Do Efforts to Raise Tax Revenues Accelerate Capital Flight ? The Experience of African Countries

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Abstract

This article examines the impact of tax revenue mobilization on capital flight in 30 African countries, focusing on the role of natural resources. Over the period 1998-2018, the econometric analysis is based on the dynamic generalized method of moments (GMM) and the main results of the study suggest that tax revenue mobilization reduces capital flight in Africa. However, when countries have more natural or oil resources, the negative impact of tax revenues on capital flight weakens. So, despite the importance of the benefits associated with natural resource wealth or, in particular, oil wealth, their presence compromises the impact of tax revenue mobilization on stemming capital flight. Finally, greater responsibility in the management of natural resources and more transparent reporting by companies operating in this sector are needed.

Keywords : Capital flight ; Residual method ; Natural resources ; Tax revenues ; GMM.
JEL Classification Codes : C23, E6, F32.

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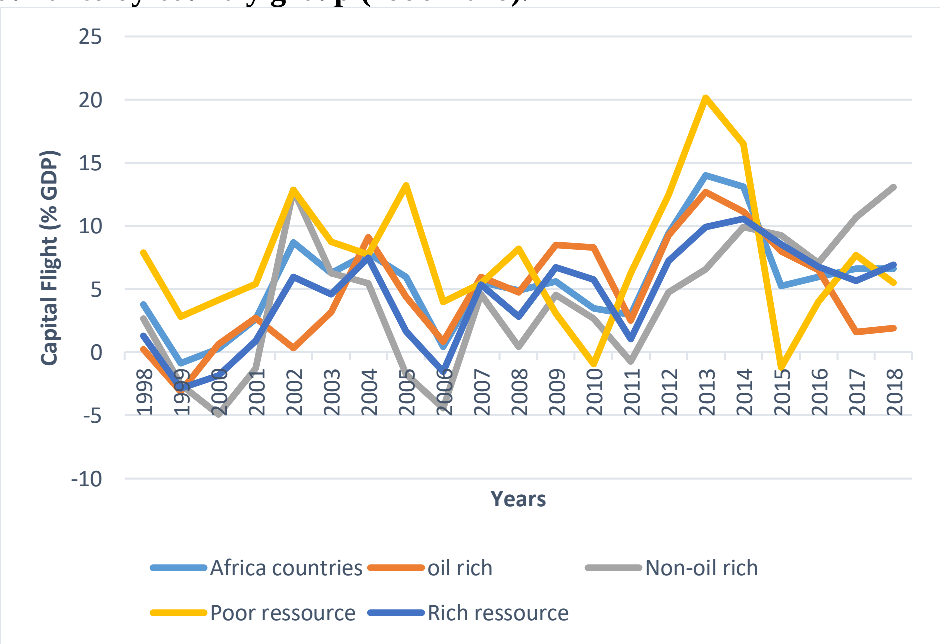
1 Introduction

Public resource mobilization is an important and indispensable strategy for the implementation of public services, investment policies, poverty reduction and economic growth (Culpeper & Bhushan, 2010). However, the acceleration of public revenue mobilization is intensifying at a time of increasing capital flight (Ndikumana et al., 2014). Despite the performance of African economies in terms of tax collection, most of them do not have sufficient savings to finance their investments. Their economies are therefore forced to depend on official development assistance, which is steadily decreasing due to recurring crises.

The literature points out that the discovery of a natural resource in an economy tends to attract the attention of several interest groups in the national economy and beyond (Tornell & Lane, 1998). In this respect, all the evidence suggests that most resource-rich African countries are experiencing high levels of poverty and are lagging behind in terms of development objectives, notably access to social services such as health, education, water and sanitation, compared with resource-poor countries (Sachs & Warner, 1997; Stijns, 2005). This situation raises serious concerns about the benefits to be derived from natural resources. In the 1960s and 1970s, resource-rich African countries far outstripped other African countries, achieving around twice the per capita income. Since then, most resource-rich countries have tended to underperform, and the benefits of natural resource wealth have evaporated. Today, in Africa, there is virtually no difference in income between resource-rich and resource-poor countries.

Figure 1: Evolution of the ratio of capital flight to gross domestic product (GDP) in 30 African countries by country group (1998-2018).

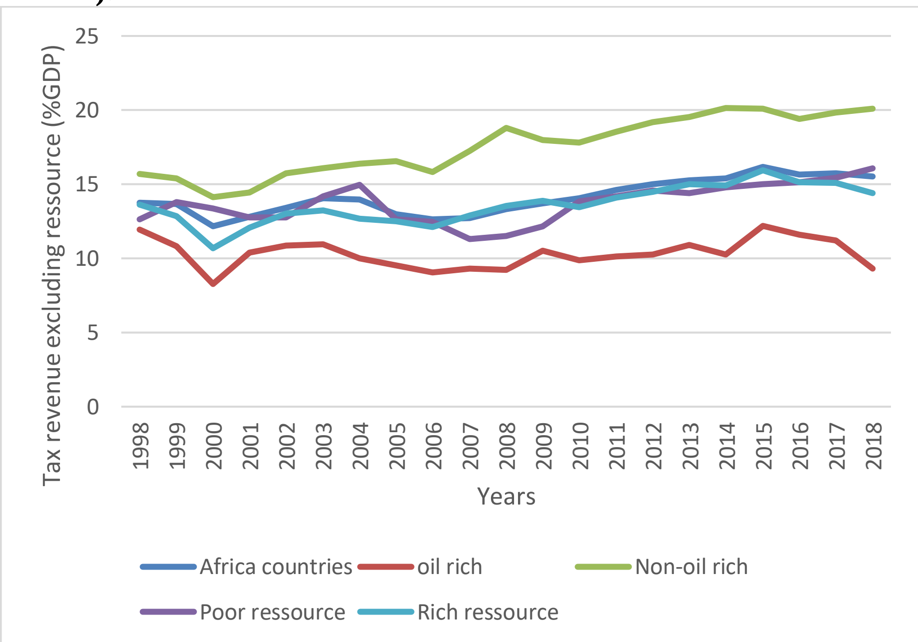


Source: Authors' calculations (2022)

A vast body of economic literature suggests that resource-rich countries perform no better in terms of social and economic development than countries less well endowed with natural resources (Ross, 2015). On the contrary, natural resource wealth is associated with more corruption (Brollo, 2013), less democracy (Andersen and Aslaksen, 2013) and a higher likelihood of violent conflict (Collier and Hoeffler, 1998). In many African countries, the natural resources sector is the main export vehicle that allows dictators, corrupt leaders and rogue agents to use tax evasion, transfer pricing and anonymous corporate ownership to maximize their profits, while millions of Africans are deprived of nutrition, health and education.

In recent decades, 30 African countries have experienced massive outflows of private capital to Western financial centers (see figure 3 in appendix). Ndikumana and Boyce, (2019) reported that between 1970 and 2018, capital flows from developing countries amounted to around $2,010.8 billion (or 93.8% of GDP). However, a high endowment of natural resources and a high predominance of natural resources in total exports and government revenues expose a country to a high risk of capital flight due to corruption associated with a high concentration of power. This scenario is also a symptom of weak institutions in general and poor governance of the natural resources sector in particular. For example, after the discovery of large oil reserves in Nigeria in 1965, the country was worse off than before the discovery, with GDP per capita falling from $1,113 in 1965 to $1,084 in 2000. Furthermore, according to Sala-i-Martin and Subramanian (2013), the percentage of people living in poverty rose from 36% in 1965 to almost 70% in 2000. The resource curse is seen as inevitable in other African countries such as Angola and the Democratic Republic of Congo.

Figure 2: Evolution of non-resource tax revenues in 30 African countries by country group (1998-2018).



Source: Authors' calculations (2022)

The ratio of average real capital flight to gross domestic product (GDP) in Africa was 5.6% between 1998 and 2018 (see Figure 1). Over this period, the ratio of average real capital flight to GDP for resource-poor countries stood at 7.3%, compared with 4.4% for resource-rich countries. However, resource-rich countries had a higher volume of real capital flight ($1,063.16 billion) than their resource-poor counterparts ($82.64 billion). Among resource-rich countries, the rate of non-resource tax revenue in non-oil-rich countries stood at 17.6% versus 10.3% in oil-rich countries between 1998 and 2018 (see figure 2). However, this phenomenon can be explained by the fact that a country that is highly endowed with natural resources, but less dependent on them (with a diversified economy) faces a relatively lower risk of capital flight (Figure 1) and will therefore fare relatively better in terms of public revenue collection.
The natural resources sector is the main issue in many African countries. Governments must strive to collect as much revenue as possible from the considerable profits generated, while

striving to minimize capital outflows. Consequently, they need to do more to diversify their economies and avoid economic growth driven solely by these natural resources. For example, preventing capital flight from the resource sector would contribute to the development of a national financial system, with its attendant development benefits. This, in turn, would contribute to the financing of other non-resource sectors, with positive spin-offs for public revenues in general.

The main argument in favor of tax revenue mobilization is that global economic crises could reduce flows of official development assistance and therefore have a greater impact on African economies. This could encourage citizens to hold their wealth abroad, where they feel safer. However, studies have shown that developing countries are more sensitive to global financial shocks resulting from financial liberalization, which invariably leads to increased capital flight (Pradan & Hiremath, 2017). In response to this gap in the literature, and in an effort to provide new and distinctive evidence, the aim of this study is to examine the impact of tax revenue mobilization on capital flight in selected African countries, while focusing on natural resources. In addition, based on the ensuing discussion, two empirical questions arise. Firstly, what is the impact of tax revenue mobilization on capital flight? In other words, what explains capital flight, and to what extent does tax revenue mobilization affect capital flight? Secondly, does natural resource endowment mitigate the impact of tax revenue mobilization on capital flight? Given that resource-rich countries tend to be both zones of armed conflict and political instability, and therefore important sources of capital flight.

In light of the above, it is somewhat surprising that existing studies on tax revenue mobilization have not yet explored its impact on capital flight through the role of natural resources. This, then, is the primary motivation for this study, and three main contributions flow from it. Firstly, the study adds to the existing literature on the determinants of capital flight, as it complements previous studies, such as Salisu and Isah (2021) by incorporating tax revenue mobilization in the presence of natural resources and extending the range of data to a more recent one provided by Ndikumana and Boyce (2018). To our knowledge, this is the first study along these lines. Second, the study extends the trajectory of existing studies and uses a recent econometric methodology on thirty (30) African countries, thus providing a guiding framework for policymakers in the debate and formulation of policies regarding tax revenue mobilization in Africa. Third, we provide empirical evidence of the disparity in policies in terms of tackling capital flight between resource-rich and resource-poor countries in Africa.

The rest of the paper is structured accordingly. Section 2 presents a review of the relevant literature on tax revenues, natural resources and capital flight. In section 3 the methodology and data used are presented. Next, we present the analysis and discussion of the empirical results in Section 4. Section 5 provides the conclusion and policy implications arising from the analysis.

2 Empirical literature on capital flight, tax revenues and natural resources

Capital flight is determined by a set of variables. Since the pioneering work of Cuddington 1986; Dooley 1988 and Pastor 1990 various studies have identified the structural factors determining capital flight (Raheem, 2015). These empirical studies have explored the factors that are likely to affect capital flight, both within a developing country and across country groups.

Investment diversion theory states that two factors cause capital flight, namely macroeconomic and political uncertainties in developing countries and the existence of better investment opportunities and a stable political and economic environment in developed countries (Ajayi, 1995). Better investment opportunities are due to high returns on foreign investments, a variety of financial instruments in which to invest, political and economic stability, a favorable tax system (i.e., lower taxes or tax exemption), and the hiding of accounts in tax haven countries. The favorable tax climate argument seems to suggest that countries would be better off, in terms of capital flows, if they had oriented their tax policy towards a system of lower taxes or even tax exemption.

However, Muchai and Muchai (2016) warned that reducing taxes and offering tax incentives in order to attract or retain capital causes market distortions and tax favoritism, which in turn leads to further capital losses. What is more aggravating is that on the eve of an increase in tax breaks, international investors repatriate their funds to regions with favorable tax regimes. In effect, they avoid paying high taxes and thus contribute to capital flight from a country. For example, Schineller (1997) finds, for a sample of 18 developing countries over the period 1978-1988, that low taxes contribute to low capital flight. Loungani and Mauro (2000) find that high capital flight from Russia, Central Europe, the Baltic States and Latin America is significantly associated with high taxation. Hermes and Lensink (2002) also find a positive relationship between capital flight and uncertainty about government tax policy for a sample of 84 developing countries. Cardoso and Dornbush (1989) find that capital flight is explained by the desire of residents to avoid local taxation. According to Onwioduokit (2001), most residents, anticipating higher taxes, shift their investments abroad. In the event of a large budget deficit, domestic investors have an incentive to move their capital abroad to avoid the risk of higher future taxation. This is because a large budget deficit today should increase future taxes. This is complemented by the work of several researchers (Schineller, 1997; Loungani and Mauro, 2000), who have found a positive effect of budget deficit uncertainty on capital flight.

Furthermore, the relationship between natural resources and capital flight has received particular attention in recent years. Firstly, corruption in natural resource management is a development problem rather than an isolated one (Kolstad and Soreide, 2009). High revenues from natural resources lead to rent-seeking and embezzlement by corrupt political and administrative elites and decision-makers, who typically deposit embezzled funds in foreign accounts. Secondly, the natural resources sector is generally managed by multinationals and local companies whose technological and financial processes are highly complex. As a result, they tend not to declare actual sales figures to the authorities and take advantage of opportunities for false invoicing (Ndikumana et al., 2014). At the same time, by bribing decision-makers, they award lucrative contracts and practice tax evasion (Mpenya et al., 2016). The misinvoicing of oil, gas and mineral exports is an important channel in the relationship between capital flight and natural resources. For example, using a sample of 30 African countries over the period 1970-2015, Ndikumana and Sarr (2019) examined the triangular relationship between foreign direct investment, capital flight and natural resource rents.

Thirdly, the complexity of the technological and financial processes involved in exploiting natural resources creates an imbalance in terms of expertise and technical capacity between the governments of resource-rich developing countries and multinational companies. This creates opportunities for export under-invoicing, export smuggling and other forms of unrecorded outflows of resources from countries. Econometric evidence on the link between capital flight and natural resources remains mixed. While studies assessing capital flight from developing countries show that resource-rich countries top the list of countries with the highest capital flight (Ndikumana and Sarr, 2019; Ndikumana and Boyce, 2010), robust econometric evidence of a direct impact of natural resources on capital flight is relatively scarce.

3 Econometric methodology and model specification

The estimation of capital flight, the methodology to be adopted, the data and the econometric model used are presented in the following three subsections respectively.

3.1 Estimating capital flight

Despite the substantial literature in recent years, there is no common measure of capital flight (Hermes et al., 2002; Ndikumana et al., 2014). The existing literature has proposed four main methods (the residual method; the Dooley method[1]; the trade misinvoicing method; and the hot money method) for estimating capital flight. The residual method remains the most widely used measurement method in the capital flight literature because it relies on commonly available data and is simple to implement (Ndikumana and Boyce, 2010). Therefore, indirect methods are used to calculate capital flight (Schneider, 2003):

$$FKR_{it} = CDEBTADJ + FDI + PI + OI - (CC + RES) + MISINV \quad (1)$$

Where CDEBTADJ is the change in outstanding external debt adjusted for exchange rate fluctuations, debt forgiveness, and the change in interest arrears; FDI is net foreign direct investment, PI is portfolio investment, OI is other investment, CC is the current account deficit, RES is net additions to foreign reserves, and MISINV is net trade misinvoicing. In addition, the Morgan Guaranty (1986) measure can be written as follows:

$$MG_{it} = CDEBTADJ + FDI + PI + OI - (CC + RES) + MISINV - ABD_{it} \quad (2)$$

Where MG equals the private claim measure for capital flight (Morgan Guaranty's 1986 measure); ABD equals the foreign short-term assets of the banking system.

3.2 Model specification for empirical estimation

Based on the above statement, we specify a mathematical model as follows:

$$FKR_{it-1} = f(FKR_{it-2}, TNR_{it-1}, RENT_{it-1,} TNR_{it-1} * RENT_{it-1}, \nabla GDP_{it-1}, INF_{it-1}, DEBT_{it-1,} OPEN_{it-1}, CC_{it-1} \quad (3)$$

Where i = 1,2 ... 30 is the individual (country) dimension and t = 1998 ... 2018, the time dimension. The main objective of this study is to explore the impact of tax revenue mobilization on capital flight through the natural resource channel. The empirical model used draws on the work of authors such as Ndikumana and Boyce (2010).

The dependent variable FKR denotes the volume of capital flight as a percentage of GDP where α is a constant, it is explained by a set.of variable, FKR_{t-1} represents past capital flight, TNR represents total non-resource tax revenue as a percentage of GDP (our variable of interest) and natural resources are measured by the rent they generate. Thus, RENT is total natural resource rents as a percentage of GDP. We used control variables such as ΔGDP which represents the real GDP growth rate for country i at period t, INF represents the inflation rate measured by the annual change in the consumer price index in country i at period t, DEBT represents the external debt in country i at period t. OPEN is the degree of openness of country i at period t, and CC is the institutional variable of the quality of institutions measured by the control of corruption,

[1] The residual method (World Bank, 1985; Morgan Guaranty, 1986); the Dooley method (Dooley, 1986); the commercial misinvoicing method (Bhagwati, 1964); and the hot money method (Cuddington, 1986).

which takes values ranging from -2.5 (lowest corruption) to 2.5 (highest corruption) in country i at period t. Among other things, we have decomposed[2] total resource rents into oil (OIL), gas (GAS), coal (COAL) and forest (FOREST) rents, as different types of natural resources can have a different impact on capital flight (Ndikumana and Sarr, 2019; Ndikumana and Boyce, 2010). Hese control[3] variables are included to avoid omitted variable bias. The equation to be estimated takes the form of a simple linear regression as follows:

$$FKR_{it-1} = \alpha_0 + \delta_1 FKR_{it-1} + \delta_2 TNR_{it} + \delta_3 RENT_{it} + \delta_4 TNR_{it} * RENT_{it} + \delta_5 \nabla GDP_{it} + \delta_6 INF_{it} + \delta_7 DEBT_{it} + \delta_8 OPEN_{it} + \delta_9 CC_{it} + \vartheta_i + \varepsilon_i \quad (4)$$

Where ϑ is an individual time-invariant fixed effect and ε is a set of unobservable factors.
One of the objectives of this study is to test whether tax revenue mobilization can impact capital flight through natural resources. We therefore include the interaction of tax revenues with natural resource rents, as shown in equation (4). Then, differentiating equation (4) with respect to tax revenue (TNR_{it}), we obtain the following :

$$\frac{\partial(FKR_{it})}{\partial(TNR_{it})} = \delta_2 + \delta_4 RENT_{it} \quad (5)$$

δ2 and δ4 capture the extent to which the natural resource in tax revenue mobilization countries enhances the impact on capital flight. The introduction of the interaction term means that the impact of tax revenue mobilization on capital flight should be treated as a marginal effect in such a specification (Asongu and Nwachukwu 2016).

3.3 Econometric method

The empirical literature proposes a number of approaches for estimating a dynamic panel data model with assumed endogeneity problems. To efficiently estimate the dynamic model formulated above, we use the Generalized Method of Moments (GMM) estimation approach (Arellano and Bond, 1995). To overcome the problems of endogeneity, simultaneity, autocorrelation and heterogeneity of our data. We adopted the endogeneity-resistant GMM estimator, which is an extension of the method of Arellano and Bover (1995) and Blundell and Bond (1998) and is available as xtabond2 in Stata. Blundell and Bond (1998) have shown that the GMM estimator produces dramatic efficiency gains over GMM in first base difference (Baltagi, 2013).

4 Data sources and variable definitions

4.1 Data Sources

The analysis based on balanced panel methods spans 20 years (1998 to 2018) and covers 30 African countries. The scope is determined by data availability, in particular the institutional variable of corruption control. Data on capital flight (real, in millions, constant value in 2018 dollars) were extracted from the Capital Flight Series calculated by Ndikumana and Boyce (2018) of the Political Economy Research Institute, University of Massachusetts, Amherst, and available free of charge at https ://www.peri.umass.edu/capital-fightfrom-africa. Data to be known on total natural resource rents (oil rents, natural gas rents, coal rents, forestry rents) as

[2] We were unable to include resources from minerals due to data limitations. We have included forestry resources because they are considered an integral part of World Bank data. However, the IMF also found that, on average, effective taxation in the mining sector was significantly lower than in the oil and gas sectors.

[3] Depending on the time horizon of the study, Asongu and Nwachukwu (2016) caution against using more than five control variables as this would lead to biases in the estimated coefficients due to the proliferation of instruments.

well as inflation rate, GDP growth were extracted from the World Bank's World Development Indicators (WDI, 2021). The variable of interest, non-resource tax revenues as a percentage of GDP (NRT), was taken from the International Centre for Tax and Development's (ICTD) UNU-WIDER Government Revenue Dataset 2020. Corruption monitoring is also taken from the World Bank's Worldwide Governance Indicators (WGI). The STATA 15 statistical analysisis tool was used for the estimation procedures. Table A1 lists the countries used, and Table A2 gives a full description of the data set (see appendix).

4.2 Descriptive Analysis

Descriptive statistics for the 30 African countries over the sample period are presented in Table 1. The average ratio of non-resource tax revenues to GDP is around 14.16% in countries over the 1998-2018 period. This average share is below the minimum of 25% recommended by the World Bank and the International Monetary Fund (IMF). This suggests that tax revenue mobilization performance in Africa is still very weak. In 2018, the country with the lowest tax mobilization effort was Sudan at 7.407%, while Seychelles was the country with the highest effort at 37.668%.

Table 1: Summary statistics of variables

Variables	Obs	Mean	Std. dev.	Min.	Max.
FKR	623	5.70	16.171	-53.259	180.992
MG	624	-1.4199	38.900	-144.87	557.41
TNR	622	14.169	7.284	0.573	38.657
RENT	630	12.367	11.147	0.066	58.650
ΔGDP	630	4.488	4.292	-20.599	26.417
INF	630	11.641	33.269	-8.238	513.907
OPEN	630	63.774	36.587	16.141	225.023
DEBT	609	22.639	1.191	19.715	25.900
COAL	630	0.178	0.702	0	8.047
FOREST	630	5.449	6.372	0	40.409
GAS	628	0.307	0.779	0	4.399
OIL	630	5.321	10.957	0	55.458
CC	570	-0.619	0.5792	-1.723	1.217

Source: Authors' calculations (2022)

However, over the whole period, the minimum non-resource tax revenue is 0.573% for the Democratic Republic of Congo (a resource-rich country) and the maximum is 38.657% for the Seychelles. On average, capital flight is 5.701% of GDP. In real terms, this represents 1145.8 billion US dollars. Its maximum value is 180.992% of GDP for Sierra Leone, while its minimum value is a net capital inflow of around 53.259% of GDP for Malawi. Rents from natural resources represent an average of 12.36% of GDP. Their minimum share is that of the Seychelles (0.065%) and their maximum share that of the Republic of Congo (58.65% of GDP).

4.3 Correlation analysis

The correlation matrix in table 2 presents revealing results on the relationship between tax revenue (the dependent variable) and each of the explanatory variables, as well as between the explanatory variables to mitigate potential problems of multicollinearity. We find that capital flight is positively correlated with all the variables in Table 2 (but significantly so with tax revenue, economic growth rate, and degree of openness). On the other hand, there is a possibility of multicollinearity between natural resource rents and oil rents, which is due to the fact that the measures give very similar estimates.

Table 2: Correlation matrix

	FKR	MG	TNR	RENT	ΔGDP	INF	OPEN	DEBT	COAL	FOREST	GAS	OIL	CC
FKR	1.00												
MG	0.5459*	1.00											
TNR	0.048	-0.1403*	1.00										
RENT	0.087*	0.0652	-0.445*	1.00									
ΔGDP	0.107*	0.0262	-0.111*	0.012	1.00								
INF	-0.042	-0.0157	-0.219*	0.143*	-0.103*	1.00							
OPEN	0.191*	-0.0277	0.445*	0.138*	-0.116*	-0.067	1.00						
DEBT	-0.104*	-0.0551	0.187*	-0.082*	-0.046	0.039	0.087*	1.00					
COAL	-0.002	0.0293	0.313*	-0.092*	-0.154*	-0.047	0.074	0.255*	1.00				
FOREST	0.063	0.2056*	-0.304*	0.296*	0.051	0.102*	-0.353*	-0.396*	-0.088*	1.00			
GAS	-0.008	-0.1783*	-0.015	0.200*	-0.01	-0.055	0.084*	0.214*	0.079*	-0.187*	1.00		
OIL	0.069	-0.0394	-0.304*	0.810*	-0.017	0.103*	0.303*	0.137*	-0.122*	-0.260*	0.273*	1.00	
CC	0.008	-0.2126*	0.628*	-0.455*	0.033	-0.153*	0.267*	-0.114*	0.131*	-0.255*	-0.074	-0.323*	1.00

Note : *** Significance at 1% level, ** Significance at 5% level, * Significance at 10% level.

5 Results and Discussion

5.1 Main result

In the light of the aforementioned criteria for the GMM estimator, the majority of the models used in this study are valid, as they meet three conditions. The Arellano and Bond difference autocorrelation test (AR 2), which assumes that the model does not suffer from the autocorrelation problem in the residuals, is not rejected. Secondly, the over-identifying restriction (OIR) tests based on Sargan and Hansen with the null hypotheses of instrument validity or absence of correlation with error are also not rejected. Finally, the exogeneity test for instruments anchored on Hansen's difference test (DHT) is also used to examine the validity of Hansen's test results. From this point of view, it is fundamental to mention that to ensure model persistence, the lagged values of the dependent variable must be significant and satisfy the convergence criterion. The convergence criterion is based on the argument that the absolute value of the lagged estimated capital flight indicators must lie in the interval zero and one. The detailed intuitions describing this criterion are well advanced in the existing related literature using the GMM estimator (Asongu, 2013).

Table 3 presents the impact of tax revenues on capital flight using the World Bank methodology, while examining the role of natural resources. Our estimation results indicate that an increase in non-resource tax revenues is associated with a decrease in capital flight. Regression results suggest that a 1% increase in non-resource tax revenues is associated with a 0.4022% to 3.378% decrease in capital flight in the same year. Tax revenues have a negative impact on capital flight, even though non-resource tax revenues are low in Africa and the effect is not statistically significant in the forest and natural gas models. Also, the total rent from natural resources or oil resources is associated with a reduction in capital flight. The impact of the ratio of total natural resource rent to GDP is negative and statistically significant at the 5% level in all regressions.

Table 3: GMM estimate of the tax revenue mobilization system on capital flight (FKR) using the World Bank method.

Variable	Dependent variable: FKR				
	Model 1 RENT	Model 2 OIL	Model 3 FOREST	Model 4 GAS	Model 5 COAL
L.FKR	0.245***	0.192***	0.283***	0.209***	0.229***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TNR	-3.378*	-4.023***	-0.869	-1.217	3.044***
	(0.032)	(0.007)	(0.609)	(0.482)	(0.001)
RENT	-0.994**				
	(0.018)				
OIL		-1.634***			
		(0.001)			
FOREST			0.636		
			(0.380)		
GAS				-16.984**	
				(0.016)	
COAL					28.489***
					(0.000)
TNR*RENT	0.065	0.136***	0.023	1.129***	-0.801***
	(0.127)	(0.003)	(0.647)	(0.000)	(0.000)
ΔGDP	1.091***	0.860**	0.772*	1.449***	0.849*
	(0.002)	(0.019)	(0.021)	(0.000)	(0.038)
INF	-0.075***	-0.033*	-0.044	-0.045**	-0.09***
	(0.001)	(0.052)	(0.125)	(0.004)	(0.000)
OPEN	-0.174**	-0.048	-0.385***	-0.262***	-0.304***
	(0.016)	(0.547)	(0.000)	(0.000)	(0.007)
DEBT	-2.486	0.097	-0.002	0.594	-5.363***
	(0.131)	(0.956)	(0.999)	(0.773)	(0.000)
CC	-1.968	0.723	0.630	3.299*	-8.404***
	(0.583)	(0.700)	(0.763)	(0.085)	(0.002)
_cons	98.033***	39.793	27.300	17.916	107.904***
	(0.002)	(0.321)	(0.388)	(0.681)	(0.002)
AR(1)	0.000	0.002	0.001	0.001	0.002
AR(2)	0.823	0.999	0.867	0.994	0.966
Sargan OIR	0.042	0.017	0.143	0.549	0.309
Hansen OIR	0.435	0.222	0.294	0.407	0.290
Dif(null, H=exogenous)	0.706	0.652	0.582	0.293	0.721
(b) IV (years, eq(dif))	0.338	0.375	0.315	0.648	0.466
Dif(null, H=exogenous	0.559	0.157	0.328	0.167	0.171
Fisher	3871.5***	320.58	595.70	337.65	1999.53***
Instruments	29	29	29	29	29
Country	29	29	29	29	29
Observation	492	492	492	490	492

Note: Numbers in parentheses () are standard errors (SEs). *** Significance at 1% level, ** Significance at 5% level, * Significance at 10% level. (a) estimated parameters and F-statistics and (b) failure to reject the null hypotheses of: (i) the absence of autocorrelation in the AR (2) tests and; (ii) the validity of the instruments in the Sargan OIR test. **Source:** Authors' calculations (2022)

Contrary to intuition, a proportional increase in the disaggregated components of total natural resource rents such as oil, forest and natural gas reduces capital flight by 1.633%, 0.636% and 16.98% respectively. This result does not corroborate the findings of some previous work (Kwaramba, Mahonye, & Mandishara, 2016; Ndikumana & Sarr, 2019). On the other hand, it is also interesting to note that the regressions including coal-related rent turn out to be statistically significant and positive. However, the lagged value of the dependent variable is, on the contrary, positively related to capital flight.

Overall, the main results in Table 3 reveal that when total resource/oil rents are non-zero, the impact of non-resource tax revenues on capital flight weakens (becomes less negative and sometimes positive) for countries with more resource or oil rents. It should be noted that the positive interaction term is only significant in the case of oil resources. This means that as African countries' non-resource tax revenues increase, capital flight intensifies as countries exploit or dispose of more natural resources. The result of total resource rents is similar to the result of oil, gas and forestry rents. In the coal rent regressions, the results are counter-intuitive - the coefficient of the interaction term is negative and significant. Furthermore, these results suggest that the instantaneous impact of resource rents on capital flight depends on the type of natural resources exploited.

We take into account all levels of significance to draw the following conclusions. First, capital flight increases systematically with economic growth in the majority of specifications. Developing countries are known to have high growth volatility (Sheng, 2010), which has important implications for various macroeconomic factors (Lin & Kim, 2014).

On the other hand, the model results also suggest that the coefficient on inflation is negative and statistically significant at the 5% level in the regressions. Secondly, the coefficient of the trade openness variable is, in most specifications, negative and statistically significant, suggesting that capital flight decreases with trade openness. Asongu et al, (2019) pointed out that there is no confirmed expected effect of exporting, and trade openness in general, on capital flight because its impact depends on whether it is limited to a few sectors of the economy or generalized. With regard to external debt, our results are generally consistent with the literature, with capital flight increasing with external debt, but in most regressions the coefficients are not statistically significant. Finally, the coefficient on corruption control is negative and statistically significant at the 10% significance level in model 5 in Table 3, indicating that these highly corrupt African economies tend to experience more capital flight. This result is consistent with the empirical findings reported by Le and Rishi (2006).

The impacts of non-resource tax revenues on capital flight using the Morgan Guaranty method through the role of natural resource rents are presented in Table 4. The results are almost identical to the previous ones. Thus, in all four regressions, the estimated coefficients on lagged capital flight are positive and statistically significant. Similarly, the empirical results in Table 4 reveal negative and statistically significant impacts of total natural resource rents on capital flight. Thus, the oil rent component reduces capital flight, so that a percentage increase in oil and natural gas rents reduces capital flight by 1.478% and 19.347% in that order, with an opposite result (an increase) for coal rent of 25.781%. Non-resource tax revenues show a direct and statistically significant relationship on capital flight, implying that an increase in non-resource tax revenues leads to a decrease in capital flight.

As the results in Table 4 show, the interaction of non-resource tax revenues and rents from natural/petroleum resources, with the exception of coal, are positive and statistically significant.

The economic intuition that can be drawn from this result suggests that, as African countries' non-resource tax revenues increase, capital flight intensifies as countries exploit or dispose of more natural resources. This result is in line with existing studies (Ndikumana and Sarr, 2019; Mpenya et al., 2016; Kwaramba et al., 2016; Ndikumana and Boyce, 2010) and attributes this phenomenon to numerous mechanisms such as rent-seeking, corruption, tax evasion and trade misinvoicing. African countries are endowed with large and varied natural resources and have profited abundantly from them. However, some of these rents appear to be illegally transferred abroad in the form of capital flight, although the sectors are strictly state rather than market controlled.

As for the other control variables, they are significant in most models, but differ in magnitude and sign. The estimated coefficients are not as satisfactory and are consistent with previous results.

Table 4: GMM estimation of the tax revenue mobilization system on capital flight (MG) using the Morgan Guaranty method.

Variable	Dependent variable: MG				
	Model 1 RENT	Model 2 OIL	Model 3 FOREST	Model 4 GAS	Model 5 COAL
L.MG	0.315***	0.209***	0.281***	0.246***	0.284***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TNR	-6.169**	-4.473***	-1.869	-1.739	2.411*
	(0.011)	(0.003)	(0.401)	(0.371)	(0.048)
RENT	-1.721***				
	(0.003)				
OIL		-1.478***			
		(0.003)			
FOREST			-0.365		
			(0.696)		
GAS				-19.347**	
				(0.011)	
COAL					25.781***
					(0.001)
TNR*RENT	0.113*	0.095*	1.983***	1.058***	-0.713***
	(0.035)	(0.046)	(0.000)	(0.001)	(0.000)
ΔGDP	0.831**	1.068***	1.983***	1.832***	1.429***
	(0.012)	(0.000)	(0.000)	(0.000)	(0.002)
INF	-0.091***	-0.042***	-0.068*	-0.038**	-0.083***
	(0.000)	(0.008)	(0.039)	(0.017)	(0.000)
OPEN	0.133	0.008	-0.602***	-0.154	-0.235
	(0.279)	(0.944)	(0.002)	(0.117)	(0.135)
DEBT	1.007	3.837	6.813**	1.938	0.728
	(0.741)	(0.184)	(0.014)	(0.207)	(0.696)
CC	-4.902	-6.784***	1.747	-6.098*	-9.463***
	(0.179)	(0.007)	(0.629)	(0.056)	(0.001)
_cons	23.345	-54.692	-116.338*	-29.163	-34.794
	(0.663)	(0.366)	(0.044)	(0.431)	(0.436)
AR(1)	0.002	0.005	0.003	0.005	0.010
AR(2)	0.673	0.911	0.563	0.901	0.787
Sargan OIR	0.063	0.012	0.062	0.254	0.055
Hansen OIR	0.353	0.385	0.329	0.333	0.311
H excluding group	0.339	0.255	0.487	0.648	0.141
Dif(null, H=exogenous)	0.393	0.554	0.237	0.158	0.647
(b) IV (years, eq(dif)) H	0.329	0.620	0.383	0.828	0.459
Dif(null, H=exogenous	0.415	0.165	0.298	0.050	0.200
Fisher	356.32	1606.57	430.49	1853.87	10360.99
Instruments	29	29	29	29	29
Country	29	29	29	29	29
Observation	492	492	492	490	492

Note: Numbers in parentheses () are standard errors (SEs). *** Significance at 1% level, ** Significance at 5% level, * Significance at 10% level. Note: (a) estimated parameters and F-statistics and (b) failure to reject the null hypotheses of: (i) the absence of autocorrelation in the AR(2) tests and; (ii) the validity of the instruments in the Sargan OIR test. **Source:** Authors' calculations (2022)

6 Conclusion and policy implications

This study examines the impact of tax revenue mobilization on capital flight via the conditioning role of natural resources in 30 African countries over the period 1998-2018. To facilitate the identification of the channel through which tax revenues influence capital flight, total natural resource rents and four rent-related natural resource components were used in a disaggregated manner (coal, natural gas, oil and forest resources). The empirical analysis uses the two-stage method of generalized moments. We find that non-resource tax revenues are negatively related to capital flight, and that tax revenue mobilization efforts are therefore associated with a reduction in capital flight. Similarly, we find a negative relationship between total rents from natural resources and capital flight. This conclusion does not apply to coal rents. However, the conditional impact between tax revenues and natural resources on the one hand, and its oil component on the other, presents positive and statistically significant coefficients. This suggests that when total resource/oil rents are non-zero, the impact of non-resource tax revenues on capital flight weakens for countries with more resource or oil rents.

The results of this study suggest that efforts to improve the quality of institutions and increase domestic investment returns alone will not enable governments to successfully tackle the problem of capital flight. More targeted strategies are needed to curb tax-induced capital flight. These include greater accountability of African governments in the management of natural resources, and greater transparency in the reporting of production, sales, profits and tax payments by companies operating in the natural resources sector. These results also imply the creation of a democratic environment linked to stronger governance institutions, reduced corruption and a better domestic investment climate. Finally, the promotion of good governance at all levels of the socio-economic sphere is necessary to improve tax citizenship and voluntary tax compliance, which are the levers for maximizing tax revenues and fiscal consolidation in developing countries.

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Appendices

Table A1: List of sampled countries in sub-saharan Africa.

	oil rich	non oil riche	poor ressource
Country	Cameroon	Botswana	Burkina Faso
	Gabon	Congo, Dem. Rep.	Burundi
	Ghana	Mauritania	Malawi
	Nigeria	Mozambique	Rwanda
	Congo, Rep.	Tanzania	Kenya
	Cote d'Ivoire	South Africa	Uganda
	Angola	Morocco	Zimbabwe
	Sudan	Tunisia	Madagascar
	Algeria	Zambia	Seychelles
	Egypt		Sierra Leone
	Ethiopia		

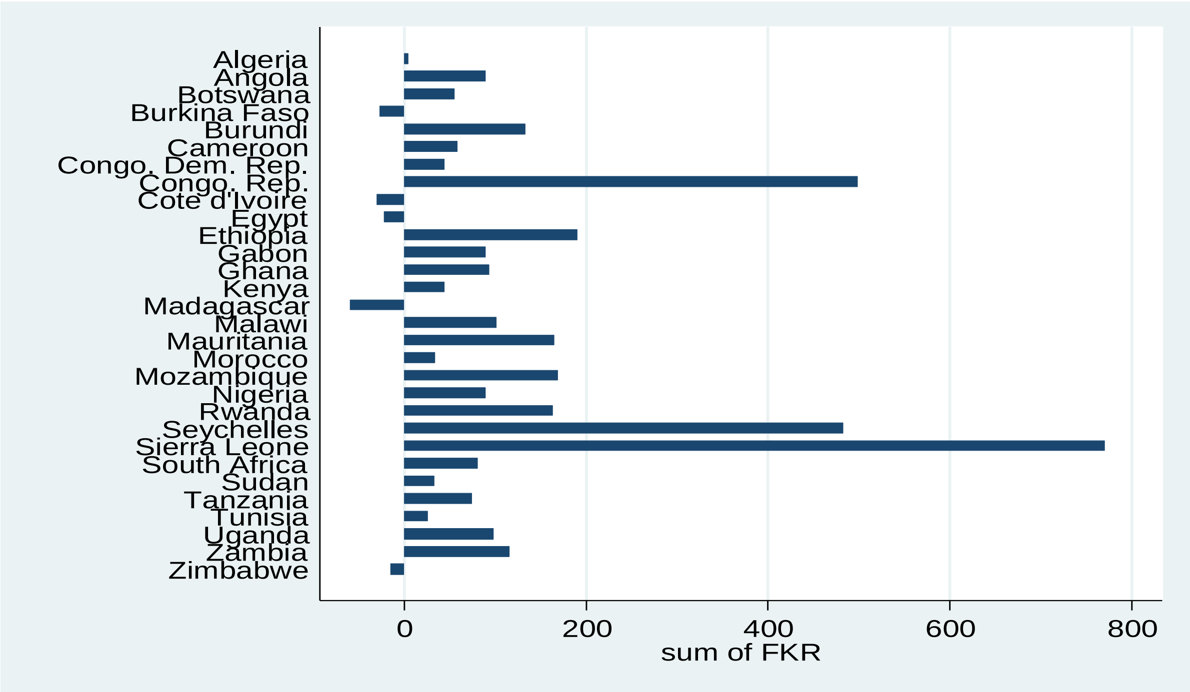
Note: Resource-rich countries are those whose average annual rents from natural resources (excluding forests) exceed 5% of GDP.

Table A2: Variable definitions

Variables	Signs	Définition	Sources
Economic growth	ΔGDP	GDP growth rate (annual %)	WDI (World Bank), 2021
Inflation	INF	Annual change in consumer price index index (CPI)	WDI (World Bank), 2021
Capital flight from Morgan Guaranty	MG	Where MG is equal to the measure of private claim for capital flight.	Author's calculation
Capital flight	FKR	Ratio of capital flight to GDP	Ndikumana et Boyce (2018)
Tax revenues	TR	Total non-resource revenues, including social contributions.	Government Revenue Dataset 2020
Natural resource rents	RENT	Total natural resource rents as a percentage of GDP	WDI (World Bank), 2021
Forest rents	FOREST	Forestry rents as a percentage of GDP	WDI (World Bank), 2021
Oil rents	OIL	Oil rents as a percentage of GDP	WDI (World Bank), 2021
Gas rents	GAS	Gas rents as a percentage of GDP	WDI (World Bank), 2021
Coal rents	COAL	Coal rents as a percentage of GDP	
Foreign debt	DEBT	Total external debt is measured as total outstanding external debt as a percentage of GDP.	WDI (World Bank), 2021
Corruption control	CC	perceptions of the degree to which public power is exercised for private ends, including minor and major forms of corruption, as well as the "capture" of the state by elites and private interests	WDI (World Bank), 2021

Note: WDI is a connotation for the World Bank Development Indicator data in the World Bank database.

Figure 3: Real capital flight of the 30 African countries over the period 1998-2018 according to the World Bank residual method. (% of GDP).



Source: Author based on data from Ndikumana and Boyce (2019)