Effects of democracy and natural resources on foreign direct investment in African natural resource-rich countries

Dramane Abdoulaye

Effects of democracy and natural resources on foreign direct investment in African natural resource-rich countries

Dramane Abdoulaye

Faculty of Economics and Management,
Research Unit in Economics and Management,
University of Parakou, Benin
Email: abdramanefr1@yahoo.fr

Abstract: This article aims to investigate the effects of democracy and natural resources on foreign direct investment (FDI) in African countries rich in natural resources. To this end, an econometric model was estimated using three methods, namely, fixed effects with sample heteroscedasticity correction, the instrumental variables method and the general method of moments, on a panel of 22 countries over the period 2000–2017. On the one hand, the results show that democracy has a positive effect on FDI. On the other hand, the analysis showed that natural resources do not help to attract FDI. Our findings suggest that concrete actions are needed in terms of strengthening and improving governance and democratic institutions to better attract FDI in African countries rich in natural resources.

Keywords: democracy; foreign direct investment; FDI; natural resources; panel data; Africa.

JEL codes: C23, E22, F21, O11, Q27.

Biographical notes: Dramane Abdoulaye received his PhD degree from the University of Abomey Calavi (Benin). He is a researcher and a Lecturer at the University of Parakou (Benin). He has attended many international conferences on the African development issue organised by African Capacity Building Foundation think tanks at Nairobi (Kenya). He has published many articles on the field of institutions and economic performances in African countries.

1   Introduction

A striking feature of the world economy in recent decades has been the growth of foreign direct investment (FDI), that is, the investment made abroad by transnational or multinational corporations with a view to acquiring assets and managing on-site production activities (Mallampally and Sauvant, 1999). FDI has become an important source of private external financing for developing countries. Unlike other major types of external private capital flows, it is motivated primarily by the prospect of long-term

profits that investors hope to realise in the productive activities that they directly manage. Developing countries in general and those in sub-Saharan Africa in particular try to attract FDI for the positive effects it can have on growth and development. Thus, the analysis of economic and institutional determinants has given rise to an abundant series of research carried out by various authors (Mallampally and Sauvant, 1999; Mc Donald et al., 2006; Ngouhouo, 2008; Asiedu and Lien, 2011; Asiedu, 2013 Malikane and Chitambara, 2017; Hamid and Jena, 2022). Mallampally and Sauvant (1999) divide the economic determinants of FDI into three groups: those related to the resources or assets available locally; those related to the size of markets for goods and services; and those related to production cost advantages.

In the economic literature, two theories are used to explain the multinationalisation of firms and the growth of FDI. The first relates to the theory of multinational corporations and FDI. According to this theory, the fundamental justification for FDI by firms in a globalised market economy is the quest to increase or protect their profitability and capital value. One of the ways in which transnational corporations achieve this objective is to engage in FDI, either to better exploit their existing competitive advantages or to preserve, increase or reinforce these advantages. This approach is part of the 'OLI paradigm' (Ownership advantages, Localisation advantages, Internalisation advantages) or the eclectic approach proposed by Dunning (1977). According to the 'OLI paradigm', the factors linked to the location of multinational firms are the presence of natural resources, low transport and labour costs, government incentives and local market opportunities in host countries.

The second relates to investment development path theory. According to this theory, the position of a country's inward and outward FDI is systematically linked to the level and structure of a country's economic development. Along the investment development path, outward FDI should only be undertaken when a country has reached a certain minimum level of development, by which time ownership advantages may have evolved between firms in that country. The pattern of outward FDI will therefore reflect the changing nature of ownership advantages of domestic firms as well as changes in the advantages of the home economy relative to potential host economies. This approach is found in the work of Mucchielli (1992), who shows that firms therefore arbitrate on localisation or offshoring according to the discrepancy or concordance between their specific advantages and the comparative advantages of the countries.

Over the past forty years, FDI has increased markedly in the countries of sub-Saharan Africa: from 11.8 billion dollars in 1980, it reached 25.6 billion in 1990 and more than 101 billion in 2004. (UNCTAD, 2006). However, FDI in Africa decreased by 16% in 2020 to reach $40 billion, but in sub-Saharan Africa, FDI inflows decreased by 12% to reach $30 billion, and investments increased in only a few countries (UNCTAD, 2021). The COVID-19 pandemic continues to have a persistent and multifaceted negative impact on cross-border investment globally and regionally. The decline in FDI in Africa is greater than the decline in the average for developing countries. Moreover, FDI on the continent remained virtually unchanged in 2019 compared to 2018. The decline in FDI in 2020 was particularly pronounced in economies dependent on natural resources due to low prices and lower demand for energy products. Several authors believe that institutional factors such as democracy and the abundance of natural resources are the major determinants of FDI in developing countries (Poelhekke and Van der Ploeg, 2010; Asiedu, 2013). Indeed, the analysis of the democratic process in African countries rich in natural resources highlights two trends when observing the indicators of democracy

'polity2' and 'executive index of electoral competitiveness (eiec)' over the period 2000–2017. We have in the first category the countries that are making progress in terms of democracy and in the second category the countries that have scores below the average. Thus, through the scores of the polity2 indicator, three countries have democratic performances above the average, namely, Botswana, South Africa and Zambia. The other countries have unsatisfactory democratic performances. The second indicator of democracy, 'executive index of electoral competitiveness', also leads to broadly similar results. This indicator shows that Botswana, South Africa, Zambia, Ghana, Nigeria and Sierra Leone have made efforts to improve their democratic processes with scores varying between 6 and 7. For the other countries in the sample more efforts are needed in terms of democracy. Moreover, according to UNCTAD data (2021) on FDI flows, five African countries mobilised the largest flow in dollars of FDI inflows in 2020. Among these five countries, namely, Egypt (5.9 billion), Congo ($4.0 billion), South Africa ($3.1 billion), Nigeria ($2.4 billion) and Ethiopia ($2.4 billion), three countries belong to our analytical sample (Congo, South Africa and Nigeria). It is therefore interesting to examine the role of the institutional factor, particularly the effect of democracy on FDI. This paper, therefore, aims to analyse the effects of democracy and natural resources on FDI in twenty-two resource-rich African countries. Two basic reasons justify this research. The first is that, when we go through the economic literature, we notice that very few studies are devoted specifically to this group of African countries, particularly with regard to the effects of democracy and natural resources on FDI. The second reason is that when we compare the evolution of FDI and that of democracy, we get the impression that the establishment of democratic institutions has contributed in one way or another to the increase in FDI towards this group of countries. This study will help to provide an empirical answer to this observation.

This article mainly makes two important contributions to the literature on FDI. The first contribution is that unlike in the abundant literature on the determinants of FDI in underdeveloped countries, like that of Poelhekke and van der Ploeg (2010), who used firm-level data from multinationals in the Netherlands to study the effect of natural resources on FDI, and that of Asiedu and Lien (2011), who analysed the interaction effect of natural resources and institutions on FDI on a panel of 112 developing countries, this research specifically analyses the effect of natural resources and democracy on FDI using twenty-two African countries constituting the group of African countries rich in natural resources according to the classification established by the IMF (2018). Indeed, according to the regional economic outlook report published in April 2018 by the IMF, countries rich in natural resources are countries where non-renewable natural resources represent at least 25% of total exports. The natural resources available in these African countries are mainly oil, gold, diamond, uranium, bauxite, iron, copper, tin, lead, zinc, nickel, silver, phosphate and wood. By focusing specifically on countries rich in natural resources, the analysis will make it possible to understand the effect of democracy and natural resources with regard to African countries to suggest actions in terms of policies to be implemented. The second contribution of this article is methodological. Indeed, unlike several studies that have analysed the determinants of FDI using a single institutional variable indicator such as democracy (Asiedu and Lien, 2011), our research uses two democracy indicators, namely, ''the polity2'' indicator and ''the executive indices of electoral competitiveness'' indicator, and four governance variables to take into account the effect of institutional factors on FDI. In addition, the analysis uses three different estimation methods, namely, fixed effect with sample Heteroscedasticity

correction, instrumental variables method and general method of moments, to test the robustness of the results obtained.

The article is organised into four sections. Section 2 presents the literature review on the determinants of FDI with aim of highlighting the role of an institutional factor, namely, democracy, and that of natural resources. Section 3 outlines the methodology and data of the study. Sections 4 and 5 analyse the empirical results obtained and conclude and formulate some policy implications.

2   Literature review

This reflection is part of the search for the determinants of FDI in African countries rich in natural resources by highlighting the role of democracy and that of natural resources. This review will be structured into three main axes. The first axis reviews the role of democracy in the attractiveness of FDI. The second axis analyses the role of natural resources in the attractiveness of FDI. The third axis describes the other economic determinants of FDI.

2.1   Impact of democracy on FDI

Is democracy favourable or unfavourable to FDI in African countries? We will first analyse the position that it is, then the opposing position.

2.1.1   Democracy, a favourable factor in attracting FDI

Olson (1993) argues that stable democratic systems provide good conditions for foreign investors, namely, independent justice and protection of human rights and property rights. In addition, Henisz (2000) shows that the institutions of counter power in a democratic system bring through their monitoring actions to propose reforms for the improvement of the business climate and to attract FDI. This conclusion is confirmed by Jensen (2003), who suggests that strengthening the attractiveness of a country in a democratic system often engenders a review of national economic policies which in turn leads public authorities to take measures favourable to multinational firms. The author highlights the positive and significant effects of democracy on FDI. In another study, Li and Resnick (2003) argue that democracy can also attract FDI if institutions protect property rights and reduce the risks for foreign investment. Busse (2003) empirically examines the complex relationship between democracy and FDI using panel data and finds that FDI increases in democratic countries. Approaching in the same direction, several other authors (Busse and Hefeker, 2007; Jakobsen and De Soysa, 2006) maintain that there is indeed a positive relationship between democracy and FDI. These results are obtained following estimates that take into account the types of regimes, innovations and statistical methods of transforming the dependent variable. Furthermore, Asiedu and Lien (2011) estimate a linear dynamic panel model using 112 developing countries that export natural resources over the period 1982–2007 to analyse the effect of democracy on FDI. The authors find that there are threshold effects. Indeed, democracy favours FDI below the threshold, and beyond the threshold, democracy contributes to the reduction of FDI.

Specifically, these authors found that in 90 countries of their sample, FDI increases when democracy improves, and in the other 22 countries of the sample, FDI decreases

when democratic institutions are strong. Mathur and Singh (2013) show that democratic countries that do not guarantee economic freedom attract less FDI. This means that to increase the attractiveness of FDI, it is necessary to promote economic freedom and protect property rights. Malikane and Chitambara (2017) conduct a study on the link between FDI, democracy and economic growth in a panel of eight southern African countries over the period 1980-2014 using the system generalised method of moments. They find that the impact of FDI on economic growth depends on the level of democracy in the host country. The results also show that countries with strong democratic institutions are able to absorb the beneficial effects of FDI. Peres et al. (2018) examine the impact of institutional quality on FDI by categorising developed and undeveloped countries. The authors find that institutional quality positively affects FDI in developed countries, while in underdeveloped countries, the quality of institutions has no significant effects on FDI because of the weakness of the structure of institutions. Hamid and Jena (2022) analyse the impact of democracy on FDI in India using an autoregressive distributed lag (ARDL) model over the period 1980–2017. The results show that democracy does not influence FDI in the short term, but in the long term, there is a positive and significant effect of democracy on FDI.

2.1.2 *Democracy an unfavourable factor in attracting FDI*

Contrary to the analyses carried out above, Okafor et al. (2011) determine the effect of democracy on FDI inflow in selected African countries. They find that FDI decreases when African countries move towards consolidating their democracy. Thus, democracy has a negative impact on FDI. Some authors have had difficulty finding any positive effect of democracy on FDI. This is the case, for example, of Yang (2007), who finds that there is no statistically detectable evidence of the effect of democracy on FDI. The author concludes that the fact that a country becomes democratic does not increase FDI in this country. This conclusion is confirmed by Dario (2014), who finds through estimation by the generalised method of moments that there is no relationship between democracy and FDI. Li (2009) shows that autocratic systems better protect foreign investments and are less inclined to expropriate foreign assets. For this author, one does not need to be in a democracy before attracting FDI flows. Resnick (2001), for his part, finds that the transition to democracy has a negative effect on FDI. Moreover, its results highlight that political instability discourages foreign investors. Several other authors see undemocratic regimes as virtues in attracting FDI. From this perspective, Haggard (1990) argues that an autocratic power can put in place economic policies to facilitate the influx of FDI. This idea was later supported by Greider (1998), who finds that undemocratic regimes can attract FDI by improving the business environment and granting tax advantages to foreign investors. The channels through which democracy can hinder the entry of FDI interest Li and Resnick (2003). Indeed, these authors describe three channels through which democratic institutions hinder the influx of FDI. The first channel is that democratic authorities often put an end to the dominant positions of multinational firms, which leads to a reduction in FDI. The second channel is that certain rulers under pressure reduce tax advantages and facilities for multinational companies. The third channel is that democratic institutions often protect national investors to gain more popularity and relegate the influx of FDI to the background. Moreover, these authors show that national investors who see FDI as a threat put pressure on governments to obtain protection, thus rejecting FDI.

2.2   *Role of natural resources in the attractiveness of FDI*

Several studies have shown that natural resources such as uranium, gold, oil, timber and cash crops such as cotton, cocoa and coffee are the main determinants of FDI. In this perspective, Basu and Srinivasan (2002) argue that the ability of sub-Saharan African countries to attract FDI lies in the fact that they possess significant natural resources. Morisset (2000) shows that the ability of African countries to attract private capital is also largely determined by the existence of natural resources. This is how countries such as Nigeria, Angola and, to a lesser extent, Equatorial Guinea, despite their political and economic instability, have managed to attract much private capital thanks to their oil resources. For authors such as Addison and Heshmati (2003) and Becchetti and Hasan (2004), traditional determinants of FDI, such as natural resources and low labour costs, become relatively less important, while less traditional factors, such as governance and economic freedom, have become more popular. The aspect concerning natural resources was also addressed by Ngouhouo (2008), who shows that natural resources are by far the most significant determinant of FDI in Economic and Monetary Community of Central Africa. Asiedu (2013) examines the interaction between FDI, natural resources and institutions in a panel of 99 developing countries over the period 1984–2011 using the GMM estimator of Blundell and Bond (1998). The results show that natural resources exert a negative effect on FDI and that the FDI-natural resource curse persists even after taking into account the quality of institutions and other important determinants of FDI. Diaw and Guidime (2013) find that natural resources positively but relatively influence FDI flows to ECOWAS countries. Hayat (2018) analyses the relationship between FDI and economic growth by highlighting the role of the abundance of natural resources in the host country in this relationship. To do this, the author uses a panel of 114 countries over the period 1996–2015 by applying the GMM method of Arellano and Bond. The results reveal that the effect of FDI on economic growth changes with the level of natural resource abundance in the host country. The positive effect of FDI on economic growth decreases following the expansion of the level of natural resources.

2.3   *Other economic determinants of FDI*

The economic determinants for the establishment of FDI can be divided into two groups, namely, those related to the size of markets for goods and services; and those related to production cost advantages. Although many of the factors that influence FDI are numerous, the large size of host country markets, or an adaptable and cheap labour force are increasingly endowed with significant explanatory power. Urata and Kawai (2000) believe that inflation increases the cost of production and hence has a negative impact on FDI flows. This conclusion is reinforced by Ngouhouo et al. (2005), who find that a high inflation rate reflects macroeconomic instability, which increases uncertainty and makes the situation less attractive to FDI. On the other hand, Grosse (1997) studies the determinants of aggregate FDI flows in several Latin American economies. He finds that GDP, inflation, GDP per capita, budget balance and interest rate have a positive influence on FDI flows. Other economic and noneconomic factors were studied by the authors. In this perspective, Grosse and Trevino (1996) analyse, within the framework of a gravitational model, the determinants of FDI flows entering the United States from 23 countries, on a bilateral basis, for the period 1980–1992. The results they obtain using OLS indicate that the main sources of positive influence on inward FDI are exports and

the market size of the countries of origin of the FDI, while the main sources of negative influence are the cultural differences between these countries and the United States, the geographical distance and the exchange rate. In the same vein, Morisset (2000) carried out a study on a group of 29 African countries in 1996 and 1997 and highlighted the importance of the size of the local market on FDI inflows. The author found a positive correlation equal to 0.99 between direct investment flows and GDP. For Ngouhouo (2008) the size of the market (population and gross domestic product) can also play a role in attracting FDI. According to this author, infrastructure plays a key role in the attractiveness of FDI. Economic openness is not decisive in terms of attractiveness because Economic and Monetary Community of Central Africa countries are still relatively closed compared to other developing countries. Diaw and Guidime (2013) show that the size of the market, nominal exchange rate, institutional adaptation and FDI lagged by one period are the main explanatory factors for FDI flows in ECOWAS countries. Hamid and Jena (2022) find that gross national income per capita and trade openness exert positive and significant effects on FDI in India.

3 Methodology and data

In what follows, we present the econometric methodology adopted and the data used in this study.

3.1 Methodology

3.1.1 Model specification

Several works have applied gravitational-type econometric models to the explanation of FDI (Andersen et al., 2004; Ngouhouo, 2008) to identify the main determinants of FDI and provide empirical validations to competing models. We choose this model because it is the most suitable for this type of analysis. Following De Melo (1999), Andersen et al. (2004) and Ngouhouo (2008), we retain the following basic gravitational model:

$$FDI_{ij} = \alpha_0 + N_{it}^{\alpha_1} N_{jt}^{\alpha_1} Y_i^{\alpha_3} Y_j^{\alpha_4} D_{ij}^{\alpha_5} \varepsilon_{ijt} \tag{1}$$

with:

FDI_{ij} FDI flows from investor countries to African countries.

N Population of the group of investor countries or of the group of countries in the zone.

Y_i GDP or GDP growth rate of countries in the zone.

Y_j GDP or GDP growth rate of the investing country.

D_{ij} Distance between the investing country and the countries of the zone.

α_0 a constant. α_1, α_2, α_3, α_4, α_5: the parameters.

ε_{ij} the error term.

Thus, after linearisation in logarithmic form, we obtain the following model:

$$\ln FDI_{ij} = \alpha_0 + \alpha_1 \ln N_{it} + \alpha_2 \ln N_{jt} + \alpha_3 \ln Y_i + \alpha_4 \ln Y_j + \alpha_5 \ln D_{ij} + \varepsilon_{ijt} \tag{2}$$

Equation (2) will be enriched through the integration of our variables of interest, namely, democracy, which today influences investments in African countries, and natural resources, which also attract FDI. In addition, several control variables are added to the model to gain a broader understanding of the determinants of FDI in African countries. We do not take into account the distance between the investing country and the countries of the zone due to data availability.

The empirical model to be estimated is as follows:

$$
\begin{aligned}
\ln FDI_{it} = {} & \alpha_0 + \alpha_1 \ln Democ_{it} + \alpha_2 \ln Natresource_{it} + \alpha_3 \ln Gov_{it} \\
& + \alpha_4 \ln Gdp_{it} + \alpha_5 \ln Corr_{it} + \alpha_6 \ln Pop_{it} + \alpha_7 \ln Trade_{it} \\
& + \alpha_8 \ln Save + \varepsilon_{ijt}
\end{aligned}
\tag{3}
$$

with

FDI FDI, net inflows as a percentage of GDP.

Democ indicators of democracy.

Natresource total natural resource rents as a percentage of GDP.

Gov governance indicators (regulatory quality, government effectiveness, rule of law and political stability).

Gdp growth rate.

Corr corruption index.

Pop total population.

Trade trade openness.

Save domestic savings.

3.1.2 The estimation method

We perform the Hausman test to determine the correct specification of the model between the fixed effects model and the random effects model. We used three estimation methods to ensure the robustness of our results. We started the estimation by the fixed effects model with correction of Heteroscedasticity by the AREG method. Then, given the nature of the data, our model could suffer from endogeneity problems likely to affect the quality of the results obtained. To overcome these problems, the instrumental variables method was used. We used as an instrument the lagged variable of a period of our two variables of interest, namely, democracy and natural resources. To check the robustness of our results, we used the GMM method. To test the robustness of our results, we apply GMM estimation. This method also allows analysis of the dynamic effects of democracy and natural resources on FDI over time. Indeed, Blundell and Bond (1998) showed using Monte Carlo simulations that the GMM estimator in the system is more efficient than that in the first difference. We, therefore, use the system GMM estimator in this paper. Finally, it should be noted that two democracy indicators (polity 2 and eiec) are used in this research. In this framework, three equations are estimated using each of the indicators. This leads us to estimate six equations. Furthermore, we specify that the explanatory variables differ slightly from one equation to another. This choice is justified

by the concern to avoid possible problems of multicollinearity, especially with regard to governance variables and macroeconomic variables.

3.2 Data

Three categories of variables are used in this study. The first relates to the independent variables of interest, namely, democracy and natural resources. Two democracy indicators are used in this study, namely, the polity2 index extracted from the Marshall and Gurr (2020) and the executive index of electoral competitiveness (EIEC) extracted from the Cesi et al. (2020). The polity2 index measures the degree of democracy on the basis of the right to vote, operational barriers, balances on executives, and guarantee of the other fundamental political rights and civil freedoms. The variable polity2 varies from –10 () to +10 (highest democracy level). The choice of this variable is motivated by the fact that this indicator is the most commonly used variable in many empirical works (Bhattacharyya, 2013; Ghardallou, 2016, 2021, 2022). The eiec variable takes into account executives who are elected directly by the population or elected by an electoral college that is elected by the people and has the sole purpose of electing the executive and is scored on the above scale. The variable eiec varies from 1 (lowest democracy level) to 7 (highest democracy level). Natural resources are measured by total natural resource rents as a percentage of GDP taken from the WDI database (2020). The second category concerns the dependent variable, namely, FDI. We use FDI net inflows as a percentage of GDP taken from the Word Development Indicators database (2020). We used this variable for two main reasons. The first reason is the fact that this variable is available over the entire study period for all the countries in our sample. The second reason relates to the fact that it is the most used variable in FDI studies, such as those of Asiedu and Lien (2011), Okafor et al. (2011) and Hamid and Jena (2022). Finally, the third category relates to control variables. In this group, four of the six Worldwide Governance Indicators (2020) are used, namely, regulatory quality, government effectiveness, rule of law and political stability. The governance variables range from –2.5 to +2.5, where –2.5 represents a low level of governance and +2.5 represents a high level of governance. The corruption index is the corruption perceptions index taken from the Transparency International Database (2020). The economic variables are taken from the Word Development Indicators Database (2020), namely, Gdp growth rate, total population, trade openness and domestic savings. Given the availability of statistics for each of the countries in the sample, the period of this study runs from 2000 to 2017.

4 Empirical results

We performed the Hausman specification test on our model. The results obtained indicate that the probability of the test (0.0672) is less than 10%, which implies that the fixed effects model is preferable to the random effects model. The results of this text are shown in Appendix 2.

Before analysing the results of our estimates, we present the statistical results.

4.1 Statistical results

The descriptive statistics of the variables used in the study are presented in Table 1.

Table 1   Descriptive statistics on the variables

Variables	Mean	Std. dev.	Min	Max	Observations
Foreign direct investment	6.424833	15.28969	–6.054918	159.7189	396
Democracy (polity2)	2.179293	4.591205	–6	9	396
Democracy (eiec)	5.953283	1.658034	1	7	396
Natural resources	18.81921	15.06424	0.5254255	61.94497	396
Regulatory quality	–0.7220248	0.6547524	–2.210173	0.791475	396
Government effectiveness	–0.8361402	0.6252532	–1.960637	0.7272412	396
Rule of law	–0.8135508	0.650855	–2.113683	0.66833	396
Political stability	–0.6293259	0.9154205	–2.672609	1.186454	396
Growth	4.92202	7.053682	–36.69995	63.37988	396
Corruption[1]	7.074242	1.115027	3.5	9	396
Population	2.26e+07	3.34e+07	614323	1.91e+08	396
Trade	79.97092	44.39859	20.72252	351.1057	396
Domestic savings	16.9506	27.80127	–141.9739	95.80721	396
Inflation (Consumer price index)	11.41829	36.90498	-8.97474	513.9069	396

Source: Author's computations based on data from Kaufmann and Kraay (2020), Marshall and Gurr (2020), Cesi et al. (2020), World Development Indicators Database (2020) and Transparency International Database (2020)

Table 1 highlights differences in the values of certain variables. This is the example of the variables FDI, democracy (polity2), democracy (eiec) and natural resources. The figures show a difference on the order of 15.29, 4.59, 1.66 and 15.06 as the value of the standard deviation for the variables FDI, democracy (polity2), democracy (eiec) and natural resources, respectively. This means that the countries in the sample have different characteristics concerning the level of FDI, democracy and natural resources. Statistics show that the average value of FDI for the countries in the sample is 6.42. The minimum FDI value (–6.05) was recorded in Angola in 2012. The maximum value of FDI (159.72) was recorded in Liberia in 2010. For the other two variables of interest, the statistics show that their average values are 2.17 and 18.82 for democracy and natural resources, respectively. In addition, the minimum value of the democracy indicator (–6) is recorded in Congo (DRC) in 2000 and in Equatorial Guinea from 2000 to 2017. The maximum value of the democracy indicator (9) is recorded in South Africa from 2000 to 2017. For the natural resources variable, its minimum value (0.52) is recorded in Namibia in 2001, and its maximum value (61.94) is obtained in Congo in 2000.

4.2   *Effect of democracy on foreign direct investment*

We performed the Heteroscedasticity test of Breusch Pagan in the panel. The results of this test showed that there is Heteroscedasticity in the fixed effects model. Thus, to

correct for the Heteroscedasticity in our fixed-effects model, we apply the correction for Heteroscedasticity by White's method. To do this, we use the estimation by the AREG method. Table 2 presents the results of the estimates robust to Heteroscedasticity.

Table 2 The results of the estimation of the model robust to Heteroscedasticity

Variables	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI
Democracy (polity2)	0.263***	0.250***	0.209**			
	(2.75)	(2.59)	(2.33)			
Democracy (eiec)				0.169	0.237**	0.229**
				(1.51)	(2.09)	(2.10)
Natural resources	–0.055	–0.074	–0.106*	–0.104	–0.081	–0.119*
	(0.77)	(1.00)	(1.67)	(1.63)	(1.12)	(1.70)
Growth	–0.023	–0.017	–0.019	–0.006	0.019	0.016
	(0.23)	(0.17)	(0.21)	(0.07)	(0.19)	(0.16)
Corruption	–0.541	–0.731			–0.636	–0.354
	(1.03)	(1.39)			(1.23)	(0.72)
Regulatory quality	0.343					
	(1.14)					
Inflation	0.215***					
	(4.67)					
Population	–0.128	–0.267	–0.112	–0.174	–0.217	–0.150
	(0.54)	(1.08)	(0.56)	(0.98)	(0.96)	(0.68)
Trade	0.611***	0.587***	0.663***	0.695***	0.597***	0.705***
	(4.26)	(4.02)	(4.97)	(5.30)	(4.17)	(5.25)
Domestic savings			0.156***	0.157***		0.140***
			(2.85)	(3.25)		(2.83)
Government effectiveness			0.235**			
			(2.16)			
Rule of law				0.539*		
				(1.65)		
Political stability					–0.008	
					(0.07)	
Constant	1.747	5.370	0.517	1.053	4.326	1.640
	(0.37)	(1.15)	(0.16)	(0.38)	(1.01)	(0.40)
R^2	0.41	0.38	0.40	0.40	0.39	0.40
N	396	396	396	396	396	396

Notes: The estimation method is AREG with sample Heteroscedasticity correction. The absolute value of t-statistics in parentheses. *** ** and * denote significance at the 1% 5% and 10% levels, respectively. FDI: foreign direct investment.

Source: Author's computations based on data from Kaufmann and Kraay (2020), Marshall and Gurr (2020), Cesi et al. (2020), World Development Indicators Database (2020) and Transparency International Database (2020)

Table 3   The results of the estimation by instrumental variables

Variables	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI
Democracy (polity2)	0.259**	0.249**	0.207**			
	(0.106)	(0.108)	(0.105)			
Democracy (eiec)				0.161**	0.228***	0.226***
				(0.0811)	(0.0790)	(0.0763)
Natural resources	–0.0579	–0.0787	–0.110*	–0.106*	–0.0853	–0.123**
	(0.0597)	(0.0606)	(0.0604)	(0.0610)	(0.0600)	(0.0615)
Growth	–0.0201	–0.0117	–0.0135	–0.00245	0.0218	0.0208
	(0.0792)	(0.0807)	(0.0794)	(0.0791)	(0.0797)	(0.0788)
Corruption	–0.513	–0.706			–0.620	–0.336
	(0.490)	(0.488)			(0.483)	(0.493)
Regulatory quality	0.382					
	(0.251)					
Inflation	0.207***					
	(0.0504)					
Population	–0.114	–0.231	–0.0795	–0.148	–0.183	–0.117
	(0.204)	(0.205)	(0.173)	(0.169)	(0.191)	(0.192)
Trade	0.605***	0.579***	0.647***	0.682***	0.589***	0.697***
	(0.108)	(0.110)	(0.116)	(0.114)	(0.109)	(0.117)
Domestic saving			0.153***	0.154***		0.137**
			(0.0556)	(0.0557)		(0.0575)
Government effectiveness			0.249***			
			(0.0885)			
Rule of law				0.575**		
				(0.267)		
Political stability					0.0199	
					(0.0949)	
Constant	1.474	4.773	0.0613	0.671	3.772	1.115
	(3.947)	(3.936)	(2.845)	(2.779)	(3.719)	(3.850)
Observations	395	395	395	395	395	395
Number of countries	22	22	22	22	22	22

Notes: The estimation method is fixed-effects (within) IV regression. Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels, respectively. FDI: foreign direct investment.

Source: Author's computations based on data from Kaufmann and Kraay (2020), Marshall and Gurr (2020), Cesi et al. (2020), World Development Indicators Database (2020) and Transparency International Database (2020)

The results in Table 2 reveal that the democracy indicators (polity 2 and eiec) have a positive and significant coefficient. This shows that democracy positively and significantly explains FDI in these countries. When the level of democracy improves, the level of the flow of FDI increases. Thus, for example, through the first column of Table 2, when the democracy indicator increases by 10%, FDI improves by 2.63%. Improving the level of democracy, therefore, has beneficial effects on FDI in African countries. This result could be justified by the fact that foreign investors attach great importance to strengthening the institutional framework in the countries before their decision-making because it is democratic institutions that are able to protect property rights. This result seems very important to us because it implies actions in terms of economic policy and reforms. This result corroborates those of Jensen (2003), Henisz (2000), Malikane and Chitambara (2017) and Peres et al. (2018). Malikane and Chitambara (2017), for example, find that the impact of FDI on economic growth depends on the level of democracy in the host country. They also show that countries with strong democratic institutions are better able to absorb the beneficial effects of FDI. Peres et al. (2018) find that institutional quality positively affects FDI in developed countries, while in underdeveloped countries, the quality of institutions has no significant effects on FDI because of the weakness of the institutions. However, our results invalidate those of Li (2009) and Okafor et al. (2011). Li (2009) thinks that autocratic systems better protect foreign investments and are less inclined to expropriate foreign assets. For this author, one does not need to be in a democracy before attracting FDI flows, while for Okafor et al. (2011), FDI decreases when African countries move towards consolidating their democracy. Finally, Asiedu and Lien (2011) find that the effect of democracy on FDI depends on the importance of natural resources in the host country's exports. Democracy facilitates FDI in countries where the share of natural resources in total exports is low but has a negative effect on FDI in countries where exports are dominated by natural resources.

4.3 *Effect of natural resources on foreign direct investment*

In Table 2, the results show that the coefficients of the natural resources variable are negative and significant for columns 3 and 6. This means that natural resources have a negative effect on FDI. This result shows that the abundance of natural resources does not attract foreign investors. This conclusion can find a justification in the economic literature, particularly through the theory of the curse of the winner elaborated by Capen et al. (1971). This theory explains the negative relationship between natural resources and economic development because the abundance of natural resources can have negative effects on the growth and political stability of a country. Indeed, the abundance of natural resources is prone to armed conflict and creates an environment of uncertainty. This situation discourages investors because the country's risk is much higher. Collier and Hoeffler (1998) empirically show how natural resources increase the probability of civil war. The probability of civil war can lead to a reduction in FDI in the host country. This reason can justify the negative effect of natural resources on FDI that we have highlighted through our results. Congleton et al. (2008) have shown that the abundance of a natural resource is not a guarantee for growth and social well-being due to the weakness

of political institutions and, in particular, property rights that favour the search and capture of rents from the exploitation of natural resources. Our results fit into this literature and corroborate those of Assiedu (2013), who showed that natural resources exert a negative effect on FDI and that the FDI-natural resource curse persists even after taking into account the quality of institutions. However, our results contradict those of Morisset (2000), Addison and Heshmati (2003), Ngouhouo (2008) and Hayat (2018), who argue that natural resources promote increased FDI in host countries.

Regarding the control variables, the results reveal on the one hand that trade openness, domestic savings, inflation, government effectiveness and rule of law have a positive and significant effect on FDI. On the other hand, economic growth, population size, corruption, regulatory quality and political stability do not have significant effects on FDI.

We carried out the Hausman endogeneity test on the democracy variables, namely, 'polity 2' and 'eiec' to deepen the results of our analyses. The results revealed that there is endogeneity in the models. We, therefore, applied the instrumental variables method and that of GMM for the rest of the estimations to avoid endogeneity problems. The results of the endogeneity tests are available in the appendix in Table 6.

We present in Table 3 the results of the estimations by the instrumental variables method.

The results of the estimation using the instrumental variables method improve and generally confirm those previously obtained. Indeed, it appears that the democracy indicators used have a positive and significant effect on FDI at the thresholds of 1% and 5%. Natural resources have a negative effect on FDI (columns 3, 4 and 6). For the control variables, the results confirm on the one hand that trade openness, domestic savings, inflation, government effectiveness and rule of law have a positive and significant effect on FDI. On the other hand, economic growth, population size, corruption, regulatory quality and political stability do not have significant effects on FDI. To ensure the robustness of our results, we performed robustness tests.

4.4 *Robustness checks*

Table 4 summarises the different results of the GMM estimation.

The analysis of the robustness of the results consisted in estimating the initial model by the system generalised method of moments (commonly called system GMM) on a dynamic panel. We do not reject the hypothesis of the Hansen test and the second-order autocorrelation test of Arellano and Bond. The results show that democracy is an institutional factor favourable to the increase in FDI in African countries. This result is valid for the two democracy indicators used. The findings also show that the level of initial FDI negatively influences FDI flows[2]. This implies, in economic terms, that a foreign investment made in year t, for example, can be reduced in year t + 1 if the expected effects are not obtained. However, the estimation by system GMM reveals that natural resources do not significantly influence the entry of FDI in African countries rich in natural resources. Other more important factors appear to be the determinants of FDI in these countries, namely, the rule of law and the degree of trade openness.

Table 4   Results of the estimation by GMM

Variables	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI
L.FDI	0.546***	0.398***	0.426***	0.525***	0.430***	0.445***
	(0.0782)	(0.0877)	(0.0797)	(0.0774)	(0.0941)	(0.0956)
Democracy (polity2)	0.0791**	0.180**	0.128**			
	(0.0289)	(0.0654)	(0.0509)			
Democracy (eiec)				0.196*	0.168*	0.180*
				(0.104)	(0.0907)	(0.0884)
Natural resources	0.000497	−0.0499	0.0144	−0.00822	0.0205	0.0296
	(0.0569)	(0.101)	(0.0917)	(0.0458)	(0.0744)	(0.120)
Growth	−0.0962	−0.209	−0.0466	−0.0338	−0.0297	0.0174
	(0.141)	(0.249)	(0.145)	(0.150)	(0.140)	(0.119)
Regulatory quality		1.028				
		(0.774)				
Domestic saving		0.315	0.119	−0.0291		0.272
		(0.214)	(0.118)	(0.0294)		(0.236)
Inflation	0.0358	0.0733		0.104**		
	(0.0698)	(0.164)		(0.0435)		
Corruption	0.540	1.863*			0.0128	0.182
	(0.342)	(0.946)			(0.256)	(0.308)
Trade	0.268***	0.657**	0.332***	0.250***	0.281***	0.156
	(0.0884)	(0.234)	(0.0931)	(0.0642)	(0.0627)	(0.338)
Rule of law	0.299*					
	(0.159)					
Government effectiveness			−0.0505	−0.0584		
			(0.132)	(0.0602)		
Population						−0.129
						(0.215)
Constant	−1.226	−7.020**	−0.764	−0.259	−0.0915	0.585
	(1.087)	(2.731)	(0.809)	(0.384)	(0.848)	(4.674)
Arellano–Bond test for AR(2) (p value)	p = 0.240	p = 0.752	p = 0.404	p = 0.277	p = 0.290	p = 0.532
Hansen test (p value)	p = 1.000	p = 0.997	p = 0.998	p = 1.000	p = 0.497	p = 0.588
Number of countries	22	22	22	22	22	22
Observations	374	374	374	374	374	374

Notes: The estimation method is dynamic panel-data estimation, a one-step system GMM. Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels, respectively. FDI: foreign direct investment.

Source: Based on data from Kaufmann and Kraay (2020), Marshall and Gurr (2020), Cesi et al. (2020), World Development Indicators Database (2020) and Transparency International Database (2020)

5   Conclusions and economic policy implications

The theoretical and empirical literature is marked by controversy concerning the effect of democracy and natural resources on FDI. This paper aims to overcome these inconclusive results by studying the effect of democracy and natural resources on FDI. Based on the estimation of panel data using fixed effects, the instrumental variables method and the dynamic GMM method, this study investigated the effect of democracy and natural resources on FDI in twenty-two resource-rich African countries. The estimation results strongly show that democracy has a positive effect on FDI. Moreover, the positive effect of democracy is reinforced by good governance through the rule of law and government effectiveness. Our findings reveal that natural resources have a negative effect on FDI in resource-rich African countries. These results can be explained by the fact that the abundance of natural resources leads to armed conflicts and creates an environment of uncertainty. This situation discourages investors because the country's risk is much higher. This leads to a reduction in FDI in the host country. This finding is consistent with the winner's curse theory and the natural resource curse theory.

Our results have important economic policy implications for African countries rich in natural resources. Our findings have highlighted that democracy has a positive effect on FDI. This result suggests that African countries rich in natural resources establish strong and credible democratic institutions to reassure and attract foreign investors. In addition, these African countries must also improve the functioning of institutions that guarantee the security of FDI, such as institutions for the protection of property rights. For example, investors will make long-term arrangements if they believe ownership rights are stable and their machine, plant and land will be secure. This implies that countries must put in place a strong legal framework to promote the resolution of commercial disputes in a predictable and rational manner. It is also necessary to put in place institutions that ensure transparency in elections so that electoral periods are not a source of political tension and wars in African countries. Moreover, the results showed that natural resources negatively influence FDI. This conclusion is consistent with the winner's curse theory and the natural resource curse theory. Indeed, the exploitation of natural resources can generally be a source of political tension or war. It is therefore essential that African countries rich in natural resources commit to improving governance, transparency and accountability at the level of the institutions that manage the exploitation of the various natural resources available in the country, for example, the EITI (Extractive Industries Transparency Initiative). The fight against corruption, and good governance in the management of natural resources, contribute to attracting foreign investors and reducing country risk. Good governance allows better use of the natural resources available in the country and attracts more FDIs.

References

Addison, T. and Heshmati, A. (2003) *The New Global Determinants of FDI Flows to Developing Countries: The Importance of ICT and Democratization,* WIDER Discussion Papers//World Institute for Development Economics (UNU-WIDER).

Andersen, L., Nina, O. and Te Velde, D.W. (2004) *Trade, FDI, Growth and Poverty in Bolivia*, Development Research Working Paper Series from Institute for Advanced Development Studies.

Asiedu, E. (2013) *Foreign Direct Investment, Natural Resources and Institutions*, International Growth Centre, Working Paper, p.47.

Asiedu, E. and D. Lien. (2011) 'Democracy, foreign direct investment and natural resources', *Journal of International Economics*, Vol. 84, No. 1, pp.99–111.

Basu, A. and K. Srinivasan. (2002) *Foreign Direct Investment in Africa – Some Case Studies*, IMF Working Paper WP/02/61, African and International Capital Markets Departments.

Becchetti, L. and Hasan, I. (2004) *The Effects of (within and with EU) Regional Integration: Impact on Real Effective Exchange Rate Volatility, Institutional Quality and Growth for Mena Countries,* World Institute for Development Economics Research of the United Nations University, Research Paper (No. 2005/73).

Bhattacharyya, S. (2013) 'Political origins of financial structure', *Journal of Comparative Economics*, Vol. 41, No. 4, pp.979–994.

Blundell, R. and Bond, S. (1998) 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics*, Vol. 87, No. 1998, pp.115–143 [online] https://www.ucl.ac.uk/~uctp39a/Blundell-Bond-1998.pdf.

Busse, M. (2003) *Democracy and FDI*, Working paper, p.31.

Busse, M. and Hefeker, C. (2007) 'Political risk, institutions and foreign direct investment', *European Journal of Political Economy*, Vol. 23, No. 2, pp.397–415.

Capen, E.C., Clapp, R.V. and Campbell, W.M. (1971) 'Competitive bidding in high-risk situations', *Journal of Petroleum Technology*, Vol. 23, No. 6, pp.641–653.

Cesi, C., Keefer, P. and Scartascini, C. (2021) *Database of Political Institutions 2020*, Inter-American Development Bank Research Department, Washington, DC.

Collier, P. and Hoeffler, A. (1998) *On Economic Causes of Civil War*, Oxford Economic Papers, Vol. 50, No. 4, pp.563–573.

Congleton, R.D., Hillman, A.L. and Konrad, K.A. (2008) *Forty Years of Research on Rent Seeking: An Overview*, Working paper, p.61.

Dario, C. (2014) *Foreign Direct Investment and Democracy,* Working paper, p.45.

De Mello, L.R. (1999) *Foreign Direct Investment-Led Growth: Evidence From Time Series and Panel Data,* Oxford Economic Papers, Vol. 51, No. 1, pp.133–151.

Diaw, A. and Guidime, D.C. (2013) 'A dynamic analysis of the determinants of foreign direct investment in the countries of the economic community of West African States', *Canadian Journal of Development Studies*, http://dx.doi.org/10.1080/02255189.2013.757547.

Dunning, J.H. (1977) 'Trade, location of economic activity and the MNE: a search for an eclectic approach', in Dir B. Ohlin (Ed.)*: The International Allocation of Economic Activity*, pp.395–418, Macmillan, London.

Ghardallou, W. (2016) 'Does democratic transition spur financial development?', *Journal of Financial Economic Policy*, Vol. 8, No. 4, pp.499–513.

Ghardallou, W. (2021) 'Political origins of financial structure in developing countries', *Review of Development Economics*, Vol. 25, No. 2, pp.895–915.

Ghardallou, W. (2022) 'Financial system development and democracy: a panel smooth transition regression model approach for developing countries', *Journal of the Knowledge Economy*, Vol. 13, No. 2, pp.1–22.

Greider, W. (1998) *One World, Ready or Not: The Manic Logic Of Global Capitalism,* Touchstone, New York.

Grosse, R. (1997) 'Foreign direct investment in Latin America', in Grosse, Robert (Ed.): *Generating Savings for Latin American Development*, pp.135–153, North-South Center Press, University of Miami. Google Scholar, Coral Gables, FL.

Grosse, R. and Trevino, L.J. (1996) 'Foreign direct investment in the United States: an analysis by country of origin', *Journal of International Business Studies*, Vol. 27, pp.139–155, https://doi.org/10.1057/palgrave.jibs.8490129.

Haggard, S. (1990) *Pathways from Periphery. The Politics of Growth in the Newly Industrializing Countries,* Cornell University Press, Ithaca.

Hamid, I. and Jena, P.K. (2022) 'Is democracy necessary for foreign direct investment inflows in India?', *The Indian Economic Journal*, Vol. 70, No. 1, pp.88–111.

Hayat, A. (2018) 'FDI and economic growth: the role of natural resources?', *Journal of Economic Studies*, Vol. 45, No. 2, pp.283–295, https://doi.org/10.1108/JES-05-2015-0082.

Henisz, W.J. (2000) 'The institutional environment for economic growth', *Economics and Politics*, Vol. 12, No. 1, pp.1–31.

IMF (2018) *Sub-Saharan Africa: Tax Revenue Mobilization and Private Investment. Regional Economic Outlook*, Economic and financial studies, p.130.

Jakobsen, J. and De Soysa, I. (2006) 'Do foreign investors punish democracy? Theory and empirics, 1984–2001', *Kyklos*, Vol. 59, No. 3, pp.383–410.

Jensen, N. (2003) 'Democratic governance and multinational corporations: political regimes and inflows of foreign direct investment', *International Organization*, Vol. 57, No. 3, pp.587–616.

Kaufmann, D. and Kraay, A. (2020) *Worldwide Governance Indicators (2020)* [online] http://info.worldbank.org/governance/wgi/.

Li, Q. (2009) 'Democracy, autocracy, and expropriation of foreign direct investment', *Comparative Political Studies,* Vol. 42, No. 8, pp.1098–1127.

Li, Q. and Resnick, A.L. (2003) 'Reversal of fortune: democratic institutions and foreign direct investment inflows to developing countries', *International Organization*, Vol. 57, No. 4, pp.175–211.

Malikane, C. and Chitambara, P. (2017) 'Foreign direct investment, democracy and economic growth in southern Africa', *African Development Review*, Vol. 29, No. 1, pp.92–102.

Mallampally, P. and Sauvant, K.P. (1999) 'Foreign direct investment in developing countries', *Finance and Development*, pp.34–37.

Marshall, M.G. and Gurr, T.R. (2020) *Polity 5 Dataset Version 2018. Political Regime Characteristics and Transitions, 1800–2018*, Center for Systemic Peace.

Mathur, A. and Singh, K. (2013) 'Foreign direct investment, corruption and democracy', *Applied Economics*, Vol. 45, No. 8, pp.991–1002.

McDonald, C., Treichel, V. and Weisfeld, H. (2006) 'Attract investors', *Finance and Development,* Vol. 43, No. 4, pp.34–36.

Morisset, J. (2000) *Foreign Direct Investment in Africa: Policies also Matter*, Policy Research Working Paper N°. 2481.

Mucchielli, J.L. (1992) 'Determinants of offshoring and multinational firms: synthetic analysis and application to Japanese Firms in Europe', *Economic Review*, Vol. 43, No. 4, pp.647–659.

Ngouhouo, I. (2008) *Foreign Direct Investment in Central Africa: Attractiveness and Economic Effects. Economy and Finance,* Doctoral Thesis, University of the South Toulon Var., p.300.

Ngouhouo, I., Khaled, E.M. and Sa'adi, S. (2005) 'Does FDI means productivity growth for the host Country?', *American Journal of Business and Management.*

Okafor, E.C., Ujah, N.U., Elkassabgi, Y.A. and Ajalie, W. (2011) 'Democracy and FDI inflow : evidence of discordance in subsaharan Africa', *International Research Journal of Finance and Economics,* Vol. 63, No. 2011, pp.141–149, ISSN: 1450-2887.

Olson, M. (1993) 'Dictatorship, democracy, and development', *American Political Science Review*, Vol. 87, No. 3, pp.567–576.

Peres, M., Ameer, W. and Xu, H. (2018) 'The impact of institutional quality on foreign direct investment inflows: evidence for developed and developing countries', *Economic Research Ekonomska Istraživanja*, Vol. 31, No. 1, pp.626–644, https://doi.org/10.1080/1331677X.2018.1438906.

Poelhekke, S. and Van der Ploeg, F. (2010) *Do Natural Resources Attract FDI? Evidence from Non-Stationary Sector-Level Data*, CEPR Discussion Paper 8079.

Resnick, A.L. (2001) 'Investors, turbulence, and transition: democratic transition and foreign direct investment in nineteen developing countries', *International Interactions: Empirical and Theoretical Research in International Relations*, Vol. 27, No. 4, pp.381–398.

Transparency International Database (2000) [online] https://www.transparency.org/en/cpi/2020.

United Nations Conference on Trade and Development (2006) *World Investment Report,* FDI from Developing and Transition Economies: Implications for Development, p.372.

United Nations Conference on Trade and Development (2021) *World Investment Report*, *Investing in Sustainable Recovery*, p.280.

Urata, S. and Kawai, H. (2000) 'The determinants of the location of foreign direct investment by Japanese small and medium-sized enterprises', *Small Business Economics*, Vol. 15, No. 2, pp.79–103.

World Development Indicators Database (2020) [online] https://databank.worldbank.org/source/world-development-indicators.

Yang B. (2007) 'Autocracy, democracy, and FDI inflows to the developing countries', *International Economic Journal*, Vol. 21, No. 3, pp.419–439.

Notes

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.

2 The coefficient of the initial value of FDI is calculated according to the following formula: L.FDI – 1.

Appendix 1

Table A5 List of 22 African natural resource-rich countries

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

Appendix 2

Results of the Hausman test

a   Results of the Hausman test with the democracy index 'polity2'

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(–1)](b-B)

= 14.61

Prob > chi2 = 0.0672

b   Results of the Hausman test with the democracy index 'eiec'

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(–1)](b-B)

= 95.49

Prob > chi2 = 0.0000

> *Source:*   Author's computations, 202

Appendix 3

Table A6   Hausman Test of endogeneity

> ➢   Hausman Test of endogeneity for « polity 2 » model
>   Test: Ho: difference in coefficients not systematic
>   chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
>   chi2(7) = 20.97
>   Prob>chi2 = 0.0038
>
> ➢   Hausman Test of endogeneity for « eiec » model
>   Test: Ho: difference in coefficients not systematic
>   chi2(6) = (b-B)'[(V_b-V_B)^(–1)](b-B)
>   chi2(6) = 62.98
>   Prob>chi2 = 0.0000

> *Source:*   Author's computations, 2022