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CO2 emission in Africa: national leader's professional background effect

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Abstract

Theories supporting the anthropogenesis of climate change distinguish between macroeconomic and individual determinants as a factor in the mitigation or intensification of CO2 emissions. Specifically, studies show that the environmental issue is primarily political. However, this studies focus only on showing the institutional effects of CO2 emissions in this case democracy; thus neglecting the political variables themselves specifically the role of the leader's profile. This study proposes to this end, in the light of the theory of the political leader, to show that the president's professional background influences CO2 emissions in Africa. After multiple regressions by fixed-effects, random-effects, generalized least squares and Drisc-kraay methods. The results show that the "politician" profession has a negative effect on the quantities of CO2 emitted. This result is robust to different estimation methods as well as to the political regime of each country. The estimation by the GMM method in order to take into account the phenomenon of endogeneity does not relatively change results. Thus, a national leader politician by profession tends to adopt pro-environmental economic policies.

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1. Introduction

If for many observers Africa is the second lung in the world behind Brazil due to the extent of forests that it abounds in particular that of the Congo Basin, environmental scientists believe that Africa is the most vulnerable continent to climate change due to its high poverty rates, water scarcity and rain-fed agricultural production (Wild, 2015b). The argument is "based on two things: geographically and climatically Africa is exposed ..." Africa in general is already hot enough heat it up more and it's just downhill for animal production, crop production and human health" (Wild, 2015a). In addition, parts of subtropical and central Africa had previously shown a sharp increase in temperature between 1961 and 2010 (Wild, 2015a). Since the start of its post-independence development process, the continent has faced many cancers, including civil wars, poaching and deforestation, which has resulted in a considerable loss of its biodiversity. Megevand (2013) note that as a result of mining, agriculture, energy, forestry and infrastructure activities, it lost 4,067,000 hectares of forest each year between 1990 and 2000.

Environmental protection is an important emerging concept today and the pursuit of significant and sustainable economic growth for the poor remains a necessity and a priority for all economies. The simultaneous search for environmental protection and economic performance raises many questions, including that of the determinants of environmental quality. Many authors have attempted to give theoretical and empirical answers to this question and the most popular of them remains the Kuznets environmental curve (EKC) hypothesis. The EKC describes the relationship between declining environmental quality and economic growth as an inverted U, that is, during economic growth and development, environmental quality initially deteriorates but eventually improves with improvement in income level (Grossman and Krueger 1995; Torras and Boyce, 1998).

However, studies have suggested that the relationship between income and environmental quality is not limited to EKC (Bovenberg and Smulders 1995, 1996; Bruvoll, Glomsrod and Vennemo 1999). Theories of the provision of public goods show that institutional and political variables could play an important role in explaining the quality of the environment. In particular, it has been argued that non-democratic countries are likely to under-deliver public goods (Olson, 1993; McGuire and Olson 1996; Deacon, 1999; Lake and Baum, 2001; Bueno de Mesquita et al, 2003). However, some authors have argued that in democratic countries special interest groups have a disproportionate influence on policymaking (Olson, 1965, 1982). This implies that public goods (environmental quality) may be insufficiently provided in the presence of powerful special interest groups opposing environmental policies. The same would be true if the elected politician prevails over short-term factors (Congelton, 1992). Thomas Bernauer and Vally Koubi (2009) show's that civil liberty has an ambiguous effect. While more civil liberties in less liberal countries translate into a growing environment, more civil liberties in relatively free countries do not contribute to better environmental quality. This finding may be linked to the disproportionate influence of special interest groups opposing stricter environmental policies in countries where civil liberties are developed. In this context, they find that in democratic countries, the quality of the environment is affected by the strength of unions. Presidential democracies enjoy better environmental quality than parliamentary democracies. The same is true for countries with a larger winning electoral coalition, a finding that is consistent with the supply of public good theories.

However, although studies linking institutional variables to the quality of the environment are increasing, very few are devoted to the profile of the political leader in power. We believe that the profile of the ruling leader is a significant factor, because some public decisions emanating from the president may aim to protect or damage the environment; examples around the world speak volumes. There are several reasons to suspect an influence of the national leader on the quality of the environment:

Earth's lung is more threatened than it has ever been since Brazilian President Jair Bolsonaro took office in early 2019. From January to July, the pace of deforestation in the Amazon jumped 50% compared to the same period the previous year, according to satellite data provided by the National Institute for Space Research (Inpe). In July, more than 1,340 km^2 of Amazon rainforest was destroyed, almost the size of the London metropolitan area, explains The Guardian. This is equivalent to the disappearance of three football pitches per minute during the same month, underlines the British daily. The Brazilian administration is now extremely lenient with those who break the law by attacking the Amazon. "Jair Bolsonaro is in the process of abolishing just about all environmental policies in place since 1992. He is putting great pressure on federal environmental protection officers, thereby favoring those responsible for environmental damage. The numbers of fines imposed from January to May 2019 in the Amazon region for environmental harm is the lowest in 11 years, and inspections carried out this year have fallen by 70% compared to last year "explained to Metro Montreal Claudio Angelo, researcher at the Climate Observatory in Brasilia. Jair's environmental policies turned out to be very opposed to those of President Loula, who made the protection of the Amazon his presidential campaign.

The Trump administration has made a formal request to exit the Paris Agreement on Change at the United Nations. The withdrawal process lasts for a year, which means that the United States will not be part of the Paris Agreement on November 4, 2020. Trump's withdrawal from the United States has been justified by the costs generated by the fight against change climate. This decision was marked by a recovery in the energy sector, which contributes more than 20% to greenhouse gas emissions. Thus, according to the climate commission, the level of pollution in the United States has significantly increased under the current regime of Donald Trump, from 15 to 20%; thus placing the States second polluter in the world behind China. Comparing the latter's profile to that of his predecessor, Barrack Usen Obama, who pursued very opposing policies; one might rush to confirm that the leader's profile influences air quality.

Unlike the two previous countries, many efforts are being made to protect the environment, particularly in the Congo Basin; in Gabon, for example, President Ali Bongo describes Lee White as the man for the job. The only one capable of reaffirming Gabon's ability to save its forests (89% of the territory), after his predecessor Guy-Bertrand Mapangou was dismissed at the same time as Vice-President Pierre Claver Maganga Moussavou on May 21, 2019, after the "Kevazingogate": a scandal triggered by the discovery, in two Chinese warehouse sites in the capital Libreville, of nearly 5,000 cubic meters of kevazingo, a rare wood whose exploitation is prohibited. It was therefore Lee White; a British naturalized Gabonese in 2008, who was appointed Minister of Forests, the Sea and the Environment during the cabinet reshuffle on 10 June of the same year. This shows all the attention that the Gabonese leader pays to the protection of the environment.

Madhumita Paul report in June 2020 with the help of a United Nations Environment Program project that seeks to regulate the export and import of used vehicles in Africa indicates that Africa is importing used vehicles mainly from high income countries. About 2.5 million of these vehicles were exported from the European Union, Japan and the United States, the main exporters in 2017. About 48% of these used vehicles were destined for Africa, according to the report released by the South African Automobile Association on July 1, 2020, only five of the continent's 54 countries had a major comprehensive used vehicle ban, while 22 countries had restrictions on the import of vehicles from opportunity. The remaining 27 countries have age restrictions on the importation of used vehicles; these range from 3 to 15 years. Fifteen pay, with and without age restrictions, impose additional taxes on vehicles imported over a certain age, ranging from 3 to 10 years, according to the study. Mauritius, Seychelles and Uganda apply an additional tax based on environmental impact. The combustion of diesel is one of the main factors of air pollution. Sub-Saharan Africa experienced a 75% increase in transport emissions between 2000 and 2016, with transport emissions increasing by 153% in Ghana, 73% in Kenya and 16% in Nigeria. Regulating vehicle imports to allow vehicles with only the equivalent emission standard and banning vehicles over five years old will reduce atmospheric carbon dioxide levels. African countries as a whole have received more FDI in the past two decades compared to decades immediately following independence. If authors and media attribute this to political stability marked by a decline in coups on the continent (Joseph Keneck, 2019), others believe it to be the work of a political elite having completed their education in the West. Indeed, Constance et al (2009) highlight the relationship between trade openness and the profile of managers. They show that African leaders trained abroad are defenders of free trade, make FDI the pillar of their development policy. In the same vein, Donal Ajoumessi and Ngouhouo (2020) show that these leaders trained outside their country of origin tend to invest less in the education of their country.

Education and public awareness of the environment in all countries are priority tools in the fight against the effects of CO_2 emissions. For example, the Ethiopian government is demonstrating its will and commitment in the area of soil and water conservation and the use of a climate resilient green economy. Various awareness-raising actions have been carried out in the country using mass media (TV, radio, newsletters and social media like the face book, Twitter web pages and the Internet) as the main tool for disseminating information through the country. It is a good option to educate all people on the causes and impacts of climate change. The current performance and activities of the Ethiopian government and the people on soil and water conservation should be seen as a model for other African countries. Although the majority of people have observed the increase in temperature and rainfall variability because of their timeliness, the majority of our people have little information about the root causes of climate change and how climate change will affect all systems, from food insecurity to the risk of water scarcity and good health. Thus, the African populations should be educated and made aware of their role and how they can play such a role in adaptation to climate change. Another good way to reduce the impacts of climate change is to conduct research on climate change and disseminate the results to decision-making bodies and relevant stakeholders. Educational institutions, research centers and the meteorological organization should focus on research on climate change. After environmental education and awareness, relevant stakeholders will do their best to bring about changes through adaptation and mitigation options. Adaptation and mitigation of climate change are essential mechanisms to save the lives of vulnerable communities, especially the African continent. An effective way to cope with the impacts of climate change is to integrate adaptation measures into sustainable development strategies in order to reduce pressure on natural resources, improve management of environmental risks and increase welfare, being social of the poor is very important. According to Besley et al (2011), Diaz Serrano and Pérez (2013), leaders with master's and doctoral degrees adopt policies aimed at boosting the level of education in their country. In Africa, the example of Zimbabwe under the Robert Mugabe era is a case in point. However, one wonders if the academic performance of a country like Zimbabwe is accompanied by a low level of pollution. Jun Karren and al (2018) conduct a one-way analysis of variance to determine the influence of demographic factors on the individual carbon footprint. The results show that the participants were "moderately informed" about climate change. At the same time, their average carbon footprint (1.20 metric tons per capita per year) is slightly higher than the 2014 Philippine average (1.1 metric tons per capita per year), suggesting that a good knowledge of climate change does not necessarily lead to a reduction in the carbon footprint. The results of the study also show that among the demographic factors studied, only the highest level of education of the parents ($p = 0.000$), the level of urbanization ($p = 0.002$) and household income ($p = 0.044$) influence the individual carbon footprint.

One of the channels through which this article argues that the profile of the national political leader could influence the quality of the environment is monetary policy. Indeed, Jiang Qingquan et al (2020) link CO2 emissions to monetary policies. Using a new predictive model, they estimate the impact of monetary policies on CO2 as well as control variables, including income, remittances, urbanization, fossil fuels and human capital in selected Asian economies for the period 1990-2014; using Pedroni and Kao co-integration assays, fully modified panel techniques (PFM-LS) and dynamic panel least squares (PD-LS). From their results, it emerges that: first, the results showed a significant positive long-term relationship between expansionary monetary policy and CO2. Second, contractionary monetary policy is an effective measure to mitigate CO2 emissions. Third, improvements in human capital have a positive impact on reducing CO2 emissions. Fourth, remittances and fossil fuels are also the main determinants of CO2 emissions. Studies on the profile of the political leader have very often highlighted his role in the formulation of monetary policy. According to Ansgar Belke and Niklas Potrafke (2009), in OECD countries, political ideology has an effect on monetary policy. Specifically, left-conservative governments tend to keep nominal short-term interest rates high. One potential reason for this finding could be that left-wing governments seek to effect market-driven policy change by delegating monetary policy to conservative central bankers. Monetary policies would be restrictive under the mandates of the leaders of the left party. A priori by extrapolating the results of Jiang Qingquan et al (2020), one would expect the level of pollution to be lower under the mandates of leftist leaders in OECD countries. In the context of African countries, studies in recent years have called into question the real independence of central banks. There is growing evidence that political cycles are strongly linked to monetary cycles.

From our examples it appears that leaders with a career in politics tend to work for the environment unlike their counterparts in other professional vocations. Hence the following hypothesis: the professional background of the national political leader would influence the quality of the air in Africa. Although theoretically to our humble knowledge there is no work in this direction, much research has had to examine the interest of the leader in the environment. To this end, Thad Koussera and Bruce Tranter (2018) show the influence of the political leader's communication on the attitudes of the population towards climate change. By analyzing eighty master plans of major Chinese municipalities, Lei Zhang et al (2018) find that the education and age of local leaders have a significant effect on the environmental concerns of master plans, unlike their work experience and to their duration in power. They conclude that well-trained local leaders and a more collaborative planning approach could deal more effectively with environmental issues in China. In feminist economic theory, Mavisakalyan and al (2018) show that women adopt environmental policies better in the American parliament than their male counterpart. These studies cited are on a community or parliamentary scale; in addition, they analyze the transmission channels for policies likely to influence CO_2 emissions. This article is part of a continuation of his work by examining at the national level the possible effect of the manager's professional background on CO_2 emissions.

2. Empirical approach and data

Information on the professional background of African presidents has been collected from several sources including the Library of Congress; African political leader history, the Archigos 2015 database... three mains information has received our attention: the duration in power of the leader, his age and his profession before coming to power. The construction of the occupation variable is inspired by Silja Göhlmann and Roland Vaubel, (2007). We group leaders into six major professions, namely: “science and / or engineer”, “politics”, “military”, “teachers”, “other science” and “others / unknown”. Many leaders have had to practice more than one profession; we thus chose the one whose leader worked the longest before entering politics because many professions were transitory; generally this was closely linked to his academic course. The profession criterion is in no way based on the duration of academic training, for example in Guinea Bissau President Amilcar Cabral studied engineering leading to an Agronomist degree, and he practiced his profession for some time. but he was also devoted to the union in the liberation struggle of his country; his successor Joao Bernado Vieiga trained him in electricity and then performed compulsory military service before entering politics for this purpose, both leaders are found in our sample with the same professional profile that of “science and/or engineer”.

Although it is trivial for a leader to be a politician when he comes to power, some after their training went directly to political office hence the category “Politics”. This is the case of Ali Bongo who after his studies directly occupied a post of minister. From Marçias Nguema, who at his young age was mayor, after deputy before coming to power, to Konan Bédié who was appointed ambassador upon his return from university training in France, many examples can be found in our sample.

With regard to the “military” in particular, some leaders did so quickly because at one point military service was compulsory in their country. Others like the Ghanaian Jerry Rwalings was a very particular soldier insofar as the latter was an air pilot with an engineer bases for this purpose we have classified him in two categories: “scientist and/ or engineering” and “military”.

Managers classified in the “other science” category are those who have worked in professions related to the economy (banks, insurance companies, and businessman), lawyer, judge, and consultant.

The “other / unknown” category includes leaders who have exercised professions we were unable to classify in the previous categories such as President Tolbert of Liberia former pastor, Laurent Kabila or Chales taylor former rebel, Bob Denard former mercenary of the French navy, Jomo Kenyatta who carried out odd jobs and writer; also made up of leaders the profession was not clearly defined as Mwinyi of Tanzania, Joseph Leabua Jonathan of Lesotho.

The dependent variable in this case CO_2 emissions in metric tons per capita are taken from the WDI. For control variables, we choose variables: institutional such as the index of perception of democracy from the Polity IV database. It provides a number of variables, which capture different dimensions of democracy, including the degree of competitiveness and openness in recruiting leaders; this base variable (POLITY2) goes from 10 to -10. We define a country as democratic if the variable POLITY2 is positive (Persson and Tabellini, 2006); macroeconomics such as trade openness, forest area, forest rent, foreign direct investment, financial development and trade openness taken from the World Development Indicator (WDI). Table 1 below describes the variables used on average.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CO2	1722	.601	1.135	.011	10.926
Trade	1722	68.926	35.118	6.32	311.354
FDI	1722	3.459	8.929	-28.624	161.824
Democracy	1721	-1.463	6.009	-10	10
Growth	1722	7.565	.818	4.898	10.75
other/unknown	1722	.185	.388	0	1
Other science	1722	.074	.262	0	1
Teachers	1722	.103	.305	0	1
Military	1722	.42	.494	0	1
Science/engineer	1722	.091	.288	0	1
Politics	1722	.127	.333	0	1
Tenure	1722	10.268	8.154	1	42
Âge	1722	55.343	11.673	18	91

Source: Author

2.1. The econometric model

The analysis covers a sample of 42 African countries over the period 1975-2015. The number of countries in this article is due to the lack of data in some countries like Morocco, Tunisia, Egypt, Libya. Our model is an adaptive improvement of that of Timothy Besley, Jose G. Montalvo and Marta Reynal-Querol (2013). In their model, the dependent variable is the difference in per capita income that we replace with the CO2 emission rate; instead of the vector of variables that can explain growth, we will put those that can explain CO2 emissions. In addition to that, we will add in this model a vector of characteristic which can explain the preferences of the leader.

The econometric model is written:

$$CO_{2ilt} = \alpha + \beta' D_{ilt} + \lambda prof_{ilt} + \Theta X_{ilt} + \mu_l + n_t + \varepsilon_{ilt} \quad (1)$$

Where $CO2_{ilt}$ represents the level of pollution of country i when leader l is in power at period t; D represents the matrix of the other characteristics of the leader likely to influence his policies, namely the length of time in power and the age of the leader; X the matrix of economic variables of the country likely to influence the level of pollution, n_t the temporal fixed effect, μ_l the individual fixed effect and ε_{ilt} the error term linked to each period; the coefficients α, β, λ, and Θ are the parameters to be estimated. The coefficient on which our hypothesis is built is λ which allows us to capture the level at which the professional and academic background of the political leader could affect the pollution rate of his country. For this purpose, the Prof Matrix is made up of the different professions of African leaders. The matrix D of the characteristics of the political leader of the country is made up of several variables:

The length of time the leader has been in office represents political stability and provides insight into the experience of a president. A young leader will have political preferences different from those of an old president insofar as the latter has a long political career to preserve unlike the more experienced old; age also informs about the latter's ability (Lau and Readlawsk, 2008).

The matrix X of the country's macroeconomic variables is made up of several variables:

The level of democracy here tells us about the institutional constraints facing the leader; the presidents of autocracies would be freer in their political choices and in the implementation of these (Jones and Oklen, 2005; Barro, 1999). The president's education level is an important factor in the growth process; a president with higher education would have become familiar with development theories that make him a driver of growth in his country (Besley et al, 2013). In Africa, leaders who have received their training in France would have development policies turned outward to this end could attract more external financial flows (Page, 2013; Constante et al, 2010).

Four econometric methods were used to estimate the preceding equation namely: the fixed effect method, the random effect method, generalized least squares (GLS) and the Driscoll-Kraay method. The use of these methods is for the following reasons: tests on the residuals of the regression by the random-effect method reveal the presence of serial autocorrelation and heteroscedasticity; this is therefore corrected by the GCMs. However, since the Hausman test revealed that the fixed-effect model is preferred over the random-effect model, GCMs are no longer sufficient because only corrects for random effects. Hence the use of the Driscoll-Kraay method under the presence of independence of individuals assumption.

2.2. Results

2.2.1. Basic result

This article determines the effect of the professional background of the national leader on CO2 emissions using a macroeconomic approach. In order to overcome the problem of multi-collinearity between dependent variables of interest, we excluded the variable others / unknown. The results obtained from the estimation of equation (1) by the fixed-effect, random-effect, GLS and Driscoll-Kraay method are presented in Table 2 below.

Table 2: effect of political leader's professional background on CO2 emissions

	(fe)	(re)	(MCG)	(Drisc/Kraay)
VARIABLES	CO2	CO2	CO2	CO2
Trade	-0.000355	-0.000103	0.00160**	-0.000355
	(0.000790)	(0.000767)	(0.000629)	(0.000773)
FDI	-0.00664***	-0.00641***	0.000768	-0.00664**
	(0.00178)	(0.00177)	(0.00227)	(0.00306)
Growth	0.867***	0.880***	0.970***	0.867***
	(0.0382)	(0.0367)	(0.0257)	(0.0969)
Democracy	-0.00649**	-0.00676**	-0.00776**	-0.00649***
	(0.00322)	(0.00320)	(0.00371)	(0.00221)
Tenure	-0.00264	-0.00245	0.00528*	-0.00264
	(0.00221)	(0.00220)	(0.00271)	(0.00433)
Age	0.00129	0.00120	0.00114	0.00129
	(0.00173)	(0.00171)	(0.00203)	(0.00179)
Other science	-0.0223	-0.0222	-0.0825	-0.0223
	(0.0708)	(0.0704)	(0.0867)	(0.0545)
Teachers	0.0574	0.0549	-0.0144	0.0574
	(0.0714)	(0.0707)	(0.0755)	(0.0490)
Military	0.0521	0.0550	0.148***	0.0521

	(0.0519)	(0.0514)	(0.0532)	(0.0427)
Science/engineer	0.0613	0.0567	-0.0768	0.0613
	(0.0690)	(0.0685)	(0.0770)	(0.0515)
Politics	-0.122**	-0.119*	-0.0620	-0.122*
	(0.0616)	(0.0611)	(0.0692)	(0.0606)
Constant	-5.979***	-6.091***	-7.019***	-5.979***
	(0.303)	(0.305)	(0.199)	(0.694)
Observations	1,721	1,721	1,721	1,721
R-squared	0.257	0,631		0,257
Number of countryid	42	42	42	
Number of groups				42

Source: Auteur

Note: Robust standard errors are indicated in parentheses. (***, **, *) indicate statistical significance at 1%, 5% and 10%.

Columns 1 to 4 show that foreign direct investment in Africa tends to reduce CO2 emissions in its countries. As explained above, this would be due to the fact that the foreign portfolios include environmental assets that have a contagion effect on the host country's portfolio. Our results thus corroborate the research of Yanmin Shao (2017).

The results also reveal that economic growth increases the pollution rate in African countries. The explanation lies in the economic structures of African countries. Indeed, the African economies for the most part are anchored to the exports of raw materials, especially oil, so extraction and use are sources of emission of huge quantities of greenhouse gases. Logging is also one of the indicators of the economic performance of some African countries. It therefore appears that economic growth is accompanied by pollution in our countries. This result confirms studies by Hilaire Nkengfack et al (2019).

The growing literature in environmental economics highlights the effect of democracy on environmental performance. Above we have highlighted the negative effect of democracy on CO2 emissions Makarvin, B. and Lew, Byron (2011). Our result is part of this dynamic.

Regarding specifically our variables of interest, the results show that professional politicians significantly and negatively influence the level of pollution at the 5% and 10% thresholds (columns 1 to 4). This result derives its explanation from the fact that in order to be elected or promoted to different political positions before his accession to the supreme office, presidents who were previously politicians have a greater knowledge of environmental challenges unlike their scientific, economist and military counterparts; this is because they are supposed to be more informed on the issue during their participation in exchanges on a national and international level ... also the quest for the confidence of the voters by the politician forces the latter to take more interest in business to the smallest detail in a continent where governments are exerting strong economic pressure. This result leads to the questioning of how a politician reduces CO2 emissions. Many authors note that the issue of CO2 emissions is first political before being scientific; in doing so, parliamentarians become at the heart of the pollution issue (Rebecca Wills, 2019). Let us give feedback on the environmental behavior of African politicians, we realize that many have worked enormously in the fight against CO2 emissions, particularly through reforestation; at the head of the contest, At 37, Wangari Maathai, deputy in the Kenyan parliament, later Minister of the Environment decides to launch a vast campaign of reforestation in Kenya for this purpose founds the Green Belt Movement which will then extend to other African countries; many other examples can be seen across the continent.

2.2.2. Robustness analysis

As mentioned in earlier essays, a leader with more power would find it easier to assert his preferences (John Kane and Haig Patapan, 2012) unlike another in a democratic regime. In order to verify this approach empirically, we group the sample into two subgroups, one made up of democratic countries (polity2> 0) and the other of non-democratic countries (polity2 <0).

2.2.2.1. The case of democracies

The results of estimating Equation 1 above by the previous four methods in democracies are summarized in Table 3 below.

Table 3: Effect of the profession of political leader on CO2 emissions in democracies

	(fe)	(re)	(MCG)	(Drisc/Kraay)
VARIABLES	CO2	CO2	CO2	CO2
Growth	0.767***	0.788***	0.808***	0.767***
	(0.0383)	(0.0344)	(0.0203)	(0.0889)

FDI	-0.00132	-0.000810	0.00273	-0.00132
	(0.00150)	(0.00149)	(0.00195)	(0.000879)
Trade	-0.000869	-0.000570	0.00222***	-0.000869
	(0.000587)	(0.000565)	(0.000531)	(0.000643)
Democracy	0.00843	-1.64e-05	-0.0682***	0.00843
	(0.00837)	(0.00806)	(0.00746)	(0.00670)
Tenure	0.00771***	0.00803***	0.00466*	0.00771**
	(0.00234)	(0.00230)	(0.00270)	(0.00327)
Age	-0.00140	-0.00135	0.00365**	-0.00140
	(0.00156)	(0.00153)	(0.00165)	(0.00182)
other sciences	-0.175***	-0.179***	-0.227***	-0.175**
	(0.0462)	(0.0460)	(0.0535)	(0.0685)
Teachers	-0.0892	-0.102*	-0.216***	-0.0892
	(0.0545)	(0.0538)	(0.0565)	(0.0743)
Military	-0.119**	-0.132***	-0.126**	-0.119
	(0.0514)	(0.0508)	(0.0554)	(0.0809)
Science/engineer	0.137**	0.115**	-0.0814	0.137
	(0.0542)	(0.0538)	(0.0584)	(0.112)
Politics	-0.269***	-0.254***	-0.110*	-0.269**
	(0.0583)	(0.0570)	(0.0567)	(0.100)
Constant	-5.116***	-5.225***	-5.440***	-5.116***
	(0.286)	(0.264)	(0.159)	(0.703)
Observations	580	580	580	580
R-squared	0.521	0,742		0,521
Number of countryid	35	35	35	
Number of groups				35

Source: Author

Note: Robust standard errors are indicated in parentheses. (***, **, *) indicate statistical significance at 1%, 5% and 10%.

From Table 3, it appears that many economic variables lose their significance in favor of variables describing the characteristics of the leader in place. We thus observe that other sciences have a negative, significant and robust effect on CO_2 emissions in democracies; just like a politician who has maintained his initial sign and significance. It therefore appears that the profession of the ruling leader has a negative effect on CO2 emissions in democracies. We can therefore say that leaders who were once politicians and their colleagues who have worked in science-related professions are defenders of the environment in democracies. What about non-democratic countries?

2.2.2.2. Case of autocracies

The results of estimating Equation 3 above by the previous four methods in non-democratic countries are summarized in Table 4 below.

Table 4: Effect of the president's profession on pollution in non-democratic countries

	(fe)	(re)	(MCG)	(Drisc/kraay)
VARIABLES	CO2	CO2	CO2	CO2
Growth	1.384***	1.356***	1.224***	1.384***
	(0.0601)	(0.0571)	(0.0428)	(0.151)
FDI	-0.00642***	-0.00647***	-0.00835**	-0.00642
	(0.00243)	(0.00242)	(0.00333)	(0.00419)
Trade	-0.00103	-0.000658	-0.000289	-0.00103
	(0.00135)	(0.00128)	(0.000947)	(0.000864)
Democracy	-0.0337***	-0.0344***	-0.0310**	-0.0337***
	(0.0113)	(0.0112)	(0.0127)	(0.0103)
Tenure	-0.0233***	-0.0213***	0.00784*	-0.0233***
	(0.00374)	(0.00366)	(0.00401)	(0.00607)
Age	0.0105***	0.00969***	-0.000224	0.0105***
	(0.00287)	(0.00281)	(0.00309)	(0.00254)
other science	-0.0665	-0.0946	-0.295	-0.0665
	(0.243)	(0.241)	(0.318)	(0.130)
Teachers	-0.207	-0.216	-0.0389	-0.207*
	(0.149)	(0.144)	(0.129)	(0.116)
Military	-0.129	-0.115	0.275***	-0.129**
	(0.0869)	(0.0846)	(0.0750)	(0.0530)
Science/engineer	-0.354***	-0.337***	-0.0118	-0.354***
	(0.128)	(0.126)	(0.125)	(0.0738)

Politics	-0.242**	-0.226**	-0.0131	-0.242**
	(0.110)	(0.107)	(0.104)	(0.105)
Constant	-10.10***	-9.889***	-8.993***	-10.10***
	(0.479)	(0.464)	(0.323)	(1.134)
Observations	1,062	1,062	1,062	1,062
R-squared	0.367	0,538		0,367
Number of countryid	40	40	40	
Number of groups				40

Source: Author

Note: Robust standard errors are indicated in parentheses. (***, **, *) indicate statistical significance at 1%, 5% and 10%.

The first observation that emerges from Table 4 is the joint significance of macroeconomic variables and the profile of the manager. It therefore appears that in democracies, economic variables alone cannot explain the intensity of pollution; but also the profile of the leader. These results contrast with the work of Alexander Baturo (2016).

2.2.3. Taking into account endogeneity

The analysis of the macroeconomic effects of foreign direct investment and trade openness on CO_2 emissions requires taking into account the phenomenon of endogeneity. The estimation by GMMs thus makes it possible to overcome the said problem. Table 5 resumes the estimate of the previous equation by the system GMM method.

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Table 5: leader profession effect on CO2 emission: GMM approach

VARIABLES	(overall) CO2	(democracy) CO2	(autocracy) CO2
L.CO2	0.526***	-0.211	-0.121
	(0.0758)	(0.418)	(0.176)
Democracy	-0.000204	0.0128	0.0509
	(0.00852)	(0.0973)	(0.0342)
Trade	-0.000650	0.0133***	-0.00869
	(0.00102)	(0.00515)	(0.00611)

FDI	0.000545	-0.0292	0.00507
	(0.00170)	(0.0215)	(0.0114)
Growth	0.353***	1.101***	0.701
	(0.0713)	(0.357)	(0.457)
Age	-0.00299	-0.0122*	-0.0199
	(0.00356)	(0.00635)	(0.0187)
Tenure	-0.000897	0.0347	-0.0228*
	(0.00347)	(0.0291)	(0.0138)
Other sciences	-0.0238	-0.278*	-0.254
	(0.0590)	(0.157)	(0.256)
Teachers	-0.0187	-0.0773	-0.0729
	(0.0333)	(0.0994)	(0.139)
Sciences/engineer	-0.0120	-0.393**	0.127
	(0.0302)	(0.195)	(0.165)
Military	0.0336	-0.203	-0.293*
	(0.0271)	(0.172)	(0.158)
Politics	-0.0459*	-0.128*	-0.223
	(0.0243)	(0.0777)	(0.147)
Constant	-2.171***	-7.951***	-2.862
	(0.515)	(2.910)	(2.096)
Observations	1,679	576	1,024
Number of countryid	42	35	40
Sarganp	0.127	0.512	0.978
AR(1)	0.000	0.015	0.000
AR(2)	0.350	0.634	0.489

Source: Author

Note: Robust standard errors are indicated in parentheses. (***, **, *) indicate statistical significance at 1%, 5% and 10%.

The first column represents the estimate of the previous equation as a whole; the second column the case of democratic countries and the third that of non-democratic countries. The results of this estimate tell us that the occupation of "politicians" has a negative and significant effect across the sample and in democratic countries. In non-democratic countries, it is the "military" profession that has a negative and significant effect. Taking endogeneity into account therefore reveals that in democratic countries, leaders who were politicians before coming to power adopt pro-environmentalist policies while they exert no effect on CO_2 emissions in autocracies. However, regardless of the political regime, we realize that the profession of the leader in place significantly influences the rate of CO_2 emissions.

The sargan statistic in all estimations exceed 5%, therefore the validity of the instruments is confirmed for all the specifications used, because the value of the chi-square statistic is not significant in any regression at the required threshold of 5%. Alternatively, we also show the results of the Arellano-Bond test for the AR (1) and AR (2) autocorrelation. The value of the structure AR (1) cannot be rejected for the estimated model from which the dynamic model is appropriate, while the structure AR (2) is rejected therefore lack of serial autocorrelation between the first differentiated variables used as instruments and residues. So these are good instruments.

3. Conclusion

The aim of this article was to test the effect of the professional profile of Presidents on CO_2 emissions. To our humble knowledge, the majority of works that have been interested in the determinants of pollution have always put economic, structural, institutional and political factors in the foreground, but rarely have they taken into account the individual characteristics of Presidents. Following on from the political leader's literature, this chapter has highlighted a new determinant specific to African economies: the professional background of heads of state. In order to test the hypothesis according to which the personal characteristics of the leader affect the degree of pollution, we used a sample of 42 African countries over the period 1975-2015; or approximately 197 presidents. The estimation is done by means of the fixed and random effect method, generalized least squares, and the Drisc-Kraay estimate. Our results show that former leaders who were once politicians before their ascension to the highest office negatively affect CO_2 emissions. On average, when a politician head of state is in power, overall there is a decrease in the average level of pollution; regardless of the political regime.

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Appendices

Table 5: hausman Test

	Coefficients (b) eq1	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
tradeGDP	-.0003552	-.0001034	-.0002518	.0001881
IDE	-.0066354	-.006412	-.0002234	.0001518
Lncgdppc	.8669111	.8795446	-.0126336	.0105773
polity2	-.0064924	-.0067559	.0002635	.0003905
duréepouvoir	-.0026413	-.0024476	-.0001936	.0002146
âge	.0012881	.001201	.0000871	.0001931
autresscie~s	-.0223344	-.0221621	-.0001723	.0072867
enseignants	.057384	.0549373	.0024467	.0100523
militaire	.0521068	.0550485	-.0029417	.0074741
sciences	.0612689	.0567384	.0045306	.0086127
politicien	-.1216721	-.1186899	-.0029821	.0073633

```
                  b = consistent under Ho and Ha; obtained from xtreg
   B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

            chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =        9.75
          Prob>chi2 =      0.5531
```

Table 6 : within and between Std.Dev table

Variable		Mean	Std. Dev.	Min	Max	Observations
CO2	overall	.6013037	1.135039	.0107203	10.9256	N = 1722
	between		.9695657	.0338495	5.157572	n = 42
	within		.6083634	-1.847378	7.026635	T = 41
tradeGDP	overall	68.92582	35.11825	6.320343	311.3541	N = 1722
	between		31.22928	26.31439	143.4019	n = 42
	within		16.75383	-14.6976	236.878	T = 41
IDE	overall	3.459092	8.928967	-28.62426	161.8238	N = 1722
	between		5.129922	.4380672	29.23219	n = 42
	within		7.349965	-30.21165	145.6918	T = 41
Lncgdppc	overall	7.564922	.8179929	4.89784	10.75028	N = 1722
	between		.7488801	6.429995	9.336889	n = 42
	within		.3483185	6.026301	9.286368	T = 41
polity2	overall	-1.46271	6.008913	-10	10	N = 1721
	between		3.568347	-9.414634	9.829268	n = 42
	within		4.865082	-11.41393	10.31229	T = 40.9762
duréep~r	overall	10.26829	8.153953	1	42	N = 1722
	between		4.084417	4.121951	21.85366	n = 42
	within		7.084648	-10.58537	30.41463	T = 41
âge	overall	55.34262	11.67306	18	91	N = 1722
	between		6.928394	41.87805	70.97561	n = 42
	within		9.453744	21.70848	94.46458	T = 41
autres~s	overall	.0743322	.2623869	0	1	N = 1722
	between		.1352051	0	.4878049	n = 42
	within		.2258126	-.4134727	1.049942	T = 41
enseig~s	overall	.1033682	.3045276	0	1	N = 1722
	between		.2023361	0	.8780488	n = 42
	within		.2296708	-.7746806	1.078978	T = 41
milita~e	overall	.4198606	.4936793	0	1	N = 1722
	between		.3300786	0	.9756098	n = 42
	within		.3705397	-.5557491	1.39547	T = 41
sciences	overall	.0911731	.2879387	0	1	N = 1722
	between		.1633982	0	.4878049	n = 42
	within		.238391	-.3966318	1.018002	T = 41
politi~n	overall	.126597	.3326175	0	1	N = 1722
	between		.1981647	0	.804878	n = 42
	within		.2688455	-.6782811	1.102207	T = 41

Table 7 : autocorrelation test

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      41) =     16.706
           Prob > F =      0.0002
```

Table 8: Breusch-pagan test for groupwise heteroskedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of CO2

         chi2(1)      =  2250.69
         Prob > chi2  =   0.0000
```

Table 9 : Pesaran's test of cross sectional independence

Correlation matrix of residuals:

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	c14	c15
r1	1.0000														
r2	0.3140	1.0000													
r3	0.6526	0.2654	1.0000												
r4	0.0266	0.0494	0.1149	1.0000											
r5	0.3623	0.1694	0.7520	0.1774	1.0000										
r6	0.2399	-0.1438	0.5420	0.0115	0.8091	1.0000									
r7	-0.4468	-0.1879	-0.3735	0.1318	-0.1690	-0.1362	1.0000								
r8	-0.2825	-0.3320	-0.4229	0.1502	-0.2253	-0.1578	0.2986	1.0000							
r9	0.2940	0.6347	0.2224	0.0065	0.0293	-0.2059	-0.0049	-0.1009	1.0000						
r10	0.4714	0.0432	0.6708	0.3037	0.7980	0.7901	-0.3017	-0.3223	-0.0780	1.0000					
r11	-0.2827	0.3576	-0.4778	-0.0891	-0.6416	-0.7407	0.2849	-0.1223	0.2370	-0.6774	1.0000				
r12	0.4418	0.4872	0.7328	0.2391	0.8718	0.6608	-0.3076	-0.3423	0.3250	0.7093	-0.4365	1.0000			
r13	0.1191	0.2812	0.1254	-0.0241	-0.2669	-0.4740	0.0468	-0.1704	0.4414	-0.2313	0.2936	-0.1474	1.0000		
r14	0.0671	0.0717	0.2824	0.0535	0.6805	0.6073	-0.2421	-0.0826	-0.0970	0.5168	-0.4622	0.6087	-0.5541	1.0000	
r15	0.2664	0.7999	0.4564	0.1818	0.4648	0.0766	-0.1422	-0.2627	0.5973	0.1815	0.1086	0.7501	0.1773	0.3022	1.0000
r16	-0.5469	-0.2705	-0.8501	-0.0169	-0.8400	-0.7036	0.5458	0.5355	-0.1163	-0.7851	0.5567	-0.8372	0.1944	-0.5792	-0.4561
r17	0.6257	0.1753	0.7745	0.1643	0.6621	0.5412	-0.3406	-0.2907	0.1325	0.6212	-0.3332	0.6954	-0.2536	0.4121	0.4209
r18	0.4356	0.1650	0.5693	-0.0568	0.4540	0.3523	-0.1606	-0.5108	-0.1309	0.4239	-0.1769	0.3781	-0.2127	0.2198	0.2332
r19	0.1871	0.6662	0.4346	0.0112	0.5590	0.2476	-0.1318	-0.2087	0.4806	0.2024	-0.0035	0.7570	-0.1262	0.4566	0.8797
r20	-0.5069	-0.1137	-0.5932	0.1699	-0.2483	-0.1411	0.3757	0.4975	0.0103	-0.2441	0.0223	-0.1832	0.0614	-0.0343	-0.0358
r21	-0.5546	-0.3121	-0.7308	-0.2726	-0.6263	-0.3098	0.6023	0.2897	-0.1601	-0.6134	0.4077	-0.6877	0.0481	-0.4366	-0.4723
r22	0.3775	0.7009	0.5330	0.3018	0.3765	-0.0010	-0.0840	-0.2672	0.6433	0.2681	0.0806	0.6316	0.4472	0.0769	0.8451
r23	0.3977	0.2898	0.6184	0.4524	0.6657	0.5183	-0.2143	-0.2933	0.1381	0.7284	-0.3912	0.7550	-0.0824	0.4307	0.5006
r24	-0.2866	0.2034	-0.5285	0.0116	-0.7829	-0.9398	0.3130	0.0996	0.2551	-0.7696	0.8029	-0.6318	0.5538	-0.6739	-0.0270
r25	0.2287	0.1360	-0.0707	-0.3591	-0.3421	-0.4043	-0.1643	-0.2416	0.3365	-0.2370	0.3473	-0.2822	0.2545	-0.2503	-0.1414
r26	0.2484	-0.1009	0.5723	0.1498	0.8462	0.9053	-0.2906	-0.0960	-0.1772	0.7780	-0.7947	0.7351	-0.5768	0.7637	0.2040
r27	-0.3051	0.0205	-0.5826	0.0011	-0.8332	-0.7804	0.4177	0.2337	0.1455	-0.7577	0.7234	-0.7192	0.4827	-0.7618	-0.2359
r28	0.3622	0.1577	0.6605	0.0878	0.8571	0.7686	-0.3749	-0.2218	0.0827	0.7070	-0.6978	0.8801	-0.3494	0.6851	0.5003
r29	0.2855	0.3247	0.3377	0.2175	0.0815	-0.1403	0.1400	-0.0090	0.4314	-0.0095	0.0935	0.1996	0.5918	-0.2584	0.4015
r30	0.5474	0.3953	0.8353	0.1294	0.7865	0.5265	-0.2979	-0.4852	0.3268	0.6406	-0.4173	0.7999	0.1300	0.3590	0.5906
r31	-0.0026	0.6809	0.0246	0.0424	0.2479	0.0251	-0.2025	-0.2681	0.4382	0.1068	0.2592	0.5116	-0.2042	0.4586	0.7120
r32	0.1668	0.6930	0.1769	0.1601	-0.0487	-0.4284	0.0875	-0.1807	0.7157	-0.2146	0.4588	0.2379	0.7144	-0.3273	0.7032
r33	-0.1556	0.3342	-0.4271	-0.0084	-0.6586	-0.7994	0.2331	-0.0972	0.2764	-0.6073	0.8820	-0.4780	0.2915	-0.5240	0.0677
r34	0.4611	0.2112	0.7749	0.0467	0.8760	0.8006	-0.3667	-0.3268	0.0430	0.7531	-0.5775	0.8351	-0.3952	0.6335	0.4335
r35	0.5321	0.7678	0.6793	0.1510	0.4615	0.1033	-0.3211	-0.5581	0.6036	0.3834	0.0591	0.7184	0.3826	0.1277	0.8240
r36	-0.1863	0.0881	-0.2812	0.1636	-0.4572	-0.5040	0.5471	0.0559	0.2016	-0.4515	0.5780	-0.3721	0.2359	-0.4525	-0.0154
r37	0.0699	0.5819	-0.1613	-0.1928	-0.4192	-0.6745	-0.2681	-0.2481	0.4548	-0.4312	0.6242	-0.1503	0.5670	-0.2795	0.3470
r38	-0.4777	-0.2932	-0.7182	-0.0474	-0.3751	-0.0692	0.2809	0.4845	-0.1559	-0.3230	0.1358	-0.3389	-0.3451	-0.0335	-0.3198
r39	0.2431	0.2296	0.4283	0.1110	0.7632	0.7505	-0.2592	-0.2031	0.0320	0.7167	-0.5093	0.7947	-0.4999	0.6316	0.4182
r40	-0.2409	0.3839	-0.4612	0.0515	-0.6821	-0.8839	0.2636	0.1482	0.4380	-0.7243	0.7859	-0.4360	0.6002	-0.5910	0.1954
r41	0.4999	-0.0414	0.5775	0.0614	0.4128	0.1911	-0.4948	-0.1238	0.0283	0.4729	-0.5541	0.3150	0.2209	0.1428	0.0860
r42	-0.0053	0.6093	0.0350	0.1555	-0.0479	-0.4428	0.0209	-0.2251	0.4761	-0.2162	0.5505	0.1633	0.2481	0.0231	0.5783