Cross-Border Exchange of Information and Tax Revenue Mobilization in Africa

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Abstract

Tax evasion and avoidance generate distortions in tax systems and cause significant revenue losses for African economies. International cooperation is one of the most effective methods of combating tax evasion and tax avoidance. As such, many countries are participating in global initiatives toward the exchange of information between national administrations for tax purposes. This paper provides the first empirical evidence on the revenue effects of tax-related exchange of information for African countries. The regressions are carried out on a sample of 54 African countries on data from 1990–2020. The findings indicate that the exchange of information for tax purposes between national tax jurisdictions has a positive and statistically significant impact on tax revenue. The estimation results show that exchange of information could increase tax revenue collection by a magnitude ranging from 5 to 19 percent. These findings reiterate the importance of international cooperation for combating tax evasion and stimulating tax collection in Africa.

Cross-Border Exchange of Information and Tax Revenue Mobilization in Africa

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1. Introduction

Tax evasion and avoidance are particularly acute in African countries and deprive governments of significant revenues. The amount lost annually by Africa through illicit financial flows – much of it due to tax evasion – was thought to exceed USD 89 billion in 2020, or 3.7% of the continent's GDP (UNCTAD 2020). While monetary amounts are daunting amounts per se, they are even more so at a time when domestic resource mobilization has become crucial to face post-COVID-19 increased demands for social expenditure and higher debt loads.

The fiscal stress raised by the COVID-19 pandemic (Coulibaly, 2021), the conflict in Ukraine and climate change adaptation policies suggest that it is imperative for African countries to redouble efforts to increase domestic revenue mobilization (Coulibaly and Camara, 2022). The combat against tax evasion and tax avoidance through strengthened national regulation and increased international cooperation constitute one of the policy options to stimulate tax revenue mobilization (Johannesen and Zucman, 2014).

In fact, informational asymmetry between taxpayers and tax authorities creates opportunities for abuse of the tax system. Accordingly, international tax cooperation through exchange of information (EOI) between tax authorities is a powerful response to the issue, which allows tax authorities to reach out to offshore information sources (Johannesen and Zucman, 2014). The mere availability of information to tax authorities also carries a deterrent effect by reducing the risks of evasion. This in turn enhances public belief in the fairness of the tax system and thus strengthens the motives for tax compliance.

The exchange of information on request (EOIR) standard urges a tax authority to provide, on request, information to another tax authority that is relevant for that administration to investigate and enforce its tax laws. The automatic exchange of information (AEOI) standard requires financial institutions to report financial account information of non-residents to their tax authorities, who in turn automatically exchange this information with the tax authorities of the account holders' country of residence under the globally agreed Common Reporting Standard (CRS). This substantially improves the ability of tax authorities to detect tax evasion, including in cases where there was no initial indication of non-compliance. In terms of reform sequencing, EOIR comes before AEOI as the latter requires more sophisticated information security standards and capacity to handle more information.

As part of the package of EOI for stimulating self-tax compliance, some countries launched voluntary asset and income declaration before tax administrations activated EOI mechanisms,

an initiative that may stimulate tax collection. The impact of the implementation of AEOI has been tangible with around EUR 102 billion in additional tax revenue collected through voluntary compliance mechanisms and offshore investigations prior to the commencement of the first AEOI exchange; approximately 1 million individuals have come forward to disclose offshore assets worldwide (OECD 2019).[4] However, African tax administrations may not have fully exploited revenue potential from the cross-border exchange of information. This may be due to shortcomings in legal frameworks as in the case of Nigeria (Obanina 2016), or because of a lack of technical and human capacities for data mining and data analysis for tax audits (Hearson 2018). In addition, taxpayers may hide relevant information from cooperative external tax jurisdictions when they anticipate that these tax jurisdictions may share this information with a host country tax administration. Taxpayers could also shift their assets that they want to hide from a host tax jurisdiction engaged in the AEOI to tax jurisdictions that are not participating in the international exchange of information for tax purposes.

Empirically, Beer, Coehlo and Leduc (2019) note that deposits held in offshore jurisdictions decrease once countries engage with EOIR by 8% to 12% and drop by as much as 25% when AEOI is in place. Similarly, Casi, Spengel, and Stage (2020) observe a 11.5% drop in cross-border deposits held by OECD residents in tax havens that pass laws enshrining Common Reporting Standards. It is however unclear whether these effects translate into higher taxes, or simply accelerate other strategies of tax evasion. The fact that multinational enterprises or high net worth individuals can relocate and shift profits to non-cooperative tax jurisdictions could undermine the likely positive effect of the cross-border exchange of information between tax jurisdictions. Presumably however, greater cooperation would decrease the number of such non-cooperative jurisdictions and increase the risk of hiding assets.

Accordingly, the theoretical impact of cross-border exchange of information on tax revenue is somewhat ambiguous, suggesting undertaking an empirical evaluation to enrich policy discussion on the revenue effect of cross border exchange of information. Thus, to our knowledge, this paper is the first piece of work that provides empirical evidence on the impact of tax-related cross-border exchange of information on tax revenue for African economies.

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[4] The nature of such programs in the context of AEOI is not directly discussed in this paper. Literature suggests that they tend to be positive on the whole whether they are conducted in "surprise" or planned manner (Schmittdiel, 2018), including in Africa (Rukundo 2020). They are nonetheless subject to many caveats having a potential impact on their efficiency and overall cost-benefit ratio. They however remain linked to efforts made by countries in the framework of the CRS and worth investigating in subsequent research.

The rest of the paper is structured as follows: Section 2 presents the stylized facts on cross-border exchange of information (EOIR) for tax purposes in Africa. Section 3 contains the empirical analysis. Section 4 provides key results of our study in detail. In Section 5, we conclude.

2. Stylized facts on cross-border exchange of information (EOIR) for tax purposes in Africa

Cross-border exchange of information for tax purposes has been on the policy agenda since the 1920s, with the establishment of the first models of tax conventions regulating double taxation and exchanges between specific jurisdictions. It was however not until the end of the 1990s that a renewed impetus was found through the publication of the OECD of its report on harmful tax competition, underscoring the important and damaging extent of tax havens, and putting a focus on difficulties posed by mobile activities such as finance. In 2000, the Global Forum on Transparency and Exchange of Information for Tax Purposes (the Global Forum) was founded, publishing a list of 35 tax havens, also known as 'non-compliant jurisdictions.' With the advent of the financial crisis, the Global Forum saw a restructuring in 2009 and gained backing from the G20 to spearhead global coordination for cross-border exchange of information. In many ways, the Global Forum has become a receptacle for international tax cooperation on matters pertaining to tax evasion.[5]

A first mechanism sponsored by the Global Forum to this end is the EOIR Standard. Using this tool, tax administrations can make specific requests to other (foreign) administrations for information which can include accounting records, bank statements or information on the legal and beneficial ownership of assets and entities. From a legal standpoint, EOIR is based on the 'Multilateral Convention on Mutual Administrative Assistance in Tax Matters' (MAAC),[6] which has been taken up by a large number of financial centers (some communally referred to as 'tax havens'). Since it has been opened to non-OECD or non-Council of Europe countries, there has been a progressive uptake of the EOIR standard in Africa. In 2014, only 7 African countries had joined the MAAC, for a total of 38 requests sent and 279 received. In 2021, 22 countries had joined the MAAC with 592 requests sent and 618 received (figure 1). According

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[5] Challenges in international tax cooperation pertain to (i) tax avoidance and tax evasion, (ii) tax competition and (iii) inter-nation equity of taxation (Hearson 2018). The present paper focuses on the former, and somehow more specifically on tax evasion, as international cooperation mechanisms for tax evasion would fall under the purview of Base-Erosion and Profit Shift (BEPS) rules.

[6] The MAAC is only one of several instruments for EOIR, but by far the strongest as it has over 145 participating jurisdictions. EOIR can also be done through tax convention, EOI agreements, as well as through regional instruments (directives, etc.).

to the Global Forum, African countries identified more than USD 35.1 million in additional taxes due to EOIR in 2020, and USD 37.2 million in 2021 (OECD 2022).

A second step in information exchange is the AEOI standard. AEOI is not mutually exclusive of EOIR and requires the signing of an instrument called the 'Multilateral Competent Authority Agreement', which builds upon the MAAC. So far, 5 countries on the African continent have engaged with AEOI, two should do so in 2022, and two more are working on their first exchanges in the coming two years.[7] The AEOI Standard involves annual 'bulk' exchanges. It focuses on information on financial accounts in a pre-defined format and includes financial account details as well as specifics about the account holder (name, date of birth and importantly tax identification number).

Achieving AEOI standard and engaging in automatic exchanges is a rather complex matter as it requires confidentiality and data safeguard assurances, and robust legal frameworks to ensure data usage restrictions as well as alignment with CRS standards. Engaging in such an endeavor requires a certain degree of institutional strength and capacity of tax administrations. Tax literature does suggest that "first-best" solutions (from normative viewpoints of equity / efficiency) tend not to be inversely related to tax system simplicity (Kaplow, 1999; Krever, 2003; Gadžo & Klemenčić 2017). This is illustrated by the fact that so far only middle-income countries on the continent have either begun or are on their way to begin AEOI.

By setting global standards on information exchange, membership in the Global Forum is a key condition country engagement. More specifically regarding Africa, the Global Forum launched in 2017 the 'Africa Initiative' to help countries meet requirements for effective tax co-operation. Building political awareness, accompany new members through the core stages of information exchange (sign and ratify the required legal instruments, prepare a strategy on how to use EOI information, set-up EOI units etc.) and pave the way for AEOI have been at its core. Global Forum membership (GFM) is, in essence, a proxy for exchange of information intensity and the degree of (structured) international cooperation on tax matters.

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[7] Seychelles and South Africa in 2017, Mauritius in 2018, Ghana in 2019 and Nigeria in 2020. Kenya and Morocco are planning for 2022, Uganda for 2023, and Tunisia and Rwanda for 2024. Senegal is considering a date for the first exchange in the short-term.

Figure 1: EOI requests sent and received by African countries since 2014
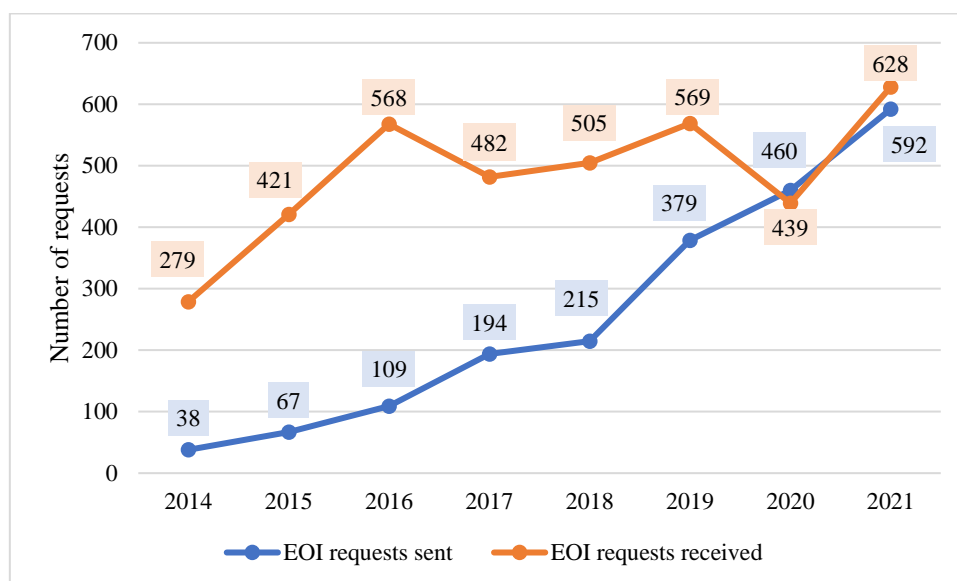
Note: The graph reflects the situation for the 34 African countries which have provided data. The 2020 data includes feedback from five new respondents who did not participate in last year's survey (Congo, Sierra Leone, Gambia, Zambia and Zimbabwe) but excludes feedback from three countries (Guinea-Bissau, Niger and Malawi) who participated in last year's survey but did not provide feedback for this year's survey.

Source: Tax Transparency in Africa 2022: Africa Initiative Progress Report, OECD (2021).

Figure 2 displays the average tax revenue as share of GDP in both groups of countries (GFM on the one hand and non-GFM members on the other). The graph shows that over the entire period 1990-2020, GFM membership countries performed better in tax revenue mobilization than the non-membership countries.

Figure 2: Tax revenue in percentage of GDP, membership vs non-membership of GFM
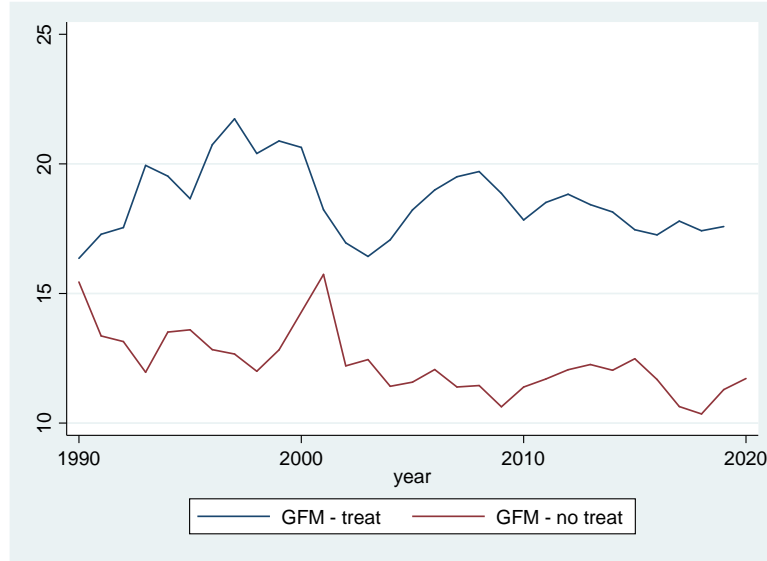
Source: Authors' using data from ICTD revenue database

3. Empirical analysis

3.1. Empirical model specification

Following the literature on tax revenue mobilization (Gnangnon and Brun, 2017; Gupta, 2007; Leuthold, 1991; Yogo and Njib, 2018), we specify a panel fixed effect model to estimate the impact of the Global Forum membership on tax revenue collection performance. Algebraically, the empirical model is specified as follows:

$$Tax_{it} = \delta GFM_{it} + \beta X_{it} + \vartheta_i + \mu_t + \varepsilon_{it} \quad (1)$$

where Tax_{it} represents the tax revenue in proportion of GDP for country i in year t. Data on the outcome variable (tax revenue) are extracted from the government revenue database (Prichard et al, 2014) developed by the International Center for Taxation and Development (ICTD).

GFM_{it} is a dummy variable which takes the value 1 in country i in year t if country i is a member of the Global Forum for the exchange of information for tax purposes and 0 otherwise.

X_{it} is the set of standard determinants of tax revenue including political, institutional, and economic variables.

ϑ_i is the country fixed effects; μ_t are time dummies, ε_{it} and the usual independent and identically distributed error term.

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In order to isolate the impact of Global Forum membership on tax collection, we include a large number of control variables in the baseline specification that affect both tax revenue and the likelihood of participating to the Global Forum initiative on exchange of information for tax purposes. These variables include GDP growth, official development assistance,digitalization, government effectiveness, trade openness, natural resources rents, and financial development (Ebeke, 2014; Gnangnon and Brun, 2017; Gupta, 2007; Kochanova et al, 2020, Leuthold, 1991; Yogo and Njib, 2018). Official development assistance is included to take into account the technical assistance and the support that development partners provide to countries to facilitate international tax cooperation.

In equation 1, the main interest is on coefficient δ, the coefficient of the variable GFM. Since participating in the Global Forum initiative is likely to stimulate tax collection performance mainly through reduction in tax evasion, we expect a positive sign for the coefficient δ.

3.2. Identification strategy

In the baseline empirical model (equation 1), the main variable of interest, namely the Global Forum membership, is potentially endogenous because of the existence of a potential reverse causality between tax revenue collection objectives and the Global Forum membership. In fact, countries wishing to increase tax revenue collection may participate in the Global Forum initiative (self-selection). In such circumstances, fixed effect ordinary least squares estimates for the coefficient of the variable *GFM* would be biased downwards.

Accordingly, in addition to panel fixed effect regression, as a robustness check, we rely on the propensity score matching technique to correct the selection bias in the participation in the Global Forum initiative (Guerguil et al., 2017; Sawadogo, 2020; Sawadogo and Wandaogo, 2021; Tapsoba, 2012). The methodology for propensity score matching is described in detail in the annex.

4. Results

4.1. Baseline specification estimates

We estimate the baseline specification (equation 1) using the fixed effects ordinary least squares estimator with Driscoll-Kraay standard errors. The estimation results indicate that the estimated coefficient of the dummy variable GFM taking the value 1 for the Global Forum membership

is positive and statistically significant at 5% (table 1). This result suggests that countries joining the Global Forum initiative for the exchange of information for tax purposes may experience an improvement in their tax collection performance.

This could be explained by the fact that Global Forum member countries benefit from an induction program whereby they receive support towards strengthening their technical and human capacities for conducting tax audits and detecting tax evasion, a factor that may stimulate tax collection. Another explanation for this result could be related to the fact that cross-border tax evaders of a host country that joins the Global Forum may reconsider their tax behavior towards better tax compliance. In fact, tax evaders may anticipate that the host country tax administration will detect their tax evasion practices thanks to the exchange of third-party information with other national tax jurisdictions. Accordingly, those tax evaders may improve their tax compliance behavior to avoid or at least to minimize sanctions and penalties when the tax administration will be in a position to detect irregularities with respect to fulfilling their tax obligations through the collaboration with other tax administrations.

Table 1: Information exchange for tax purposes and tax revenue mobilization

Tax revenue (%GDP)	
GFM	0.034**
	(0.014)
Official development assistance	-0.006
	(0.005)
Government effectiveness	0.076*
	(0.042)
GDP growth	0.003**
	(0.001)
Natural resources rents	-0.010***
	(0.001)
Trade openness	0.003***
	(0.001)
Financial development	0.005***
	(0.001)

Internet users	-0.002***
	(0.000)
Constant	2.426***
	(0.045)
Observations	356
Number of countries	32
R2	0.230

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The estimation results for the other control variables are in harmony with those of the literature on tax revenue mobilization in developing countries. As anticipated, we find that GDP growth, trade openness, financial development and government effectiveness increase tax revenue mobilization, while digitalization of the economy[8] and natural resources rents tend to impede tax revenue collection. In fact, greater reliance on resource revenue tends to reduce tax effort. According to Crivelli and Gupta (2014), natural resources can reduce incentives to invest in anti-corruption measures in favor of rent-seeking, leading to institutional weakening, which in turn affects the tax effort.

Regarding the digital economy, the negative effect could be explained by the fact that an increasingly digitized economy can offer new opportunities for fraud. Indeed, companies and individuals can take advantage of new technologies to hide sensitive information and evade taxes, thereby reducing domestic revenue mobilization.

4.2. Revenue impact of joining the Global Forum: Propensity score matching results

The fixed effects estimator (OLS) may yield biased estimates in the presence of selectivity among countries in joining the Global Forum. Following the literature on macroeconomic impact evaluation of policy reforms in developing countries, we use propensity score matching (PSM) as an alternative estimation method to address the potential self-selection bias in joining the Global Forum (Guerguil et al., 2017; Sawadogo, 2020; Sawadogo and Wandaogo, 2021; Tapsoba, 2012).

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[8] Internet penetration is here used as a proxy for digitization, i.e. for economic activity stemming from digital connections (e.g. e-commerce) which brings a key challenge in terms of taxation: the decoupling of economic and physical presence.

Propensity score matching (PSM) techniques test whether countries that joined the Global Forum experience better tax revenue performance compared to their pairs which that are not the Global Forum members, based on observable characteristics that are related to both joining the Global Forum and tax revenue. The standard determinants of tax revenue included in the baseline equation are considered as controls in the PSM estimations. The annex elaborates more on the estimation procedure of PSM techniques.

The average treatment effect on the treated (ATT) measures the revenue impact of joining the Global Forum based on the propensity scores (the results from the estimation of propensity score are reported and provided in the annex). The estimations pass the diagnostic tests for propensity score matching. The conditional independence assumption is not rejected at the conventional level of significance, the pseudo R2 is relatively low and the thresholds beyond which unobservable factors could affect the estimations (1.1) are relatively large compared to those found in the literature (Gerguil et al, 2014).

The results reported in table 2 indicate that ATTs are positive and statistically significant at 1%. These results suggest that joining the Global Forum for the exchange of information for tax purposes is likely to increase tax revenue. The magnitude of the revenue impact of joining the Global Forum is on average 0.08 for PSM estimation and 0,034 for fixed effects OLS estimation (table 1), suggesting that the PSM estimation corrected for the downwards bias in fixed effects OLS estimation. These results suggest that countries which join the Global Forum for exchanges between national tax administrations information for tax purposes may experience an increase in tax revenue collection by 5-19 percent of GDP (table 2).[9]

4.3. Matching results

Table 2 shows ATTs are positive and significant meaning that tax revenue increases when countries join the GFM. GFM adherence is a deterrent to potential evaders. Indeed, individuals will anticipate that with the country's adherence to the GFM, they will exchange information on illicit financial flows – prompting a degree of compliance. In some cases, voluntary compliance mechanisms may equally play a role.

As part of the robustness analysis, we control for a series of variables that are most likely to affect tax revenue in Africa to ensure that the PSM estimations do not suffer from the bias caused by the omission of a relevant explanatory variable. The good quality of institutions is

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[9] The values 0.05 and 0.19 correspond to the lowest and highest values of ATT in table 2, respectively.

crucial for the fight against tax evasion (Islam et al., 2020; Benkraiem et al. 2021). We take this consideration into account by including an institutional quality indicator in the baseline specification. Using corruption control as an institutional variable, estimation results show a positive coefficient suggesting that fighting corruption stimulates tax collection.

In addition, in the main equation (1), we control the impact of tax compliance[10] following the literature on tax revenue mobilization (De Paepe and Dickinson, 2014; Akitoby et al., 2020). The inclusion of an indicator of tax compliance among the explanatory variables enables to take into consideration the fact that the exchange of information for tax purpose initiatives in Africa has been generally implemented simultaneously with tax administration digitalization reforms (electronic filing and payment of taxes), a factor that may reduce compliance costs and thereby encourage tax payments. The estimation results indicate that the impacts of exchange of information for tax purposes are positive and statistically significant at the conventional significance levels (table 2). This suggests that the main results of the paper remain unchanged when we control for the impact of tax compliance costs.

More educated citizens can better understand how and why it is necessary to pay taxes. They are also more likely to be able to use digital tools for filing and paying taxes. We therefore control for the impact of human capital in the regression. The main results of the paper remain robust when human capital is included in the baseline tax equation (table 2).

We pursue our analysis by investigating the commitment to AEOI. Commitment to AEOI offers an opportunity to encourage disclosure, strengthen tax compliance, and consequently increase tax revenue collection. The main results of the paper remain unchanged when controlling for the impact of AEOI.

Furthermore, we control the effect of the exchanges of information actually carried out between the countries (the first exchange of information is considered). Preliminary results indicate significance when we take into account the limited number of exchanges of information. This result provides a signal that increasing exchanges of information would significantly boost tax revenues.

Following Ebeke (2014), we include remittance inflows in the regressions. The main results of the paper (positive impact of exchange of information on tax revenue) remain unchanged when remittances received are included in the regression.

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[10] The tax compliance indicator measures the costs incurred by taxpayers in complying with tax laws and regulations. It ranges from 1 to 7, with higher values indicating larger compliance costs.

Table 2: PSM estimates of the impact of Global Forum membership on tax revenue

	1st nearest	3rd nearest	Radious matching			Kernel matching	llr matching
			r=0.045	r=0.09	r=0.18		
			Dependent variable: Tax revenue in proportion of GDP				
ATT	0.094	0.102	0.086*	0.070	0.089**	0.083	0.083*
	(0.080)	(0.066)	(0.052)	(0.046)	(0.043)	(0.051)	(0.050)
			Quality of the matching				
Pseudo R2	0.030	0.013	0.007	0.009	0.015	0.008	0.030
Standardized bias (p-value)	0.425	0.882	0.976	0.954	0.820	0.967	0.425
Rosenbaum upper bound sensitivity test	1.1	1.1	1.1	1.1	1.1	1.1	1.1
			Sensitivity analysis of the main results				
ATT							
[1] Controlling for corruption	0.139	0.112	0.136*	0.129**	0.112**	0.131*	0.135*
	(0.093)	(0.082)	(0.071)	(0.060)	(0.050)	(0.071)	(0.074)
[2] Controlling for tax compliance	0.082	0.054	0.113**	0.068	0.089*	0.098*	0.073
	(0.078)	(0.067)	(0.056)	(0.052)	(0.049)	(0.057)	(0.067)
[3] Controlling for human capital	0.172*	0.118	0.111	0.124*	0.115**	0.120*	0.161**
	(0.091)	(0.082)	(0.069)	(0.067)	(0.058)	(0.068)	(0.068)
[4] Controlling for first exchange of information	0.125	0.119*	0.083	0.070	0.089**	0.079	0.084
	(0.076)	(0.068)	(0.055)	(0.049)	(0.044)	(0.051)	(0.054)
[5] Controlling for the commitment to the AEOI	0.071	0.086	0.079	0.066	0.089**	0.078	0.083
	(0.081)	(0.061)	(0.054)	(0.049)	(0.044)	(0.055)	(0.053)
[6] Controlling for remittances	0.090	0.059	0.060	0.085*	0.101**	0.070	0.075
	(0.080)	(0.064)	(0.053)	(0.048)	(0.045)	(0.052)	(0.051)

Note: robust standard errors in brackets; *p<0.10, **p<0.05, and ***p<0.01
Source: authors' elaboration

5. Conclusion and policy implications

The analysis conducted in this paper provides empirical evidence on the impact of cross-border exchange of information for tax purposes on tax revenue for African economies. The results confirm that EOI levels the playing field in terms of information asymmetry and boosts tax collection. More specifically, joining the Global Forum's endeavors for tax transparency can pay off, with extra revenues potentially increasing from 5% to 19% worth of GDP. Over and above the monetary gains for administrations, such effects signal increased fiscal fairness and have the possibility to impact tax morale – an effect not included in the estimate.

Such potential gains are very important for African countries in relation to their current taxation levels. They could stem from two pathways: First, from a direct effect linked to tax audits based on actual information received. In other words, from 'catching' fraudsters and evaders. A second stems from an indirect compliance effect, i.e. the fact that people will have less recourse to tax avoidance strategies due to the existence of exchanges in the first place (which imply an increase in the risk of being caught). Evidence of the latter effect is brought by the implementation of voluntary disclosure programs. In the case of South Africa, the said program, running from October 2016 to August 2017, unveiled USD 1.8 billion worth of foreign assets and revenue gains of USD 296 million, while Nigeria's program helped collect an extra USD 162 million between July 2017 and June 2019 (OECD 2022).

These effects are however subject to certain caveats, first of which is the capacity of tax authorities to process the data received via the exchanges. While digitization and tax administration capacity are accounted for in the analysis, it may not account for a sudden surge of information at a given time – especially as AEOI is usually done around a specific period (September).

A second caveat is the absence of political involvement blocking audits – considering that evaders are often part of a business/political establishment. Holding offshore accounts is typically a matter of high-net worth individuals. News stories over the past years regarding the extent of tax avoidance revealed by the Panama papers, Paradise papers or recently the Pandora papers suggest that avoidance is conducted by individuals close to power. Lobbying to escape audits should not be discounted.

From a policy perspective, it is clear that the digital maturity of public administration works in favor of joining the Global Forum and engaging in information exchange.[11] However, the risks associated with digitalization should be mitigated by adequate administrative and institutional capacity to take advantage of digital dividends. In this regard, efforts to upgrade tax administrations should be sustained, and drawing donor support for countries with lesser capacities would be important. There are also compliance costs to exchange of information over and above a tax administration's digital maturity. From a tax authority's perspective, legal adaptation costs, security and confidentiality requirements as well as capacity building

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[11] This specifically applied to AEOI since EOIR can be done through registered letters or other simpler means. However, in practice, EOIR requires a level of digitization, not least in the way audits are conducted and cases for information exchanges handled. Lastly, GFM membership is done on the account that AEOI is the ultimate goal.

expenses are to be incurred (Gadžo & Klemenčić 2017). However, these are far outweighed by the expected revenues as per the paper's findings.[12]

Information exchange should not be pursued in a vacuum or in isolation. Such policies should be framed in broader medium-term revenue strategies which would provide for ways to better leverage on information exchanged (these can be from the roll-out of risk-based tax auditing to data mining programs for instance). Equally, efforts to further deepen beneficial ownership registries/processes, or capacities to better capture transfer pricing can be equally important: they would provide further tools for using received data more efficiently.

Lastly, further analysis would be warranted on the political economy of tax cooperation. Reforms underpinning information exchange are key to international tax cooperation and ultimately tax justice. There are however questions about the drive and incentive for cooperation. In the case of Africa, estimates suggest that about 30 percent of Africans' financial wealth is held offshore (Zucman 2015), providing a powerful drive for administrations to weed them out. Similarly, estimates presented here suggest a positive return to engaging in cooperation from a revenue standpoint. Departing from the fact that African countries are generally less efficient at converting income into taxation as opposed to OECD countries for instance, the marginal tax revenue unit is more valuable to them – thus placing an even higher value to returns from cooperation. Concurrently however, offshore assets are usually held by rich and powerful individuals with close ties to power – providing an important political disincentive (Grinberg, in Pogge and Mehta 2016). As shown in this paper, AEOI is taken up by countries with greater GDP growth, trade openness, financial development and government effectiveness, all of which tend to be correlated to higher governance and weaker constraints on political settlements for collective action. Delving further in the political economy would shed further light on conditions for more constrained countries to engage.

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[12] A review of budgets for technical assistance as provided by partners in the case of Senegal for AEOI compliance (including investments for servers, technical assistance etc.) confirms this comparison (AfDB 2019).

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Annex

The principle of the PSM technique is to match countries that are members of the Global Forum with countries that are not members of the Global Forum but share some observable characteristics that are related to both the Global Forum membership and tax revenue collection. These observable characteristics are summarized in a propensity score (PS) which indicates the probability for a country to join the Global Forum (treatment group), conditional upon the observable characteristics. Then, the PS is employed to determine a group of countries that are not members of the Global Forum (control group). This group of countries serves as counterfactual for the treatment group.

On the assumption that the determinants of tax revenue are statistically independent of joining the Global Forum, given common characteristics between the treatment group and the control group, the difference in outcome between the two groups, the average treatment effect on the treated (ATT) is attributable to the Global Forum membership.

The ATT can be expressed as follows:

$ATT = E [(\beta_{i1} - \beta_{i0}) | GFM_i = 1] = E [\beta_{i1} | GFM_i = 1] - E [\beta_{i0} | GFM_i = 1]$, (1) Where GFM_i is a binary variable which takes the value 1 at the year t if in country i if that country is a member of the Global Forum at the year t and 0 otherwise.

$\beta_{i1} | GFM_i = 1$ captures property tax revenue if in country i property tax revenue collection is done by local governments.

$\beta_{i0} | GFM_i = 1$ measures tax revenue that would have been observed if country i had not joined the Global Forum. Thus, equation (1) compares the value of tax revenue observed in the treatment group (*GFM* countries) with the value of tax revenue that would have been observed in the same countries had they not joined the Global Forum.

The propensity score (PS) is given as follows $P (X_i) = E[GFM_i | X_i] = P (GFM_i = 1 | X_i)$, where X is a vector of observable variables associated with joining the Global Forum, and $P (X_i) < 1$ (such that there are comparable control countries, or non-GFM countries for each treated GFM country). Equation (1) can take the following form:

$ATT = E [\beta_{i1} | GFM_i = 1, p (X_i)] - E [\beta_{i0} | GFM_i = 0, p (X_i)]$

Propensity scores (PS) and matching

The PS is estimated using a logit model with a dummy variable for a given GFM as the dependent variable. We use various matching algorithms for country matching to test the robustness of our results. The matching techniques used include the nearest-neighbor matching with replacement, which matches each treated country to the n control countries having the closest PS (we consider n = 1, n=2 and n = 3). Then, the radius matching is also employed to match a GFM country to the non-GFM countries with PS falling within a radius of length r (we consider a wide radius r = 0.045, a medium radius r = 0.09 and a narrow radius r = 0.18). Then, the regression-adjusted local linear matching is used for pairing covariates-adjusted outcomes for the treatment group with the corresponding covariates-adjusted outcomes for the control group using local linear regression weights (Fan, 1993). Finally, the kernel matching is used as a matching algorithm for pairing a treated country to all control countries weighted proportionately by their closeness in terms of PS to the treated country.

We follow Dehejia and Wahba (2002) and calculate standard errors by using the bootstrap technique for obtaining robust standard errors for valid inference. We use Rosenbaum and Rubin (1985) diagnostic tools to check the validity of the conditional independence assumption (no evidence of significant differences on the observable characteristics within the matched data between the GFM countries and non-GFM countries), and thereby the validity of the matching results. The conditional independence hypothesis holds when the p-value associated with its t-test statistics of the standardized bias score is higher than 5%.

In addition, we use Rosenbaum (2002) bounding sensitivity tests to check to which extent unobserved heterogeneity could alter the results from the estimation of the impact of joining the Global Forum on property tax revenue. The idea is that the average treatment effect on the treated could be biased if countries that are similar in terms of observable characteristics are different in terms of significant unobservable covariates that influence both tax revenue and the decision to join the Global Forum for exchanging information for tax purposes. The bounding sensitivity tests indicate the level beyond which unobserved heterogeneity could modify the results (Guerguil et al (2017) provide details on the methodology of the bounding sensitivity tests).

We report in Table A1 the results from the estimation of the propensity scores. The results show that ODA decreases the probability of joining the Global Forum. This result could be explained by the fact that countries that already received a large flow of financial support for tax administration and largely benefit from technical assistance of development partners for

addressing tax evasion may have a priori less incentive to join the Global Forum. Credit to the private sector (proxy of financial development) negatively affects the probability of joining the Global Forum. This result may reflect the idea that the current state of financial development in most of the Sub-Saharan African countries may not encourage countries to participate in initiatives toward exchanging financial information.

The probit estimation results indicate that digitalization increases the likelihood of joining the Global Forum. The explanation for this result could be related to the fact countries that have large IT infrastructure and more digitalized economies are more likely to join the Global Forum because IT infrastructure is critical for data mining and thereby for harnessing the potential of information received from other national tax jurisdictions.

Table A1: Probit estimates of the propensity score estimation for joining the Global Forum

Global Forum membership (GFM)	
Official development assistance	-0.081***
	(0.024)
Government effectiveness	0.227
	(0.205)
GDP growth	0.018
	(0.014)
Natural resources rents	-0.008
	(0.010)
Trade openness	-0.004*
	(0.003)
Financial development	-0.014**
	(0.006)
Internet users	0.064***
	(0.005)
Constant	-0.511
	(0.357)
Observations	802
Number of countries	47
Pseudo R2	0.63

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

List of countries

Angola	Djibouti	Liberia	Nigeria	Tunisia
Burundi	Algeria	Libya	Rwanda	Tanzania
Benin	Egypt, Arab Rep.	Lesotho	Sudan	Uganda
Burkina Faso	Eritrea	Morocco	Senegal	South Africa
Botswana	Ethiopia	Madagascar	Sierra Leone	Zambia
Central African Republic	Gabon	Mali	Somalia	Zimbabwe
Côte d'Ivoire	Ghana	Mozambique	South Sudan	
Cameroon	Guinea	Mauritania	São Tomé and Príncipe	
Congo, Dem. Rep.	Gambia, The	Mauritius	Eswatini	
Congo, Rep.	Guinea-Bissau	Malawi	Seychelles	
Comoros	Equatorial Guinea	Namibia	Chad	
Cabo Verde	Kenya	Niger	Togo	

Data description

Table A below describes the variables used in the analysis

Variables	Definition	Source
Corruption	This is an assessment of corruption within the political system.	International Country Risk Guide (ICRG)
Tax compliance	Tax compliance costs, which refer to the costs incurred by individuals and businesses in complying with tax laws and regulations.	Fraser institute
Human capital	Index of human capital per person, based on years of schooling and returns to education	Penn World Table (PWT)
First exchange of information	First exchange of information under the participation to the Global Forum	OECD, Tax Transparency in Africa, report 2021 and 2022
Commitment to the AEOI	Commitment to Automatic Exchange of Information (AEOI)	OECD, Tax Transparency in Africa, report 2021 and 2023
Remittances	Personal remittances received, (% of GDP)	World Development Indicator, 2022
Global Forum membership (GFM)	Participation to the Global Forum on Transparency and Exchange of Information for Tax Purposes	OECD, Tax Transparency in Africa, report 2021 and 2023
Official development assistance	Official development assistance received, Net (% of GNI)	World Development Indicator, 2022
Government effectiveness	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	World Governance Indicator (WDI)
GDP growth	GDP growth (annual %)	WDI, 2022
Natural resources rents	Total natural resources rents (% of GDP)	WDI, 2022
Trade openness	Trade (% of GDP)	WDI, 2022
Financial development	Domestic credit to private sector, % of GDP	WDI, 2022
Internet users	Individuals using the internet (% of population)	WDI, 2022