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Corruption, property rights and economic growth in Africa: empirical evidence from natural resource rich countries

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Abstract

Corruption and property rights have long been considered taboo subjects or even areas outside the scope of economic analysis. Today, corruption and property rights are increasingly emerging as central issues in development economics. The objective of this article is to analyse the relationship between corruption, property rights and economic growth from African natural resource rich countries. Thus, a VAR model is estimated on a panel of twenty-two countries over the period 2000-2017. The results show that corruption has a positive effect on economic growth, while economic growth has no effect on corruption. Property rights promote economic growth, while economic growth does not contribute to protecting property rights. Corruption has a negative effect on property rights, while property rights have no significant effect on corruption. The findings of the study suggest the need to step up the fight against corruption by strengthening the quality of institutions and the protection of property rights that promote strong and sustainable economic growth and better management of natural resources in these countries.

We would like to express our gratitude to the Editor John P. Conley and to two anonymous referees for providing helpful comments and suggestions. All remaining errors are our own. Laboratory of Economic and Management Research - University of Parakou - Benin. Contact: Abdoulaye Dramane - abdramanefr1@yahoo.fr
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1. Introduction

Several theoretical and empirical studies establish today the importance that institutions play in growth and development. Indeed, the institutional evolution of an economy is determined by the interaction between institutions and organizations: the former present the rules of the game and the latter the players made up of groups of individuals driven by common objectives. A large number of authors believe that institutional and political factors are the main explanatory variables for the backwardsness of underdeveloped economies (Barro and Lee, 1994; Alesina et al., 1996; Easterly and Levine, 1997; Acemoglu and Robinson, 2008). Among the institutional factors that can affect development, corruption and property rights have most often attracted the attention of economists. Several studies have also been devoted to studying the link between corruption, property rights and growth (Zak, 2002; Powell and Heckelman, 2008; Dong and Torgler, 2010; D'Agostino et al., 2016a and 2016b; Huang, 2016; Gründler and Potrafke, 2019; Abdoulaye, 2021). Indeed, in legal terms, property rights are defined as the right to use an asset, the right to derive income from it, and the right to transfer it definitively to a third party. In general, a property right is then defined as a socially validated right to choose the uses of an economic good or a right assigned to a specified individual and alienable by exchange against similar rights on other goods. Most recent work on institutions and economic growth emphasizes the importance of a particular group of institutions, namely, those that protect property rights and enforce contracts. We could call them market-creating institutions, since in their absence, markets do not exist or function very poorly and can be a source of corruption. Cancio (2007) argues that economic agents indulge in corruption when institutions for the protection of property rights function poorly or do not exist. Corruption is emerging as a central problem in developing countries. Alesina and Weder (2002) define corruption as the misuse of state property by an official for personal gain. The act of corruption can be initiated either by a State agent or by a public service user. In doing so, corruption emerges as one of the most serious obstacles to development and economic growth in most developing countries. The analysis of the socioeconomic consequences of corruption from the perspective of rent seeking (Tollison, 1982) and agency theory shows that the effects of an act of corruption can be positive (Grease the wheels hypothesis: Leff, 1964; Huntington, 1968), negative (Sand the wheels hypothesis: Shleifer and Vishny, 1993; Mauro, 1995; Klitgaard, 1995) or conditional. Indeed, the IMF's "Regional Economic Outlook" document (2018) classifies African countries into three distinct groups, namely, oil-exporting countries, other resource-rich countries and resource-poor countries. Thus, oil-exporting countries are countries where net oil exports account for at least 30% of total exports. Other resource-rich countries are countries where nonrenewable natural resources account for at least 25% of net exports. Resource-poor countries are countries that belong neither to the group of oil exporters nor to the group of other countries rich in natural resources. Our study takes into account twenty-two countries constituting the first two categories, namely, oil-exporting countries and other countries rich in natural resources.

According to the various annual rankings of Transparency International, the countries of sub-Saharan Africa appear at the bottom of the ranking. Given the urgency of the situation, the African Union is committed to the fight against corruption through the adoption by all member states of the convention on the prevention and fight against corruption in July 2003 in Maputo, Mozambique. For the 2017 ranking, for example, only two African countries (Botswana, 61/100 and Namibia, 51/100) belonging to this group recorded a score greater than or equal to 50, which means that corruption remains a real problem in these different countries. According to Transparency International's ranking of the Corruption Perceptions Index of 2019, Sub-Saharan Africa is the region where corruption is most rampant, with a score of 32 out of 100, followed by Eastern Europe and from Central Asia, with a score of 35 out of 100, and from the Middle

East and North Africa, with a score of 39 out of 100. Furthermore, since 2017, there has been a decline in economic freedom in sub-Saharan Africa, although the region has been able to register generally positive economic growth during these five years. For this region, the results of the Heritage Foundation's Economic Freedom Index (2022) describe dozens of nations characterized by unequal economic rules of the game that are further marked by weak rule of law, property rights protections, cronyism and endemic corruption. The region's scores on property rights, judicial efficiency, and freedom to do business are all 10 or more points lower than the global averages. The average GDP per capita ($4,217 at purchasing power parity) is the lowest of all five regions in the global index according to calculations by the Heritage Foundation (2022).

The objective of this article is to analyse the interaction between corruption, property rights and economic growth from African natural resource rich countries. It is interesting to conduct such an analysis for several reasons. Indeed, the abundance of natural resources in African countries necessarily poses the problem of the definition and protection of property rights in order to allow efficient exploitation of these resources beneficial to the countries. However, a bad or weak definition of property rights can give rise to rent-seeking behavior, thus aggravating the level of corruption. This is what Coase (1959) showed when he asserted: "A system of private enterprise can function well only if property rights are created over the resources and, when this is done, someone one who wishes to use a resource must pay the owner to obtain it. The chaos disappears; and government too, except that a legal system to define property rights and arbitrate disputes is, of course, necessary". It seems very useful to take an interest in the relationship between corruption, property rights and economic growth in richly natural resource endowed African countries because knowledge of this relationship will make it possible to suggest concrete actions in terms of economic policy that could promote strong and sustainable economic growth in these countries.

The present study contributes to the literature on the subject in three main ways. The first contribution lies in the fact that unlike previous studies, this study uses two indicators of property rights (property rights index from Heritage Foundation and rule of law index from Worldwide Governance Indicators) to have a broad understanding of the relationship between corruption, property rights and economic growth. The main interest of our paper is to document the economic literature on the specific case of African natural resource rich countries by analysing the effect of property rights and corruption on economic growth on the one hand and on the other hand determine the contribution of economic growth in protecting property rights and reducing corruption. The analysis also aims to explore the interrelationship between property rights and corruption. The second contribution is methodological; unlike other studies that have studied the relationship in a linear specification, this research deepens the analysis using a VAR model by determining the effect of an instantaneous shock of a variable on other variables using impulse response functions. Finally, the third contribution is originality in the sense that the paper provides empirical elements for understanding the relationship between corruption, property rights and economic growth in African natural resource rich countries. This research is innovative because, to our knowledge, no study has specifically focused on this group of countries for the addressed topic, except Samuel (2011). Therefore, our article makes a major contribution to the literature because our findings are different from those of Samuel (2011). Indeed, Samuel (2011) found that the impact of property rights on economic growth was actually negative for the countries of Sub-Saharan Africa (SSA) because most innovation in SSA might be imitative or adaptive in nature; thus, providing stronger property rights might have protected foreign firms at the expense of domestic firms of SSA. We prove the opposite of Samuel's (2011) analysis in this paper.

The remainder of the paper is organized as follows: Section 2 presents a literature review on the relationship between corruption, property rights and economic growth. Section 3 describes

the methodology and data. Section 4 addresses the empirical results. Section 5 analyses the impulse response functions. Section 6 addresses the robustness checks, and Section 7 provides the conclusion and policy implications.

2. Literature review

We present in the following sections the studies carried out first on the link between corruption and economic growth, then on property rights and economic growth and finally on corruption and property rights in the economic literature.

2.1- Corruption and economic growth in the economic literature

In the economic literature, two theories are opposed to the effect of corruption in the economy. On the one hand, the proponents of the positive effect of corruption on growth (Grease the wheels hypothesis: Leff, 1964, Huntington, 1968). On the other hand, proponents of the negative effect of corruption on growth (Sand the wheels hypothesis: Mauro, 1995).

2.1.1- Corruption as a factor of economic growth

In an empirical approach relating to the causal links between the level of economic growth and the corruption index, Mo (2001) writes that the correlation is not always negative. To some extent, corruption can be seen as an incentive for work and production. Some authors argue that corruption can be a factor of economic growth (greasing the wheels hypothesis). Leff (1964) and Huntington (1968) theoretically showed that corruption can stimulate economic growth by allowing individuals to pay bribes to circumvent red tape. Similarly, Lui (1985) demonstrates that corruption can shorten the time wasted in long queues. Wedeman (1997) remarks that the most corrupt countries have high growth rates. Colombatto (2003) analyses corruption from a theoretical perspective in different institutional environments and finds that in certain cases, corruption can be more efficient in developed countries than in totalitarian countries. Powell and Heckelman (2008) find that corruption “greases the wheels” of growth when economic freedom is low, but the benefit of corruption diminishes when economic institutions improve. Huang (2016) shows that corruption and economic growth are positively correlated in South Korea. Tsanana et al. (2016) find that corruption is positively correlated with economic growth in new European Union member countries.

2.1.2- Corruption as an obstacle to economic growth

From the pioneering work of Mauro (1995) to Watson (2004), economists have constantly highlighted the dysfunctions of economic activity linked to the phenomenon of corruption. Thus, by targeting his analysis on the relationship between corruption and investment, Mauro (1995) estimated the relationship between the ratio of investment to GDP and the degree of corruption. The result of its statistically significant estimate is that countries that have a high degree of corruption also have lower investment to GDP ratios and lower private investment to GDP ratios. He then states that corruption reduces investment in a country; therefore, it is unfavorable to growth and development (sand the wheels hypothesis). Gyimah-Brempong (2002) studies African economies and finds that corruption reduces the rate of economic growth and increases social inequalities. In this same wave, Shleifer and Vishny (1993) find that when it is necessary to have the agreement of several agents who each have discretionary power to carry out a project, the level of corruption will be high, and growth will be low. D’Agostino et al. (2016a) find that corruption decreases economic growth by promoting military expenditure. Corruption has also been shown to decrease growth when investment rates are small (Cie lik and Goczek, 2018a). Some studies have also examined the corruption-growth nexus in

individual continents and regions. In Africa, corruption was negatively correlated with economic growth (D'Agostino et al., 2016b). In Europe, corruption was negatively correlated with economic growth in established European Union member countries (Tsanana et al., 2016). Gründler and Potrafke (2019) find that the cumulative long-run effect of corruption on growth is that real per capita GDP decreased by approximately 17% when the reversed CPI increased by one standard deviation. Kwadwo et al. (2020) find that corruption has a significant negative effect on per capita growth both in the short term and long term.

While it is true that corruption can have a mixed effect on economic growth, it is also true that property rights well protected and secured can stimulate economic growth.

2.2- Property rights and economic growth in the economic literature

Institutions are necessary for economic growth and development. In particular, good institutions for the protection of private property rights stimulate the development of investment and a better allocation of economic resources. (North, 1981). In recent years, empirical work based on cross-sectional and panel data has highlighted the role of institutions in economic growth and development (Acemoglu, Johnson and Robinson, 2002; Easterly and Levine, 2003; Rodrik et al., 2004; Pande and Udry, 2006). Similarly, empirical work based on microeconomic data has highlighted the role of private property rights institutions in the development of private investment, productivity and agricultural investment (Johnson et al., 2002; Goldstein and Udry, 2008; Field, 2007). The role of property rights in investment incentives is shown by Besley (1995). Weak property rights discourage reinvestment of business income even though bank loans are available, suggesting that securing property rights is one of the necessary and sufficient conditions for promoting entrepreneurial investment. Property rights also affect the profile of investments because there is a relationship between the protection of property rights and fixed and intangible investments. In summary, the empirical evidence on the role of property rights in economic growth reveals mixed results, confirming conflicting theoretical predictions. On the one hand, empirical studies that concluded that property rights had a positive effect on economic growth include Falvey et al. (2006), Besley and Ghatak (2009), Mijiyawa (2009), McLennan and Le (2011), Andrés and Goel (2011), Sattar and Mahmood (2011), Green and Moser (2012) and Haydaroglu (2015). On the other hand, Hudson and Minea (2013) concluded that the effect of property rights on innovation was more complex than previously thought, displaying important nonlinearities depending on the initial levels of both property rights and per capita GDP. Other empirical works on property rights and economic growth were skeptical about, or completely against, the positive effect of property rights. Examples include studies by Lerner (2009) and Boldrin and Levine (2009). In particular, Samuel (2011) found that the impact of property rights on economic growth was actually negative for the countries of Sub-Saharan Africa (SSA) because most innovation in SSA might be imitative or adaptive in nature; thus, providing stronger property rights might have protected foreign firms at the expense of domestic firms of SSA.

2.3- Corruption and property rights in the economic literature

Property rights and corruption are complex and multidisciplinary phenomena. Their interaction may be conceptualized as a framework of new institutional economics. According to methodological individualism, property rights are an essential institution of the market economy. North (1990) finds that agents specializing in real estate transactions are often prone to corruption because they can easily bribe state authorities so that corruption increases. Acemoglu and Verdier (1998) show that to reduce corruption, civil servants must agree to apply

the law and avoid ransoms. However, the authors show that it is often optimal to admit some acts of corruption on a small scale because property rights cannot always be guaranteed. Some underdeveloped economies have weak protection of property rights, so corruption thrives. Cancio (2007) argues that a low level of protection of property rights leads to a high level of corruption. The author shows that the reduction of corruption requires a change in behavior and mentality, which can only be obtained through the implementation of solid and effective institutions for the protection of property rights. It concludes with the idea that reducing corruption requires sanctions. Kemal (2007) shows that we can put an end to impunity by punishing corrupt and corrupters. Mance and Pecaric (2016) investigate the relationship between property rights enforcement and corruption in European Union countries. They find that corruption is a consequence of the embodiment and enforcement of a formal institution of property rights.

At the end of this literature review, we note that apart from the study by Samuel (2011), there are practically no studies devoted specifically to African countries in general and to African natural resource rich countries, particularly on the relationship between corruption, property rights and economic growth. Our research finds all its relevance and usefulness because it fills a void and makes it possible to document the empirical literature thanks to the results that we reached on the specific case of African natural resource rich countries. Moreover, what makes our sample specific in the context of our study is that it concerns countries in which these three variables (corruption, property rights and economic growth) are manifested and observed better. Indeed, the exploitation of natural resources often gives rise to problems of corruption and property rights. If we want to better observe the effect of corruption and property rights on growth, it is therefore to these countries that we must look.

3. Methodology and data

3.1- Model specification

The model used in this paper is conceptualized within the framework of endogenous growth theory and the new institutional economics. Thus, we are inspired by the work of Aziz and Asadullah (2016) and Walid and Kais (2019), whose theoretical basis is the Cobb–Douglas production function, which includes two major components, namely, labor and capital and other institutional factors. Therefore, the Cobb–Douglas production function is written as follows:

$$Y = AL^{\alpha} K^{\beta} I^{\theta} \qquad (1)$$

Y is production, A is the exogenous factor, L is the labor factor, K is the capital factor and I represents the role of institutional factors. α , β , and θ represent the share of labor, capital and institutions in production, respectively. $\alpha > 0$, $\beta > 0$, but the sign θ is uncertain. Indeed, institutions can have two alternative effects, negative or positive, on production. If institutions reduce public spending in the real sector, they negatively affect economic growth; however, if institutions increase investor confidence (by giving investors security), they positively affect economic growth. For example, if institutions build investor confidence, then domestic and international investors will invest more because the business environment is secure.

Thus, the analysis of the interaction between property rights, corruption and economic growth is carried out using a panel VAR model. The Cobb–Douglas production function materialized by equation (1) can help us explore the links between the three endogenous variables: property rights, corruption and economic growth. By transforming the production function of equation (1) into linear form, we obtain the VAR of order "p" between corruption, property rights and economic growth as follows:

$$Corruption_{it} = \alpha_0 + \sum_{j=1}^{p} \alpha_{1,t} Corruption_{i,t-j} + \sum_{j=1}^{p} \alpha_{2,t} \Pr operty_{i,t-j} + \sum_{j=1}^{p} \alpha_{3,t} Growth_{i,t-j} + \varepsilon_{1i,t} \quad (2)$$

$$\Pr operty_{it} = \beta_0 + \sum_{j=1}^{p} \beta_{1,t} \Pr operty_{i,t-j} + \sum_{j=1}^{p} \beta_{2,t} Growth_{i,t-j} + \sum_{j=1}^{p} \beta_{3,t} Corruption_{i,t-j} + \varepsilon_{2i,t} \quad (3)$$

$$Growth_{it} = \theta_0 + \sum_{j=1}^{p} \theta_{1,t} Growth_{i,t-j} + \sum_{j=1}^{p} \theta_{2,t} \Pr operty_{i,t-j} + \sum_{j=1}^{p} \theta_{3,t} Corruption_{i,t-j} + \varepsilon_{3i,t} \quad (4)$$

$Corruption_{it}$, $\Pr operty_{it}$ and $Growth_{it}$ represent the variables of corruption, property rights and economic growth, respectively. i represents the countries, t represents the years, and j represents the optimal lag of endogenous variables.

We used control variables to better understand the relationship between corruption, property rights and economic growth. To this end, we include in the model the variables trade openness, population growth rate, total natural resource rents and democracy. Indeed, the economic literature shows that these variables are determinants of economic growth. In addition, total natural resource rents may also be a factor influencing economic growth and property rights in that abundant natural resources could create problems of rights. Trade openness, population size and democracy can allow countries to promote economic growth.

We assume that the role of property rights is crucial in explaining corruption and economic growth. According to Demsetz (2008), scarcity is the main economic problem, and property rights are the necessary institution to alleviate this problem. All business activities involve transfers of ownership rights. For Hurwitz et al. (2005), if the transfer of property rights is subject to clear, unambiguous and publicly accepted rules, then property rights constitute a functional institutional mechanism design, but corruption negatively affects these commercial activities because it constitutes a threat to clear, unambiguous and unbiased rules, hampering mutual trust and expectations regarding the outcomes of human interactions. It follows that corruption influences property rights and economic growth and vice versa. Our approach finds its theoretical foundation in the fact that although property rights and corruption are complex and multidisciplinary phenomena, their interaction can be conceptualized within the framework of endogenous growth theory and the new institutional economics, namely, a combination of property rights theory and the economic analysis of law.

3.2- Econometric estimation methods

Before estimating the model (equations 2; 3; 4) above, it is important to analyse the descriptive statistics and then perform the stationarity test on the different variables of the model. Thus, the tests of Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) are carried out to study the stationarity of variables. The estimation of the VAR model begins with determining the optimal lag. After having this step, we estimate the VAR model using the optimal lag. The results of the estimations are analysed, and we deepen the reflections through the impulse response functions.

3.3- Data

This study is based on a balanced panel of corruption index, property rights indices and economic growth rate of twenty-two African natural resource rich countries over a time span of 18 years ranging from 2000-2017 to take into account the constraints of data availability for

all the variables. The corruption index is derived from Transparency International's Corruption Perceptions Index (CPI).

We use two property rights indicators, namely, the property rights index of Heritage Foundation (2022) and the rule of law of Worldwide Governance Indicators (2022). The heritage foundation property rights index consists of an assessment of the ability of the state to enforce laws protecting private property rights, the likelihood of expropriation, the independence of the judiciary concerning the enforceability of property rights, and the ability of individuals and businesses to enforce contracts. It measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. The index is granted 100 points if private property is absolutely guaranteed by the government, if the court system enforces contracts efficiently and quickly, and the justice system punishes those who unlawfully confiscate private property (Heritage foundation, 2022).

We use the rule of law variable as an alternative proxy measure of the property rights indicator. This variable captures the perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. We use the rule of law as an alternative measure taking into account its limits because due to the inherently unobservable nature of the true level of governance in a country, any observed empirical measure of governance will only be an imperfect proxy for the broader dimensions of governance that it reflects, and the data informing the Worldwide Governance Indicators are no exception (Kaufmann, Kraay and Mastruzzi, 2010; 2011; 2015). It should be noted that the two indicators of property rights used in this research each have limitations, in particular the fact that they are relative measures and that they do not allow for within-country intertemporal comparisons. The economic growth rate is based on GDP growth and is obtained from World Development Indicators.

Data on economic and institutional variables come from various sources, including the World Development Indicators (2022), the Transparency International database (2022), the Worldwide Governance Indicators (2022), the Center for Systemic Peace polity V database (2022) and the Heritage Foundation property rights database (2022).

4. Empirical results

The results to be presented mainly concern the descriptive statistics on the variables, the stationarity tests of the variables used and the results of the VAR model estimates. We carry out two stationarity tests, namely, Im, Pesaran and Shin (IPS) and Levin, Lin and Chu (LLC) unit root tests. The stationarity tests performed (IPS, LLC) show that all the variables were stationary at the level. The estimation of the VAR model requires the determination of the optimal lag. For this purpose, we have chosen the Schwarz information criterion to determine the optimal lag. The results show that the optimal lag for VAR is one.

The descriptive statistics of the variables used in the study and the results of the stationarity tests are presented in Tables 1 and 2, respectively.

Table 1: Descriptive statistics on the variables

Variables	Mean	Std. Dev	Min	Max	Observations
Corruption[1]	7.074	1.115	3.500	9.000	396
Property rights	31.553	15.421	5.000	75.000	396
Economic growth	4.922	7.053	-36.699	63.379	396
Rule of law	-0.813	0.650	-2.110	0.670	396
Democracy	2.179	4.591	-6.000	9.000	396
Trade	79.970	44.398	20.722	351.105	396
Total natural resources rents	18.819	15.064	0.525	61.944	396
Population growth rate	2.697	0.847	0.205	5.340	396

Source: Author's computations, 2022.

Table 1 highlights differences in the values of the main variables. This is the example of variables such as corruption, property rights and economic growth. The figures show that the standard deviation values for the main variables are 1.11 for corruption, 15.42 for property rights and 7.05 for economic growth. This means that African natural resource-rich countries have different characteristics with regard to the level of corruption, property rights and economic growth. Statistics show that the average value of corruption in these countries is 7.07. The minimum corruption value (3.50) was recorded in Botswana in 2012. The maximum value of corruption (9.00) was recorded in Nigeria in 2001. The above statistics show that these countries have efforts to do to reduce or eradicate corruption. For the other variables of interest, the statistics show that the average value of property rights is 31.55. In addition, the minimum value of the property rights indicator (5.00) is recorded in Zimbabwe from 2009 to 2011. The maximum value of the property rights indicator (75.00) is recorded in Botswana in 2009. The statistics show that the average value of the economic growth rate is 4.92%. In addition, the minimum value of economic growth (-36.69%) was recorded in the Central African Republic in 2013. The maximum value of economic growth (63.37%) was recorded in Equatorial Guinea in 2001.

Table 2: Panel Unit roots tests for key variables

	IPS		LLC
Variables	Level	First difference	Level
Economic Growth	-4.495***	-	-3.608***
Property Rights	-3.093***	-	-6.633***
Corruption	-0.505	-8.520***	-2.826***

Source: Author's computations, 2022. Note: *** denotes significance at the 1% confidence level.

[1] The corruption variable was transformed on a scale of 0 to 10 according to the formula: $\hat{X} = X_{max} - X$ With: X_{max} : maximum value of the corruption index and X : initial value of the corruption index. This new variable $\hat{X}$ is between 0 and 10 such that 0 represents a low level of corruption and 10 represents a high level of corruption.

The stationarity tests of Im Pesaran and Shin and of Levin Lin and Chu reveal that all the endogenous variables of the model are stationary in level. However, it should be noted that the corruption variable has some specificities. We note that the corruption is stationary in level for the Levin Lin and Chu tests, contrary to the Im Pesaran and Shin tests, where it is only stationary in first difference.

Table 3 below presents the results of the estimated VAR model.

Table 3: Results of VAR model

Dependant and exogenous variables	Corruption (Equation 2)	Property rights (Equation 3)	Economic growth (Equation 4)
corruption (-1)	**0.9398*** (45.9067)**	**-1.9998*** (-4.1170)**	**1.5082*** (2.8368)**
Property rights (-1)	-0.0009 (-0.7972)	**0.8116*** (29.3303)**	**0.0769*** (2.5401)**
Economic growth (-1)	-0.0015 (-0.8587)	-0.0269 (-0.6123)	**0.2351*** (4.8828)**
Trade	-0.0001 (-0.3200)	0.0026 (0.2900)	**0.0517*** (5.2042)**
Population size	0.0012 (0.0709)	0.5839 (1.3546)	**1.7904*** (3.7950)**
Natural resources rents	8.65E-05 (0.0687)	-0.0018 (-0.0633)	**-0.0552* (-1.6933)**
Democracy	**-0.0097*** (-2.8015)**	0.0504 (0.6134)	**0.2546*** (2.8273)**

Source: Author's computations, 2022. T-statistics are in parentheses. ***; ** and * denote significance at the 1%, 5% and 10% confidence levels, respectively.

The results of Equation 2 show that corruption lagged by one period has a positive effect on corruption. On the other hand, the results show that property rights lagged by one period and economic growth lagged by one period have no effect on corruption. These results show that the level of anterior corruption promotes corruption, while property rights and economic growth do not influence corruption. This finding confirms those of Ouattara (2007) concerning the effect of economic growth on corruption in WAEMU countries.

The results of Equation 3 highlight that corruption lagged by one period has a negative and significant effect on property rights. It can therefore be said that in these countries, a previous corruption level reduces the protection of property rights. Property rights lagged by one period have a positive effect on the evolution of property rights, and economic growth lagged by one period has no significant effect on property rights. This result corroborates Cancio (2007) and Mance and Pecaric (2016) conclusions.

The estimates in Equation 4 show that corruption lagged by one period, property rights lagged by one period and economic growth lagged by one period have a positive impact on economic growth. Notably, corruption has a statistically detectable effect on economic growth. This finding confirms the "grease the wheels hypothesis" according to the positive effect of corruption on growth. These results confirm those of Wedeman (1997), Colombatto (2003), Huang (2016) and Tsanana (2016) and infirm those of Mauro (1995), D'Agostino et al. (2016a), D'Agostino et al. (2016b), Gründler and Potrafke (2019) and Kwadwo et al. (2020). Moreover, our finding infirms those of Samuel (2011) concerning the positive effect of property rights on economic growth. Our results invalidate those of Samuel (2011), and this can be explained by several reasons. First, we use samples from different countries. Samuel (2011) focused on the

countries of sub-Saharan Africa, while we focused on African natural resource rich countries. Then, in the methodology, we used a VAR model estimated over the period 2000 – 2017 with 22 countries, while Samuel (2011) used 34 countries over the period 1985 – 2003 and applied ordinary least squares and the SUR method for the estimations.

What to retain from these results?

Economic growth has no effect on corruption, while corruption has a positive effect on economic growth. Property rights promote economic growth, while economic growth does not contribute to protecting property rights. Corruption has a negative effect on property rights, while property rights have no significant effect on corruption.

Several studies have shown that corruption can promote economic growth. From this perspective, Powell and Heckelman (2008) showed that corruption is growth enhancing when economic freedom is most limited, but the beneficial impact of corruption decreases as economic freedom increases. The authors used a panel model comprising eighty-two developed and developing countries, estimated by the weighted least square method over the period 1995-2000. The authors found that when the level of corruption increases by 1%, economic growth increases by 3.5%. In addition, the authors used the corruption perceptions index of transparency international as an indicator of corruption and the GDP growth rate to measure economic growth. Regarding our research, our results show that when the corruption index increases by 1%, economic growth improves by 1.50% in African natural resource rich countries. We also used the corruption perceptions index of Transparency International as an indicator of corruption and the growth rate of GDP to measure economic growth. From this point of view, we can affirm that the effect of corruption on economic growth is higher in the analysis of Powell and Heckelman (2008) than in ours (3.5% > 1.50%). However, our analysis has the advantage of focusing specifically on a homogeneous sample, namely, twenty-two African natural resource rich countries, unlike the work of Powell and Heckelman (2008), which covers a heterogeneous sample of eighty-two developed and developing countries. We used a VAR model that makes it possible to determine the effect of corruption on economic growth and in return to examine the contribution of economic growth to the reduction of the level of corruption. Our approach therefore seems more interesting compared to that of Powell and Heckelman (2008), who only analysed the effect of corruption on economic growth.

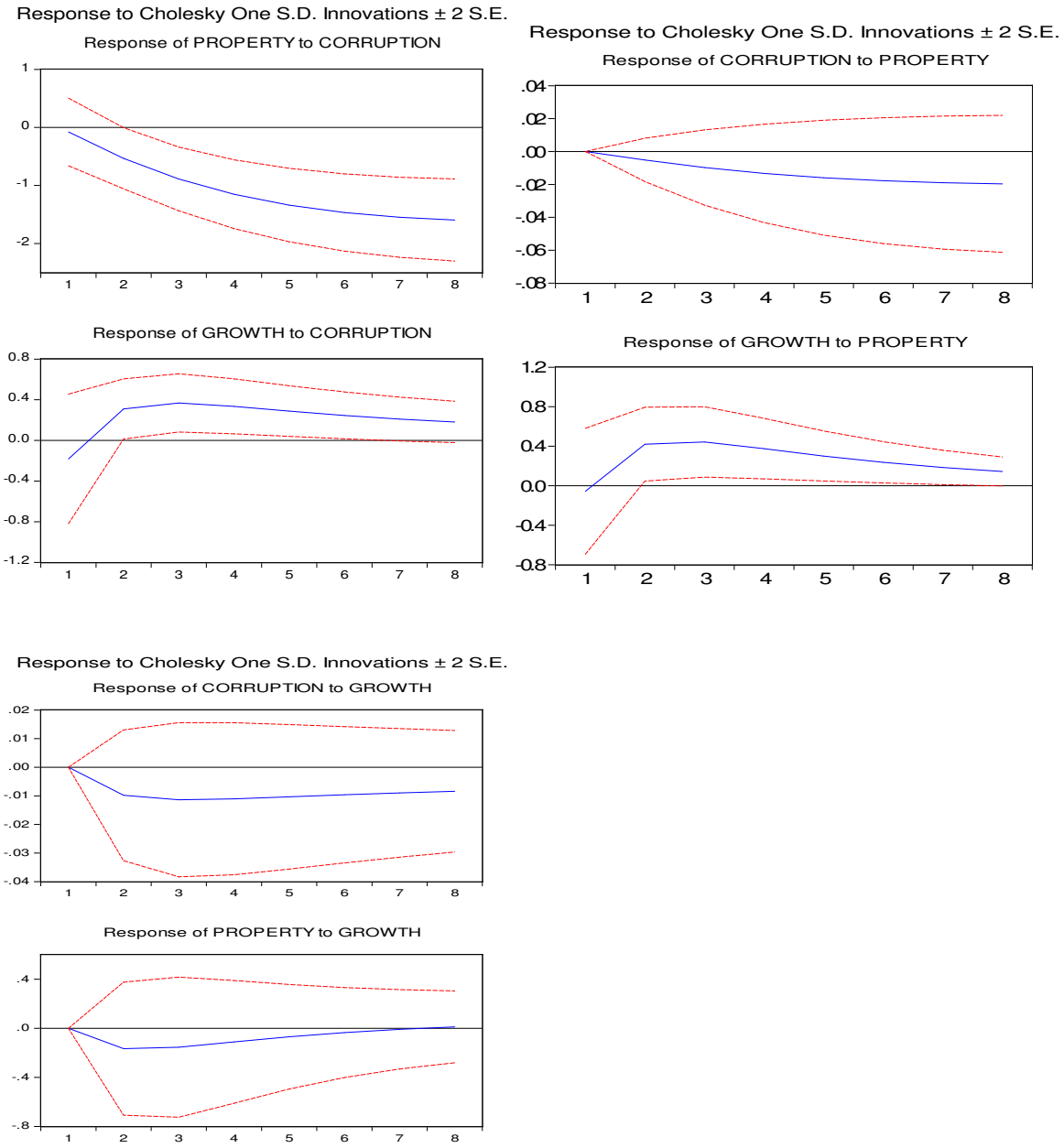
Huang (2016) investigated whether corruption has a negative effect on economic growth in thirteen Asia-Pacific countries over the period 1997-2013 using the Granger causality test. The empirical results showed that there is a significantly positive causality going from corruption to economic growth in South Korea and no significant causality between corruption and economic growth for the other countries. The results of Huang's study suggest that the "grease the wheels" hypothesis is supported for South Korea. Although we have reached the same conclusion on the effect of corruption on economic growth, namely, the "grease the wheels" hypothesis, our results are not comparable to those of Huang (2016) because our estimates use a VAR model on panel data on a specific group of African countries, while those of Huang (2016) were carried out country by country using the Granger causality test.

Our results also showed that when the property rights index increases by 10%, economic growth improves by 0.76% in African natural resource rich countries. This means that the protection of property rights is conducive to economic growth. Indeed, private property rights are highly prized, as stylized facts demonstrate that strong protection of private property rights contributes to strong economic growth. Our results confirm these stylized facts, which highlight the positive effect of the protection of property rights on economic growth.

5. Impulse response functions

We present the results of the impulse response functions and subsequently analyse them

Figure: Impulse response functions



Source: Author's computations, 2022.

Analysis of impulse response functions shows that following a shock to corruption, property rights decrease and remain negative until the eighth year. Moreover, following a shock to corruption, economic growth increases until the third year. After the third year, it starts decreasing over the entire period and remains positive.

Following a shock to property rights, corruption declines over the entire period and remains negative. Economic growth increases sharply during the first three years before decreasing until the eighth year and remains positive.

Following a shock to economic growth, corruption decreases and remains negative until the eighth year. Property rights decrease during the first three years before increasing until it becomes positive from the seventh to the eighth year.

After interpreting the impulse response functions, it is necessary to examine the robustness of our results.

6. Robustness checks

The robustness of the results consisted of estimating our initial model using an alternate indicator of property rights, namely, "rule of law", from the Worldwide Governance Indicators database. The results of the robustness tests shown in Table 4 below generally confirm our main conclusions. Indeed, it appears that property rights have a positive effect on economic growth. The level of previous corruption positively explains the evolution of present corruption. Moreover, it also emerges that corruption has a positive effect on economic growth, thus highlighting the grease the wheels hypothesis. Our findings highlight the negative interdependence between corruption and property rights. On the one hand, the protection of property rights makes it possible to reduce the level of corruption, and on the other hand, the expansion of corruption prevents better protection of property rights.

Table 4: Robustness check results

Dependant and exogenous variables	Corruption (Equation 2)	Rule of law (Equation 3)	Economic growth (Equation 4)
corruption (-1)	**0.8753*** (36.7787)**	**-0.0277*** (-2.7392)**	**2.6223*** (4.0773)**
Rule of law (-1)	**-0.1599*** (-4.0443)**	**0.9168*** (54.4957)**	**2.9766*** (2.7850)**
Economic growth (-1)	-0.0003 (-0.2132)	0.0007 (1.0264)	**0.2725*** (5.7047)**
Trade	-8.07E-05 (-0.2173)	0.0001 (1.1067)	**0.0501*** (4.9951)**
Natural resources rents	-0.0009 (-0.7592)	-0.0005 (-1.0666)	-0.0138 (-0.4127)
Democracy	**-0.0087*** (-2.5628)**	**0.0034*** (2.3537)**	**0.2409*** (2.6235)**

Source: Author's computation, 2022. T-statistics are in parentheses. ***; ** and * denote significance at the 1%, 5% and 10% confidence levels, respectively.

7. Conclusion and policy implications

The objective of this study is to analyse the relationship between corruption, property rights and economic growth in African natural resource rich countries. To achieve this objective, a VAR model is estimated on a panel of twenty-two African countries over the period 2000-2017. The main results can be summarized in three main points. The results show that economic growth has no effect on corruption, while corruption has a positive effect on economic growth. Property rights promote economic growth, while economic growth does not contribute to protecting property rights. Corruption has a negative effect on property rights, while property

rights have no significant effect on corruption. The results obtained make it possible to suggest actions in terms of the implications of economic policies. It appeared that corruption constitutes a limiting factor of development through its harmful effects on property rights. It is more imperative than ever to fight effectively against this scourge, which inhibits all development efforts. Thus, it is necessary to delimit discretionary powers and to increase transparency in the management of public affairs, as well as the sanctions affecting the corrupt and the corrupters. Laws and controls will prove insufficient without the means of enforcement. Efforts to eradicate corruption tend to succeed when reforms carried out quickly and vigorously are supported at the top of government. When the impunity for acts of corruption is no longer in doubt, the only solution is to start by convicting a number of high-ranking corrupt figures. It appears in light of all the above that bad governance or poor governance, which results in the absence of institutions of property rights, remains the source of most of the problems to which developing countries in general and those of Africa in particular are facing. To eradicate or reduce corruption, all decision-making and power centers must be reformed, which leads to identifying all the actors to increase the efficiency of structures and institutions to have strong and sustainable economic growth and a high level of protection of property rights.

Our results have also highlighted, on the one hand, that corruption prevents a better protection of property rights and, on the other hand, that property rights promote economic growth. Proper protection of property rights generates economic growth. Indeed, property rights can promote economic growth through two channels, namely, at the microeconomic level and the enterprise level. At the microeconomic level, property rights affect firm growth through the allocation of resources between physical and intangible investments. At the firm level, property rights reflect the idea of the degree of protection of returns (profits) on the investment against the most powerful competitors (dominant firms) and of protection of the investment against the actions of the government. Furthermore, when companies are exposed to risks linked to the investment profits of the State's actions (expropriation) or that of its employees and other competing companies, the countries must in these cases enforce the property rights to secure investments. The strength of a country to protect intellectual property has effects on the country's ability to innovate, and the low level of intangible investments could be linked to the weak protection of property rights. Proper protection of property rights requires the development of laws protecting private property and the proper enforcement of these laws. The judicial system is therefore central to the protection of property rights and to the effective fight against corruption. We suggest that countries improve the quality of their judicial institutions to effectively fight against corruption and ensure better protection of property rights.

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Appendices

Table 5: Data

Variables	Sources
Corruption	Transparency International (2022)
Property rights	Heritage Foundation (2022)
Rule of law	Worldwide Governance Indicators (2022)
Democracy	Polity V database (2022)
Economic growth	World Development Indicators (2022)
Trade	World Development Indicators (2022)
Total natural resources rents	World Development Indicators (2022)
Population growth rate	World Development Indicators (2022)

Source: Author's compilation, 2022.

Table 6: List of twenty-two countries in the sample

Angola, Botswana, Burkina Faso, Cameroun, Central African Republic, Tchad, Democratic Republic of Congo, Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Mali, Namibia, Niger, Nigeria, Sierra Leone, South Africa, Tanzania, Zambia, Zimbabwe.

Source: Author's compilation, 2022.