (1 and 2).

4.3 Robustness checks

To observe the robustness of our results, Table 6 reports the non-linear estimates for models of M2 and FD by controlling for the crises period. Hence, asymmetric impacts of corruption on financial development findings of both baseline models in Table 5 and robustness checks in Table 6 are complementing each other. Generally, we can interpret that as the corruption in the society goes up the trust of the investors and creditors does not establish in the system and as a result financial sector does not flourish. Thus, both models justify the hypothesis that corruption is “sand in the wheels” of financial development.

Furthermore, we re-estimated our models using an alternative proxy of institutional quality. More specifically, we used the bureaucratic quality index (Bquality) of ICRG as an alternative measure of institutional quality. Our models yielded similar conclusions to those documented in Tables 5 and 6 [4]. Thus, our results are robust and consistent having applied several checks and confirm the asymmetric impact of corruption on financial development in favor of the “sand in the wheels” hypothesis.

5. Concluding remarks

In this study, we assess the asymmetric impact of corruption on financial development for a sample of BRICS economies over the period 1991–2018.

Table 6. Nonlinear panel ARDL estimates (controlled for the crisis period)

	M2				FD Index			
	Coefficient	S.E	t-Stat	P-value	Coefficient	S.E	t-Stat	P-value
Long-run estimates								
Corruption ⁺	0.020	0.043	0.474	0.637	0.009	0.013	0.697	0.488
Corruption [−]	−0.117***	0.016	−7.399	0.000	−0.048***	0.005	9.898	0.000
Ggrowth	0.001	0.006	0.237	0.813	0.006***	0.002	3.223	0.002
AYS	0.074***	0.018	4.172	0.000	0.008	0.006	1.275	0.206
Lorder	0.095***	0.030	3.195	0.002	0.046***	0.010	4.721	0.000
Short-run estimates								
ECMt-1	−0.224*	0.129	−1.742	0.085	−0.458*	0.254	1.802	0.075
ΔCorruption _t ⁺	0.041	0.042	0.962	0.339	−0.015	0.012	−1.260	0.211
ΔCorruption _t [−]	0.056	0.043	1.292	0.200	0.012	0.015	0.826	0.411
ΔGgrowth _t	−0.001	0.003	−0.350	0.727	−0.001	0.001	0.511	0.611
ΔAYS _t	−0.089***	0.031	−2.878	0.005	−0.042**	0.017	2.498	0.014
ΔLorder _t	0.050	0.042	1.186	0.239	−0.009	0.005	1.628	0.107
C	0.690*	0.411	1.679	0.097	0.093	0.062	1.500	0.137
No. of cross-sections		5				5		
No. of Obs.		120				120		
Log likelihood		215.1				320.3		

Notes: *, **, and ***, denotes the level of significance at the 10, 5 and 1%, respectively

For that purpose, we employ an asymmetric panel ARDL approach which is estimated by the PMG technique. The baseline results revealed that a negative change in the corruption index (meaning an increase in corruption) has a significant negative influence on the M2 and FD index. The PNARDL findings also support the “sand in the wheels” hypothesis in BRICS economies because an increase in corruption significantly decreased the financial development. While a positive change in the corruption index (a decrease in corruption) insignificantly influences M2 and FD. The robustness checks also indicate that a negative change in the corruption index has significant negative effects on both M2 and FD in BRICS economies. Moreover, an increase or decrease in corruption does not change either the M2 or the FD index in the short run. Hence, we can say that long-run results are more effective and stronger as compared to the short-run estimates. These findings are of direct practical relevance for BRICS and other emerging economies.

Based on empirics, our study offers a few important policy implications for control of corruption and financial development in BRICS countries which are also applicable to other emerging economies. Our findings suggest that the governments of BRICS must take the necessary steps to reduce the level of corruption. BRICS economies could reduce corruption through good governance and by improving the quality of domestic institutions combined with educational attainment. The combat against corruption must be on all levels in BRICS economies, international pressure on corrupt countries can be beneficial. The BRICS economies can control corruption meaningfully by changing the regulatory system. A combination of social, economic and institutional policies can effectively lower the impacts of corruption on financial

development. Overall, our results suggest that policies to reduce corruption will show their efficacy in the long-run and not much in the shorter period.

As a result, this study lays the foundation for upcoming empirical studies on the connection between corruption and different development variables. A similar study can be conducted for other economies. Furthermore, future research should consider financial sector activity and banking sector efficiency, or different kinds of financial sector development, as that dissect might augment the policy implications. Based on the notable findings existing in this paper, forthcoming empirical research will need to consider asymmetries in the analysis of corruption-financial development nexus for other countries in various political regimes. Future empirical works may also address the issue of governance in highly corrupted economies concerning corruption.

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Notes

1. Corruption Perceptions Index of Transparency International spanning from 1995, and the annual World Bank control of corruption index spanning from 1995 to date.
2. Support for International Cooperation against Corruption and BRICS Anti-Corruption Working Group are examples of BRICS work against corruption.
3. South Africa (69), China (78) India (86), Brazil (94) and Russia (129) out of 180 countries.
4. Estimated models output will be made available upon request.