Journal of Environmental Science and Economics
https://doi.org/10.56556/jescae.v1i3.181
ISSN:2832-6032

RESEARCH ARTICLE

Autoregressive Distributed Lag Approach (ARDL) to Corruption and Economic Growth Nexus in Nigeria

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Received: 17 March, 2022, Accepted: 12 June, 2022, Published: 18 June, 2022

Abstract
The corruption in Nigeria is generating concern around the globe and among its citizens. This concern is because corruption has continued undermining the country's socio-economic development. Thus, this study empirically investigates the impact of corruption on economic growth in the Nigerian economy using annual data from 1980 to 2018. The study employed the autoregressive distributed lag (ARDL) model as its estimation technique. In this study, economic growth was proxied by gross domestic product growth rate (GDPGR), while corruption was proxied by the corruption perception index. The result revealed that corruption has a negative and significant impact on economic growth in Nigeria in the long run. This finding implies that corruption has impeded the economic development process in Nigeria within the period of this study. Thus, it was recommended that anti-corruption agencies in Nigeria, such as the Economic and Financial Crime Commission (EFCC) should be strengthened by enacting laws that will empower them to investigate, arrest and prosecute offenders.
Keywords: Corruption; Economic growth; Autoregressive distributed lag model; EFCC

Introduction

Over the years, the Nigerian government has embarked on numerous reforms for economic growth, such as privatisation, banking sector reform, anti-corruption campaigns, and the establishment of organisations like the Independent Corrupt practices commission (ICPC), Economic and Financial Crime Commission (EFCC), among others. These policies and agencies were adopted to ensure rapid economic growth and development and stem the country's rising tide of corrupt practices. Yet, the incidence of corrupt practices looms large in the country, from the military to the civilian administration.

Due to Nigeria's high level of corruption and how it affects economic growth, there is a continuing need to investigate corruption and economic growth in the nation. Nigeria's high poverty, inequality, unemployment, low standard of living, and general economic backwardness are believed to be traced to corruption. Corruption is a sickness that stunts any nation's cultural, political, and economic development and undermines the efficiency of the government's many departments. In 2005, Transparency International stated that "corruption is one of the major issues of the contemporary world, undermining the good government, profoundly distorting public policy, leading to the misallocation of resources, harming the private sector development, and especially hurting the poor." Corruption in Nigeria is one of the numerous unaddressed issues that severely impede and limit development (Ayobolu, 2006; Ubi, Eko & Ndem, 2012). It continues to be a significant long-term challenge for Nigeria's political and economic growth (Sachs, 2007). According to the International Centre for Economic Growth (1999), corruption ranges from petty to political or systematic corruption and has eaten deeply into the country's fabric. According to World Bank studies, Abiodem (2007) estimated that corruption costs over $1 trillion annually, or up to 15% of the GDP of a country like Nigeria. A cankerworm called corruption has slowed economic growth in all areas (EFCC, 2005). The difficulty in achieving rapid economic progress in Nigeria is partly due to corruption (ICPC, 2006).

Furthermore, empirical studies on the impact of corruption on economic growth showed mixed results. While some studies established a positive effect of corruption on economic growth, others found a negative impact on economic growth. For instance, studies such as Odi (2014), Yapatake, Abeid and Ngaba (2017), Odubunmi and Agbelade (2014), and Muzurura (2017), among others, have found positive impacts of corruption on economic growth. On the other hand, studies such as Tarek (2014), Rotimi and Obasaju (2013), Egunjobi (2013) and Moe and Fredoun (2006) have established that there is a negative impact of corruption on economic growth.

Generalising how corruption affects economic growth in Nigeria is challenging due to the inconsistent findings of earlier studies, thus provoking further research. Against this background, this study wishes to investigate corruption's effect on Nigeria's economic growth.

Consequently, the primary goal of this study is to examine the impact of corruption on economic growth in Nigeria. The remainder of this study is presented as follows. Section 2 presents the literature review; Section 3 presents the theoretical literature; Section 4 presents the methodology; Section 5 presents the result and discussions; Section 6 presents the discussion of findings; Section 7 gives the policy implication.

Literature Review

Concept of Corruption

Again, due to its many vices, corruption is viewed as a threat to economic growth. The economic, political, and social vices of a nation tolerating corruption are frequently under attack. According to Eigen (2001), corruption is considered a "daunting challenge to sustainable development," a hindrance to education, health care, and poverty reduction, and a significant obstacle to the Sustainable Development Goals (SDGs) of halving the number of people living in severe poverty by 2030. According to Akhabue and Ejere (2016), corruption uses public positions for personal gain. Public office is abused when a representative solicits, receives, or demands a bribe to further their interests. Private agents will also use public offices to go around government regulations and procedures for a competitive edge and financial gain. Even without the use of bribes, the exploitation of public office for personal gain is still possible through patronage and nepotism, theft of state property, or misappropriation of public funds (World Bank, 1997).

Salisu (2000) defined corruption as the misapplication of public resources to private ends, like public officials collecting bribes for issuing permits, licenses for authorising passage of goods at sea/airport, passport or visa, for contracting out work or passing laws intended to inflict artificial scarcity, granting undeserved score or grades to students after an exam, availing question papers to students before an examination. Occasionally, it could take the form of sexual or other gratifications. Transparency International (2005) described it as "the abuse of entrusted power for private gain". Similarly Khan (1996) and World Bank (1996), corruption is an action that violates the formal standards guiding the conduct of a person in a position of public authority for personal reasons like wealth, power, or status. Otite (2000) defined corruption as a perversion of integrity or state of affairs through bribery, favour or moral depravity". To establish dishonest, unfaithful, or defiling situations, at least two parties must interact to alter society's structure, procedures, or officials' behaviour. In other words, corruption is a systemic vice that manifests as favouritism, nepotism, tribalism, sectionalism, unjust enrichment, accumulating riches, abusing positions of authority, abusing power, and deriving undue advantages and benefits. Windsor and Getz (2000) defined corruption as socially impermissible deviance from some public duty or, more generally, some ideal standard of conduct.

According to Alatas (1990), there are seven categories of corruption: autogenic, defensive, extortive, investive, nepotistic, supportive, and transactive. Autogenic corruption is self-generating, and usually, only the offender is involved. What occurs in instances of insider trading would be a good example. Gaining essential knowledge that could impact a company's stock allows one to act swiftly to either buy or sell significant quantities of supplies before the information's potential effects materialise. When someone needing an essential service is forced to pay a bribe to avoid unfavourable consequences for his interests, this is referred to as defensive corruption. For instance, a person who requires a passport to travel abroad within a specific time frame may be forced to pay bribes or forfeit the trip. This personal corruption is in self-defence. Finally, extortive corruption is a person's behaviour demanding private compensation in exchange for services.

Investive corruption is the act of offering goods or services without any direct connection to a specific favour in the present but in anticipation of circumstances when the favour could be required. Nepotistic corruption refers to the inappropriate appointment of friends or family members to public office with the preferential treatment that goes beyond the recognised norms. The actions performed to safeguard or reinforce already-existing corruption typically do not include money or direct benefits. For instance, a corrupt official or regime may attempt to thwart the election or appointment of a decent person or government out of concern that they or the regime may be subject to investigation by the one in power after them. Finally, transactive corruption refers to circumstances in which two parties actively engage in corrupt behaviour for mutual benefit. For example, a dishonest business person may willingly bribe a corrupt government official to win a tender for a specific contract.

Empirical Review

Using the ordinary least squares method, Moe and Fredoun (2006) examine the impact of corruption on economic growth in Lebanon. Findings from the study indicated that corruption reduces the country's standard of living as measured by real per capita GDP and also undermines economic growth indirectly by reducing the factor input productivity in a Cobb-Douglas production function. Further findings from the study showed that corruption increases inefficiencies in government expenditure and reduces investment and human capital productivity, negatively impacting output.

Using Granger causality and regression techniques, Odi (2014) empirically examines corruption's effect on the Nigerian economy's expansion. GDP and corruption index were used as proxies for economic growth and corruption, respectively. According to the report, Nigeria's corruption level has significantly impacted its country's economic development throughout the years.

This study suggests that without zero tolerance for corruption, the economy cannot expand quickly. According to the study, efforts to combat poverty and corruption should be encouraged to increase economic growth. The Independent Corrupt Practices and Related Offences Commission (ICPC) and the Economic and Financial Crime Commission (EFCC) should also strengthen their anti-corruption initiatives.

Rotimi and Obasaju (2013) employed ordinary least squares (OLS) to analyse the link between corruption and economic growth in Nigeria. The study used the Granger causality method to measure the causal link between corruption and the gross domestic product (GDP). The findings showed that corruption hinders and has an impact on economic progress. They draw the following conclusion and recommend that public education campaigns/programs, private anti-corruption initiatives, and public anti-corruption activities be bolstered and encouraged to focus on the causes of corruption rather than its results.

Egunjobi (2013) empirically investigates the impact of corruption on economic growth in

Nigeria used annual time series data from 1980 to 2009 and employed regression analysis. Additionally, the Impulse Response Function and Granger Causality Test were run. The empirical findings show that worker-level corruption hurts capital expenditure, education spending, and production per worker directly and indirectly. The study also showed a one-sided causal relationship, with the direction of influence running from output per worker to corruption per worker. The study recommended a strategy that relies too much on activities in multiple areas instead of only one action (establishing anti-corruption agencies).

By including the corruption index in the economic growth model for Egypt, Tarek (2014) empirically studies corruption's direct and indirect effects on economic growth. The model offers a straightforward theoretical framework in which the degree of corruption and its impact on output variables, forging direct investments, government spending, openness, and political instability, are identified. The study's key finding offers empirical evidence that corruption raises inefficiencies in government spending, decreases investment, and depletes human capital, all of which negatively impact output. In addition, human capital, openness and political instability are the most crucial channel variables through which corruption is likely to reduce growth.

Odubunmi and Agbelade (2014) investigate the causality between corruption and economic growth in Nigeria. Time series (secondary) data spanning 1990 and 2010 were used in conjunction with the Granger causality test and ordinary least squares methods. The variables used were FDI inflow, the Corruption Index, the Gross Domestic Product, gross fixed capital creation, the economy's openness/globalisation, and government spending. The result revealed no significant relationship between corruption and the Economic Growth (GDP) determinant, the openness of the economy and globalisation (OEG). While corruption strongly affects economic growth and other factors, including government spending, foreign direct investment, and gross capital formation, this suggests that corruption has a positive relationship with economic growth (GDP). According to the findings of the Granger causality tests, corruption is a direct cause of FDI influx, government spending, gross capital formation, openness, and economic globalisation. Also, there is a uni-directional correlation between corruption to Economic growth (GDP) (GDP). The study's findings support preexisting claims that a nation's level of corruption is a significant factor in determining its economic growth rate. The report stated that the EFCC and ICPC, two Nigerian anti-corruption agencies, should step up their efforts and that our youth should be reoriented toward moral principles.

Using the vector autoregressive model (VAR), Yapatake, Abeid, and Ngaba (2017) examined the impact of corruption on the economic growth of Botswana covering the period 1996 to 2014. The results show that government effectiveness and export of goods and services are significant at 0.03 and 0.07, respectively and have a positive relationship with gross domestic product growth. The control of corruption is not significant but has a positive relationship with economic growth. However, the study recommended that many efforts should continue to be directed towards corruption because as the economy grows fast, there are inducements as well economy diversifications in agriculture, financial services and textiles for new growth opportunities.

Using multivariate regression and annual time series data, Musurura (2017) investigated the linkage between corruption and economic growth in Zimbabwe. The results indicate that corruption indeed impacts investment and economic growth. In addition, trade openness, foreign direct investment and inflation were also significant. The policy implications of these findings are: Zimbabwe should trim down excessive government regulation of economic activities because this facilitates bureaucratic corruption, rent-seeking, bribery, theft of public property and other forms of unrestrained opportunism. Removal of restrictions requires political deregulation, trade openness, injecting more integrity into the procurement process, improving anti-corruption organisations, adherence to the rule of law and expanding the chances for ordinary persons to participate in governance. It is believed that excellent administration would let citizens bring their rulers to account, resulting in better accountability, transparency and economic prosperity.

Theoretical Framework

Policy-Oriented Theory of Corruption

This theory was propounded by Teveik, Albert and Charles in 1986, explaining the government's role in fighting corruption (Odi, 2014). The theory states that despite frequent corruption, government involvement in corruption has surprisingly affected the economy's growth, which needs serious investigation. Furthermore, the theory opined that the high level of corruption in developed or developing countries would impede economic growth. It was further suggested that quantifying the impact of administrative corruption on economic growth, a framework and methodology must be created if the field of administrative corruption becomes more theoretical and less descriptive.

Endogenous Growth Theory

Endogenous growth theory is linked to economists such as Arrow (1962), Romer (1986) and Lucas (1988). They believed that productivity improvements could be connected directly to a faster pace of innovation and extra investment in human capital. They emphasise the necessity for private and public sector institutions that successfully foster innovation and offer individuals and business entities the incentives to be creative. There is also a central role in accumulating knowledge as a determinant of growth. Endogenous growth theorists contend that creating a high-value-added knowledge economy is the best way to take advantage of positive externalities. The knowledge economy can help build and maintain a competitive advantage in fast-growth industries and competitive advantage within the global economy.

The endogenous growth theory's primary arguments are as follows: In the growth model, the rate of technological advancement should not be assumed to be constant. Government initiatives that increase market competition and promote product and process innovation can boost a nation's long-term economic growth. Second, there are increasing returns to scale from new capital investments. The assumption of the law of diminishing returns is questionable. Endogenous growth theorists believe in the potential for economies of scale (or increasing returns to scale) to be experienced in nearly every industry and market. Third, private sector investment in research and development is a crucial source of technical progress. Private property rights and patent protection are essential to provide appropriate and effective incentives for businesses and entrepreneurs to invest in research and development. Fourth, investment in human capital (including health, education, and training and retraining to the labour force) is crucial to long-term economic growth. Finally, government policy should encourage entrepreneurship to create new businesses and ultimately as a vital source of new jobs, investment and innovation.

However, the endogenous growth theory has been criticised on the following grounds:

One, the theory's central tenets are derived from Adam Smith and its stand on increasing returns is traced to Marx. Two, It depends on the production function and steady-state. Three, It focuses much on the role of human capital and forgets the role of institutions. The difference between physical and human capital in its different models is vague.

Methodology

The research techniques employed are based on econometric analysis, which tends to model the relationship between the dependent) and independent variables in the study. However, the Ordinary Least Square (OLS) technique was used to analyse corruption's impact on economic growth in Nigeria.

Thus, the empirical model for this can be expressed as:

$$GDPGR = f(COR, FDI, INFL, TOP, LITR) \quad [1]$$

The econometric form of equation 3.4 can be specified as

$$GDPGR_t = a_0 + a_1COR_t + a_2FDI_t + a_3INFL_t + a_4TOP_t + a_5LITR + U_t \quad [2]$$

The logarithmic form of the model is specified as:

$$Ln(GDPGR_t) = a_0 + a_1\ln(COR_t) + a_2\ln(FDI_t) + a_3\ln(INFL_t) + a_4\ln(TOP_t) + a5\ln(LIT_t) + U_t \quad [3]$$

Where:

GDPGR = Growth rate of gross domestic product being used as a measure of economic growth

COR = Corruption

FDI = Foreign direct investment

INFL = Inflation rate

TOP= Trade openness, which is the sum of exports and imports divided by GDP (in percentage)

LITR = Literacy rate

U = Stochastic Error term

a_0 = constant term; and a_1 to a_5 = coefficients of the various explanatory variables.

It is expected that signs of the coefficients of the independent variables are: b1< 0, b2 > 0, b3 < 0, b4 > 0, b5 > < 0

Sources of Data

Annual time-series data were employed in this study on the variables from 1980 to 2018 obtained from the CBN Statistical Bulletin, CBN Annual reports, Nigerian Bureau of Statistics Bulletins and Annual Reports, Internet, Journals, Textbooks, Anti-corruption agencies reports and publications.

Result and Discussions

Unit Root Tests

Table 1: Augmented Dickey- Fuller (ADF) Test of Unit Roots

Variables	Level (first difference)	ADF Critical 1% (5%)	Order of Integration	Remark
COR	-0.725779	-3.615588 (-	I(1)	Integrated

	(-6.589377)	2.941145) -3.621023 (-2.943427)		of order one
FDI	-3.615588 (-7.606449)	-3.574446 (-2.941145) -3.621023 (-2.943427)	I(1)	Integrated of order one
GDPGR	-4.238970	-3.615588 (-2.941145)	I(0)	Integrated of order zero
INFLA	-2.740645 (-5.883831)	-3.615588 (-2.941145) -3.621023 (-2.943427)	I(1)	Integrated of order one
LITR	-1.682835 (-4.601670)	-3.615588 (-2.941145) -3.621023 (-2.943427)	I(1)	Integrated of order one
TOP	-2.402165 (-7.126781)	-3.615588 (-2.941145) -3.621023 (-2.943427)	I(1)	Integrated of order one

Source: Authors' Computation

From Table 1, using the Augmented Dickey-Fuller (ADF) unit root test, only the GDP growth rate was stationary at level. The other variables, namely, corruption, foreign direct investment, inflation rate, trade openness and literacy rate, were stationary at first.

VAR Lag

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1186.494	NA	2.38e+21	66.24969	66.51361	66.34180
1	-1085.915	162.0452*	6.79e+19	62.66192	64.50936*	63.30673*
2	-1051.550	43.90974	8.86e+19	62.75280	66.18376	63.95030
3	-998.9031	49.72248	5.83e+19*	61.82795*	66.84243	63.57814

Note: * indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

Source: Authors' Computation

Before the regression results were estimated, the test for the selection of lag length was carried out. The aim was to determine the most significant lag length that variables would be lagged. According to Henry *et al.* (2021), several lag selection criteria can be adopted for the lag length selection. This includes; Sequential modified LR test statistics, Final prediction error, Akaike information criterion, Schwarz information criterion, and Hannan-Quinn information criterion. The result of the lag length criteria is presented in Table 2. In addition, the lag length of one (1) was selected for the study based on the Schwarz information criterion.

Cointegration Test

Table 3: Bounds Tests for the Existence of Cointegration

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic K	7.7190865	10%	2.75	3.79
		5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

Source: Authors' Computation

The cointegration test indicates that the computed F-statistic of 7.719086 is greater than the lower and upper bounds critical values of 3.12 and 4.25, respectively, at the 5 per cent significance level. Consequently, the null hypothesis of no cointegration is rejected, meaning there is evidence of a long-run relationship among GDPGR, CORR, INFLA, FDI, LITR and TOP.

ARDL Short-Run Estimate

Table 4: Estimates of the Short Run Coefficients ARDL

Dependent Variable: Growth Rate of Gross Domestic Product

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	38.41553	5.054601	7.600111	0.0000
@TREND	0.298124	0.059610	5.001204	0.0001
D(COR)	-0.943326	1.617093	-0.583347	0.5656
D(COR(-1))	5.698490	1.782522	3.196870	0.0042
D(COR(-2))	6.323006	1.662968	3.802242	0.0010
D(INFL)	-0.153695	0.033928	-4.530039	0.0002
D(INFL(-1))	0.206067	0.032691	6.303401	0.0000
D(INFL(-2))	0.155957	0.036479	4.275289	0.0003
ECM(-1)	-0.250972	0.055289	-4.539267	0.0000
R-squared	0.744435	**Durbin-Watson stat**	2.207371	
Adjusted R-squared	0.668713			
F-statistic	9.831056			
Prob(F-statistic)	0.000003			

Source: Authors' Computation

The short-run coefficients are presented in Table 4.4. As shown, the estimates of one-year and two-year lagged values of corruption, the present value of inflation rate, the one-year lagged value of inflation rate, and the two-year lagged value of inflation rate are statistically

significant at 5 per cent, respectively. This result implies that these variables seem to significantly impact Nigeria's economic growth in the short run. However, the present value of corruption was not statistically significant. Thus, the current value of corruption does not impact Nigeria's short-run economic growth.

Furthermore, the coefficient of ECM has the correct sign, which is negative and statistically significant at a 5 per cent level. The ECM result shows a slow speed of adjustment from the short to the long run of approximately 25.09 per cent. The Adjusted R-squared of 0.668713 means that the independent variables account for 66.87 per cent of the systematic change in economic growth. While the other 33.13 per cent left unexplained is attributed to other factors not captured in the model but represented by the error term. The f-statistic value of 9.831056 shows that the overall model is statistically significant. The Durbin-Watson statistics value of 2.207371 shows no autocorrelation in the estimated model.

5ARDL Long-Run Estimate

Table 5: Estimates of the Long Run Coefficients ARDL Dependent Variable: GDPGR

Variable	Coefficient	Std. Error	T-Statistic	Prob.
COR	-7.633824	3.061842	-2.493213	0.0207
FDI	3.49E-10	3.61E-10	0.966303	0.3444
INFL	-0.271438	0.052709	-5.149713	0.0000
LITR	-0.218382	0.056391	-3.872656	0.0008
TOP	8.114619	6.367861	1.274308	0.2159

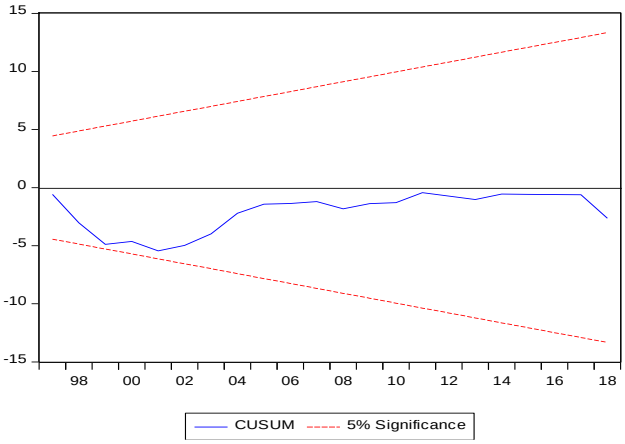
Source: Authors' Computation

The long-run coefficients are presented in Table 4.5. As shown, the estimates of corruption and inflation have the expected signs. On the other hand, foreign direct investment and trade openness are not statistically significant at the five per cent level. At the same time, corruption, inflation and literacy rate were statistically significant at a 5 per cent level. Therefore, these variables seem to impact significantly long-run economic growth in Nigeria.

Observably, corruption has a negative coefficient. Therefore, the corruption coefficient indicates that in the long run, a one per cent increase in corruption reduces economic growth by 7.63 per cent. Similarly, the inflation rate and literacy rate have negative coefficients. This result implies that a one per cent increase in inflation rate and literacy rate reduces economic growth by 0.27 and 0.22 per cents, respectively. On the other hand, foreign direct investment and trade openness all have positive coefficients indicating that a 1 per cent increase in foreign direct investment and trade openness increases economic growth by 3.49 and 8.11 per cents, respectively, in the long run.

Model Stability Test

Figure 1: Cusum Test



A diagnostic test was performed, and it can be seen that the result of the CUSUM stability test indicates that the model is stable. This stability is because both the CUSUM and CUSUM of Squares lines fall in-between the two 5% lines.

Discussion of Findings

From the findings, corruption has a negative coefficient. This outcome is due to the high level of corruption by politicians in Nigeria. Similarly, inflation rate and literacy rate have negative coefficients. The negative coefficients of the inflation rate may be due to an increase in the general price level, which reduces people's purchasing power, leading to a low standard of living. Similarly, the negative coefficient of literacy rate could be that the country's literacy level is not high enough to promote economic growth.

On the other hand, foreign direct investment and trade openness all have positive coefficients. These outcomes may be because foreign inflow into the country is invested in strategic areas that lead to economic growth. In addition, Nigeria's trade terms have been favourable, leading to economic growth.

Conclusion and Policy Implications

This paper examined the impact of corruption on economic growth in Nigeria between 1980 and 2018. It is concluded from the findings that corruption reduces Nigeria's economic growth in both the short and the long run. Thus, the policy implication is that institutions such as the economic and financial crime commission should be strengthened to fight corrupt practices in the country. Furthermore, the government should invest more in education to enhance the population's literacy rate and control the country's prices of goods and services.

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