Semi-Autonomous Revenue Authorities in Sub-Saharan Africa

Silver Bullet or White Elephant

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Abstract

A major component of tax administration reform in sub-Saharan Africa for the last 30 years has been the creation of semi-autonomous revenue authorities (SARAs). The effects of their creation on revenue performance have been much debated, although there are only a few quantitative studies. The core argument of this paper is that existing research suggesting diverse and contradictory outcomes has not taken account of trends in revenue performance in the years before the establishment of SARAs. Allowing for this revenue history our analysis based on 46 countries over the period 1980-2015 provides no robust evidence that SARAs induce an increase in revenue performance. This does not imply that SARAs may not provide benefits for tax collection, but they do not demonstrably increase (or decrease) revenue collected.

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1 Introduction

Increasing domestic resource mobilisation has been a key objective of international efforts to boost economic development. However, taxation and particularly its administration remain severely constrained in much of the developing world, especially in sub-Saharan Africa where political corruption and patronage are said to be particularly problematic. Since the 1990s, reforms have increasingly focussed on ring-fencing tax collection from political interference by setting up semi-autonomous revenue authorities (SARAs), which operate at arm's length from the ministry of finance.

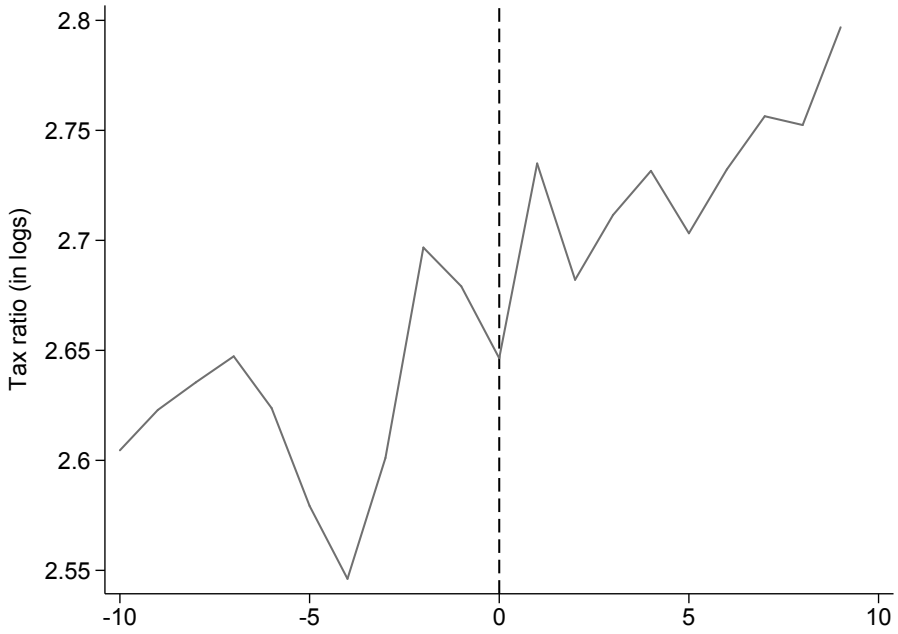
This political autonomy should improve tax compliance and collection compared to conventional tax administrations (Fjeldstad, 2009). Tax compliance might be low because government use their taxing powers in discretionary ways which might erode citizens' trust in their governments. By handing over control to an independent authority, governments can signal a credible commitment to a fairer and less discretionary collection process, which should boost compliance (Chand and Moene, 1999; Taliercio, 2004). Alternatively, increases in HR, budget, organisational and financial autonomy might create the managerial space and flexibility needed to overcome rigid civil service structures allowing the administration to operate more effectively (Devas et al., 2001; Kidd and Crandall, 2006). Moreover, if SARAs are allowed to retain a percentage of the collected revenue, an explicit incentive for increased revenue collection is institutionalised (Toma and Toma, 1992). However, to the extent to which different SARAs share the same institutional blueprint, there is a risk that the reform remains blind to local political and societal sensitivities and might therefore result in "square pegs for round holes" or isomorphic mimicry (Andrews, 2013; Pritchett et al., 2013). Moreover, by removing power from the executive the SARA reform could threaten the political bargain underlying the fiscal equilibrium and thereby undermine its own sustainability (Bird, 2008; Di John and Putzel, 2009; Therkildsen, 2004; Von Soest, 2006; Von Schiller, 2016).

Empirically, the revenue impact of SARAs is still unclear. At best, there is evidence for an initial, but unsustained revenue increase. Jenkins et al. (2000) conclude that experiences worldwide have been "impressive". However, initial increases were often not sustained nor caused by SARAs (Devas et al., 2001; Fjeldstad, 2009). Comparative case studies stress the importance of the political context for the effectiveness of SARAs (Di John, 2010; Mann, 2004; Von Soest, 2008). Econometric models, not accounting for revenue dynamics, find a positive effect. von Haldenwang et al. (2014) show that Peruvian municipalities with a SARA collect more tax than municipalities without one. Ahlerup et al. (2015) conclude that in Sub-Saharan Africa (SSA) the introduction of a SARA resulted in an initial but unsustained revenue increase. Employing synthetic control methods, Ebeke et al. (2016) find a positive revenue effect, while Sarr's (2016) results suggest considerable cross-country heterogeneity.

This paper re-evaluates the revenue gains from unified semi-autonomous revenue authorities in SSA as compared to conventional tax administrations. Relying on a panel of 46 countries between

1980 and 2015, we estimate this effect using, for the first time, dynamic panel methods to account for trends in revenue collection in the years before the establishment of SARAs. Contrary to earlier studies, our results fail to provide any evidence for a systematic relationship between the presence of a semi-autonomous revenue authority and total tax revenue in SSA. This conclusion also holds when we go beyond the total revenue effect and look at direct, goods and services, and trade taxation. As a robustness check, we extend the analysis to a number of alternative measures of fiscal capacity. Again, we do not find any evidence for an impact of SARAs. This approach does not allow us to examine potential differences across SARAs. The results should thus be interpreted as an effect *on average*.

Figure 1: Tax ratio relative to the introduction of a SARA



Notes: Figure 1 shows the averaged tax-to-GDP-ratio in logs of countries which adopted a SARA, and this from 10 years before to 10 years after the introduction of a SARA. The data was centred so that the introduction of a SARA in all countries takes place in year 0.

The paper contributes to the literature by addressing three challenges faced by existing empirical studies. First, by taking into account pre-reform revenue trends, this paper provides more reliable estimates of the revenue effect of SARAs. As shown in Figure 1, the introduction of a SARA appears to be preceded by a temporary drop in the tax-to-GDP-ratio.[1] This negative pre-reform shock either indicates that taxpayers anticipate the disruption associated with the introduction of a SARA and decrease their compliance or that governments introduce a SARA in response to the experience of a revenue shock. While anything we say is speculative, the former seems less likely given the temporary nature of the dip and the uncertainty that is usually associated with the timing of these reforms. The latter seems more plausible insofar as major reforms like this usually follow a window of opportunity.

A revenue crisis might create the domestic political space which the donor community can use to put a SARA on the agenda. The observation that SARAs are often established under severe donor pressure – which we incorporate in the empirical analysis – lends support to this interpretation. Given that governments are not very nimble, the creation of a SARA typically takes some years. This is consistent with the timing in Figure 1, which shows a lag on average of four years between the revenue shortfall and the introduction of the SARA. Moreover, this matches some case study evidence; according to Mascagni (2016), revenue problems were a trigger for the tax administration reforms leading to the establishment of the Ethiopian Revenue and Customs Authority. Either way, if not accounted for, as is the case in the existing literature, a pre-reform dip in revenue leads to an overestimation of the revenue effect of SARAs, just as failure to account for the prior trend will bias estimates of the impact of a treatment (Ashenfelter, 1978; Heckman and Smith, 1999).

Second, existing measures of SARAs are often imprecise, resulting in situations where countries are coded as having a SARA whereas in reality there is no such institution present.[2] Moreover, except for Sarr (2016), the data sources underlying existing studies are often unclear. This leads to serious discrepancies in reported establishment years, as documented in Table A.1 in the Appendix. We overcome this by being precise and transparent about our SARA definition and by relying on primary data sources for our coding. Following Kidd and Crandall (2006), we define a SARA as a governance regime for an organisation engaged in revenue administration that provides for more autonomy than that afforded a normal department in a ministry, but we extend it by imposing that it integrates customs and tax operations. This is motivated by the fact that all African SARAs now integrate these functions. With the exception of Mann (2004), no study makes the distinction between the legal and operational establishment of a SARA, despite the existence of significant gaps between the adoption of the relevant legislation and the start of operations in some cases. We recognise this possibility and exploit additional data sources to ensure that our SARA measure captures operational establishment.

Finally, even when accounting for prior trends in tax revenue, we cannot be completely certain that the presence of a SARA is not correlated with other unobservables. Therefore, we instrument the presence of a SARA with an identification strategy based on the observation that SARAs are more likely to be established when the UK is an influential donor compared to situations where France is an important donor. Hence, we exploit the variation in the relative contributions by the UK and France to total aid in individual African countries to proxy for their agenda setting power. The underlying assumption is that these aid shares affect the presence of a SARA, but do not directly affect tax revenue, conditional on a number of controls. This instrumental variable (IV) strategy gives results similar to our baseline findings.

Section 2 describes the data. Section 3 introduces the dynamic and IV frameworks used in the subsequent empirical analyses. The results are presented in section 4. Section 5 examines the robustness of the results, and section 6 concludes.

2 Data

For our analysis of the revenue effect of SARAs we use an unbalanced panel dataset covering 49 sub-Saharan African countries over the period 1980-2015. We exclude only South Sudan and Somalia because of data limitations, as well as Zimbabwe because of a small number of extremely influential observations.[3] Out of the remaining 46 countries, 21 established a semi-autonomous revenue authority during the period under consideration.[4]

As mentioned above, the coding of revenue administrations is often vague in existing empirical studies. Hence, to achieve reproducibility, we attempt to be more transparent and precise about how we classify revenue administrations. We classify a tax administration as a SARA if it is formally located outside the ministerial structure, is endowed with an independent legal status and integrates both customs and tax functions. This is a minimal definition that makes it possible to compare the revenue performance of SARAs with that of conventional tax administrations. However, while they share many elements, there is variation in the nature of SARAs with respect to their competences, organisational set-up, and responsibilities. Moreover, there might well be differences across SARAs in terms of their *de facto* autonomy from the ministry of finance. While there is no empirical evidence on these differences, their existence cannot be ruled out. This is a potential limitation of most of the empirical literature on SARAs, including of this study. We capture the average effect of SARAs, potentially masking heterogeneity among SARAs. We leave it to future research to identify and classify heterogeneity among SARAs.

Once countries with a SARA are identified, we create a dummy variable taking the value one if a SARA was present in a given year. In line with Mann (2004), we recognise that there might exist significant gaps between the legal creation and the operational start of the new revenue administration. Swaziland, for example, adopted the legal framework in 2008, but its SARA only became operational in 2011. Operational establishment is arguably the main variable of interest. The dummy thus captures the operational presence of the SARA not the legal presence. Table A.2 in the Appendix provides an overview of countries and dates, and includes the data sources used for the coding.

The main dependent variable for this study is government tax revenue as a percentage of GDP which is obtained from the Government Revenue Dataset (GRD), version July 2017 (Prichard et al., 2014). This dataset has become the go-to revenue dataset for developing countries. While not without issues, its coverage, scope and consistency outperform the available alternatives, leading to a reassessment of some of the existing research on taxation and development (Prichard, 2016). The GRD provides detailed information on various individual taxes as a share of GDP at both the central and general government level. In this paper, we focus on the general government and retain the main tax categories: total tax revenue, direct tax revenue, tax revenue from goods and services and international trade tax revenue.

Figure 2: Average tax revenue

Notes: Figure 2 shows the evolution of the averaged tax-to-GDP-ratio for countries which adopted a SARA and countries that did not, respectively the full line and the dotted line.

Figure 2 plots the time series of total tax revenue for our sample of 46 countries, split into two groups: SARA-adopters and non-adopters. The figure illustrates the stylised fact that revenue mobilisation in sub-Saharan Africa remains low (Keen and Lockwood, 2010; Keen and Mansour, 2010b). Nevertheless, there seems to be an upward trend since the mid-2000s. More interesting to our argument; it shows that SARA-adopters have, on average, a higher tax ratio than non-adopters. However, this divergence occurred before the rise of the SARA in SSA, which started around 1990. This pattern should caution us against over-relying on between group comparisons, as it might induce a bias in favour of SARAs. This observation further strengthens our belief that revenue histories are important in the analysis of the SARA reform.

For some parts of our analysis we use additional variables and control variables. All controls variables are standard in the taxation literature (for example, Gupta, 2007; Keen and Mansour, 2010a; Morrissey et al., 2016). For our instrumental variable estimation we use data on aid flows from donor i to recipient j in combination with information on total aid flowing to country j to calculate the relative shares. In the final section, where we look at corruption, we will employ the new Varieties of Democracy dataset to obtain disaggregated measures of corruption. The precise definitions and sources of all the variables used in this paper are found in Table A.3 in the Appendix, while summary statistics can be found in Table A.4. As is common when working with macro data, we will use the log transformation of all continuous economic variables in our estimations to prevent the results from being biased by outliers.

3 Methodology

The existing empirical literature imposes a strict exogeneity assumption on the relationship between SARAs and revenue. That is, it assumes that the presence of a SARA is unrelated with past and future revenue collection. Given Figure 1, our concern is that this is unlikely to be true as past revenue might influence the decision to adopt a SARA. Failing to take this into account will bias upwards the revenue effect of SARAs (Cameron and Trivedi, 2005). Accounting for past revenue should therefore bring down the SARA coefficient and provide a more reliable estimate of the revenue effect.

3.1 Dynamic Models

The core of this paper is built around two dynamic panel models which take into account past revenue performance. Since each model has its own assumptions, we include both to show that our results are independent of the chosen approach. All models compare SARAs to conventional tax administrations, assuming away potential differences in operational features across SARAs.

Our first dynamic model is the standard within or fixed effects estimator to which we add a lag of the dependent variable (LDV):

$$y_{i,t} = \beta d_{i,t} + \gamma y_{i,t-1} + \alpha_i + \delta_t + \epsilon_{i,t} \tag{1}$$

where the dependent variable is the log of tax revenue as a share of GDP in country i at time t, and $d_{i,t}$ is the dichotomous variable capturing the operational presence of a semi-autonomous revenue authority in country i at time t. In a variation, the SARA reform is captured by a set of dummies which correspond to the time relative to the introduction of the authority, similar to the approach taken in (Ahlerup et al., 2015). This addresses the concern that strict exogeneity of the treatment fails due to persistence in the reform (Wooldridge, 2010). The coefficient β thus captures the revenue effect of SARAs. The vector α_i denotes a full set of country fixed effects, while δ_t is a full set of year effects and $\epsilon_{i,t}$ is a standard error term. The effect of lagged tax revenue, $y_{i,t-1}$, on current revenue is captured by γ. By including this LDV, we estimate the revenue effect of SARAs while keeping past revenue fixed. We thus control for revenue histories. Unfortunately, the within estimator with a LDV is not asymptotically consistent when the number of time periods is small (Nickell, 1981). In our sample each country is, on average, observed 32 times. This should be enough for a nearly negligible level of bias in β (Judson and Owen, 1999). Therefore, this will be our baseline model.

A (system) GMM estimation would address the possibility of Nickell bias since it produces consistent estimates for dynamic panel models. However, the (system) GMM was developed for short panels; with longer ones there is a danger of instrument proliferation, which could undermine the validity of the results (Roodman, 2009). When dealing with macro-panels, which often involve many time pe-

riods, the (system) GMM estimator is thus not appropriate. Moreover, (system) GMM also assumes parameter homogeneity, cross-section independence and stationarity. These first two assumptions can be relaxed if we move to macro-panel methods known as panel time-series, and in particular to mean group estimators such as the Common Correlated Effects Mean Group estimator (CCEMG) (Pesaran and Smith, 1995). Allowing for heterogeneous parameters is a particularly important advantage over GMM which will be biased if the true effect of SARAs is heterogeneous across countries (Soderbom et al., 2015). Additionally, CCEMG estimators recognise that error terms might have a multi-factor structure. That is, in addition to country-specific and time-specific unobservables, there can also be time-specific unobservables which affect different countries differently. Failing to control for the latter would lead to cross-section bias. CCEMG estimators introduce cross-section means of the dependent and independent variables into the estimation to account for this (Pesaran, 2006).

The original model was recently extended to allow for lagged dependent variables (Chudik and Pesaran, 2015). When a single lagged dependent variable is included the estimator will gain consistency if $\sqrt[3]{T}$ lags of the cross-section means are added, formally:

$$y_{i,t} = \beta_i d_{i,t} + \gamma_i y_{i,t-1} + \sum_{l=0}^{p} \delta_{i,l} \bar{z}_{t-l} + \epsilon_{i,t} \tag{2}$$

where $\bar{z}_t = (\bar{y}_{t-1}, \bar{x}_t)$, p is the number of lags (which in our case will be three, given that $T = 32.5$). We test for cross-section dependence (CD) using Pesaran's(2004) test.

3.2 Instrumental Variable Approach

To deal with time-varying omitted variables, we resort to an instrumental variable (IV) estimator. The motivation for our IV strategy builds on the observation that SARAs are often established under severe donor pressure. Case study evidence suggests that the United Kingdom, in particular, has championed SARA reform in the developing world (Fjeldstad and Therkildsen, 2008; Fjeldstad, 2009; Von Soest, 2006; Devas et al., 2001). This is in contrast to France which, traditionally, favours more centralist policies (Schedler and Proeller, 2002). Comparing French and UK aid programmes, Caulfield (2006) finds that the latter focus more heavily on the establishment of executive agencies, such as SARAs, in SSA. The observation that there are hardly any SARAs in francophone Africa further supports this argument. Hence, the assumption underlying the IV strategy is that SARAs are more likely in country i, if the UK has more agenda setting power in that country. In contrast, SARAs should be less likely when France is a more important donor. We operationalise the agenda setting power of the UK and France by calculating their aid contributions relative to the total aid received by country i.

As applied in Adams et al. (2009), we follow a three-step procedure described by Wooldridge (2010). This means that (i) we estimate a binary response model (e.g. probit) of $d_{i,t}$ on $q_{i,t}$ and a set of controls $x_{i,t}$, (ii) we compute the fitted probabilities $\hat{p}$, and (iii) estimate β using a two-stage least squares model

with $\hat{p}$ ÌĆ as an instrument for the presence of a SARA. This leads us to a three-step procedure, which differs from the "pseudo-IV" procedure of running an OLS regression of y on $\hat{p}$ and x. In contrast to the latter, the usual 2SLS standard errors are still asymptotically valid under the three-step procedure (Wooldridge, 2010, p.939). Moreover, the approach takes the binary nature of the endogenous variable into account. This gives the following probit model: $d_{i,t}$ on $q_{i,t}$ and a set of controls $x_{i,t}$:

$$Pr(d_{i,t} = 1|q_{i,t}, x_{i,t}) = \Phi(\theta_0 + \theta_1 UKAidShare_{i,t} + \theta_2 FrAidShare_{i,t} + \phi x_{i,t}) \tag{3}$$

where $\Phi(-)$ is the cumulative distribution function, $x_{i,t}$ is a vector of control variables which includes: total net aid received by country i, the identity of the former coloniser, the presence of a short- and mid-term IMF programme and a linear time trend. Next, we compute the fitted probabilities $\hat{p}$. Finally, we estimate β using a two-stage least squares model with $\hat{p}$ as the instrument:

$$\begin{aligned} y_{i,t} = &\quad \beta d_{i,t} + \mu_1 x_{i,t} + \alpha_i + \delta_t + \epsilon_{i,t} \\ d_{i,t} = &\quad \pi \hat{p}_{i,t} + \mu_2 x_{i,t} + \alpha_i + \delta_t + u_{i,t} \end{aligned} \tag{4}$$

3.2.1 Identification assumption

The identification strategy relies on the exclusion restriction that, conditional on the included controls, the agenda setting power of the UK and France, as captured by their relative aid contributions, only affects taxation through the SARA reform.

A potential concern is that colonial histories might be related to both contemporary foreign aid flows and fiscal capacity. This possibility cannot be ruled out given recent evidence; **?** find that British colonial rule, compared to French rule, has weakened state and fiscal capacity in African countries. On the other hand, we know that colonial ties are a significant predictor of bilateral aid flows (Alesina and La Ferrara, 2000). If not controlled for, the exclusion restriction would be violated since the aid shares would pick up differences in tax revenue due to differences in colonial legacies. We deal with this in two ways. First, an indicator variable for a country's colonial past based on La Porta et al. (2008) is included in the probit model to ensure that the instruments pick up more than colonial differences. Second, the 2SLS estimation includes country fixed effects. Hence, colonial histories are accounted for.

Another concern is the relationship between aid and taxation. There is an extensive literature on the potential effects of foreign aid levels on tax efforts in developing countries (Clist, 2016; Gupta et al., 2004; Morrissey, 2015, for example,). However, we do not rely on aid levels, but we exploit changes in the composition of the aid received. We use changes in UK and French aid as a share of total aid received by country i. Nevertheless, to completely close this backdoor path, a measure for the total aid level is included. A related concern is that the UK and France support additional public sector reforms which potentially affect taxation. Following Ahlerup et al. (2015), we control for this by including

variables for short and mid-term IMF programmes since these programmes are usually the basis of any form of public sector reform in developing countries.

Finally, while we cannot directly test the exclusion restriction, we can run a placebo test. The test consists of an estimation of the impact of UK and French aid on tax revenue for the countries and periods when no SARA is present. If the exclusion restriction holds, that is if the aid shares only affect taxation through their effect on SARAs, then the aid shares should not predict tax revenue when there is no SARA present. As will be discussed in section 4.2, the results are satisfactory.

4 Results

4.1 Dynamic Models

Briefly reiterating our core motivation; the hypothesis is that lagged tax revenue is an omitted variable in static models used in much of the existing literature. If this is the case, then the inclusion of lagged tax revenue should bring down the SARA coefficient compared to existing studies.

In Table 1 we present the results of our dynamic models specified in section 3.1, but we also include the results from a static fixed effects estimation as a benchmark. Each panel represents a different type of tax with the relevant summary statistics and test statics included at the bottom of each panel. Glancing over the columns, in the uneven numbered ones the SARA reform is captured by a single before/after dummy variable, which tells us whether there is a break in revenue collection after the SARA is introduced. In the even numbered columns the SARA reform is introduced as a set of dummies capturing the time since the reform. The logarithmic transformation of the dependent variable allows us to roughly interpret the coefficient on the SARA dummies as a percentage change. In order to save space and highlight the most important coefficients, we do not report the fixed effects.

Columns I and II show the results from the static fixed effects estimator as, for example, found in Ahlerup et al. (2015). According to this estimator the SARA reform has clearly had a positive and significant effect on revenue collection. The results in column II suggest that SARAs have an immediate impact during the first two years of 8.7 per cent or 1.3 percentage points, if we take the average tax ratio of 14.5 per cent in the sample. This positive impact continues during the first 10 years after which the effect is still positive but no longer significantly different from zero. These results are close to the ones obtained by Ahlerup et al. (2015) who find an increase of 1.5 percentage points during the first two years. This effect on total tax revenue seems to be due to increases across the different subcategories, with the exception of trade taxation which seems to have been least affected by the SARA reform. In short, the findings in the static models are in line with the existing literature.

Table 1: Dynamic panel - Revenue effect of SARAs

	Stat. FE		Dyn. FE		CCEMG	
	I	II	III	IV	V	VI
	Panel A: Total tax revenue					
SARA	0.094***		0.011		0.010	
	(0.031)		(0.019)		(0.017)	
SARA, years 1-2		0.087*		0.034		-0.003
		(0.052)		(0.030)		(0.030)
SARA, years 3-5		0.111**		0.006		-0.007
		(0.047)		(0.028)		(0.028)
SARA, years 6-10		0.109**		0.012		-0.011
		(0.045)		(0.027)		(0.033)
SARA, years >10		0.056		-0.014		-0.020
		(0.049)		(0.029)		(0.041)
L.Total			0.780***	0.780***	0.272**	0.251**
			(0.016)	(0.016)	(0.126)	(0.125)
N	1496	1496	1440	1440	1278	1278
Groups	46	46	46	46	46	46
adj. R^2	0.082	0.081	0.674	0.674	0.304	0.329
CD p-val.					0.052	0.031
	Panel B: Direct tax revenue					
SARA	0.244***		0.058**		-0.017	
	(0.053)		(0.029)		(0.025)	
SARA, years 1-2		0.193**		0.069		0.032
		(0.082)		(0.045)		(0.023)
SARA, years 3-5		0.205***		0.034		0.005
		(0.073)		(0.039)		(0.044)
SARA, years 6-10		0.278***		0.065		-0.077
		(0.073)		(0.040)		(0.051)
SARA, years >10		0.384***		0.086*		-0.061
		(0.083)		(0.045)		(0.053)
L.Direct			0.807***	0.806***	0.525***	0.497***
			(0.017)	(0.017)	(0.161)	(0.163)
N	1196	1196	1134	1134	984	984
Groups	44	44	44	44	44	44
adj. R^2	0.086	0.087	0.718	0.718	0.882	0.891
CD p-val.					0.000	0.000
	Panel C: Goods & services revenue					
SARA	0.147***		0.056*		0.009	
	(0.056)		(0.031)		(0.047)	
SARA, years 1-2		0.108		0.105**		0.015
		(0.087)		(0.049)		(0.039)
SARA, years 3-5		0.179**		0.045		0.090*
		(0.077)		(0.042)		(0.051)
SARA, years 6-10		0.198**		0.050		0.094
		(0.078)		(0.043)		(0.069)
SARA, years >10		0.007		-0.010		0.038
		(0.089)		(0.049)		(0.069)
L.Goods & Services			0.794***	0.793***	-0.096	-0.188
			(0.017)	(0.017)	(0.147)	(0.147)
N	1176	1176	1107	1107	928	928
Groups	46	46	46	46	46	46
adj. R^2	0.160	0.162	0.738	0.738	0.322	0.358
CD p-val.					0.000	0.000
	Panel D: Trade tax revenue					
SARA	0.079		-0.013		-0.036	
	(0.064)		(0.041)		(0.026)	
SARA, years 1-2		0.186*		0.027		0.028
		(0.100)		(0.066)		(0.054)
SARA, years 3-5		0.151*		-0.022		-0.059

Continued on next page

		(0.088)		(0.056)		(0.106)
SARA, years 6-10		-0.049		-0.038		0.015
		(0.089)		(0.057)		(0.098)
SARA, years >10		-0.035		-0.005		0.109
		(0.101)		(0.065)		(0.076)
L.Trade			0.793***	0.793***	0.197	0.192
			(0.019)	(0.020)	(0.127)	(0.140)
N	1212	1212	1144	1144	969	969
Groups	46	46	46	46	46	46
adj. R^2	0.063	0.066	0.632	0.631	0.247	0.288
CD p-val.					0.000	0.000

Notes: The table reports estimates of the effect of SARAs on the log of tax revenue. Columns I and II give the results for the static fixed effects model. Columns III to VI contain the results from the dynamic estimations. Panel A presents the estimates for total tax revenue; Panel B for direct tax revenue; Panel C for revenue from goods and services and Panel D for trade tax revenue. Uneven columns include a single before and after dummy, taking the value 1 if a SARA is present. Even columns include a series of SARA dummies capturing posttreatment effects. Models I through IV account for country and year fixed effects. Standard errors in parentheses (significance indicated as *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$). Models V and VI were corrected for small time series bias using Jackknife corrected standard errors. The p-value of the cross-section dependence (CD) test is reported. The null-hypothesis is no cross-sectional dependence in the majority of the models.

The fixed effects estimator which includes past revenue is presented in columns III and IV. As noted before, caution has to be exercised when interpreting the results, as the results might be subject to Nickell bias. Nevertheless, given our fairly long panel, the results should still be informative. Compared to the static model the coefficient on the SARA dummy has dramatically decreased, and now suggests a 1.1 per cent increase in revenue after the introduction of a SARA. However, it is no longer statistically significant. The estimates in column IV point to an initial but unsustained gain of about 3 per cent during the first two years. Again, none of the estimates are statistically significant at standard levels. Importantly, the coefficient on lagged tax revenue, in a pattern common across all models in this paper, is sizeable suggesting significant persistence in tax revenue. We test for a unit root in Table A.5 in the Appendix. With respect to the main sub-components of total tax, there is some evidence that SARAs have had a positive impact on revenue from direct taxes as well as from taxes on goods and services. Column III suggests that SARAs have, on average, led to a 5.8 and 5.6 per cent increase respectively. However, this only holds at the 5 per cent significance level. Moreover, this effect is less clear if we look at column IV, and will disappear when we move to the CCEMG estimator. For trade taxation, the findings indicate a negative, but statistically insignificant impact.

Overall, both models III and IV fail to reject the null-hypothesis of no effect on total tax revenue. This is in line with our hypothesis that lagged revenue was an important omitted variable in static models. When not accounted for, this led to an overestimation of the revenue effect of SARAs, possibly due to the correlation between negative shocks to revenue in the past and the introduction of the SARA. Based on these first findings we are, therefore, led to the initial conclusion that semi-autonomous revenue authorities have not significantly increased total tax ratios in sub-Saharan Africa.

We also examine the results from the correlated common effects mean group models in columns VII and VIII. CCEMG models are more appropriate than GMM when working with longer panels and have the additional advantage that they allow us to control for cross-section dependence and

heterogeneous effects. For total tax revenue, the coefficient on the SARA dummy in column VII is close to the two previous estimates, but it remains statistically indistinguishable from zero. The results in column VIII have turned negative and are never significant. The findings for the different types of taxation are similar to what we found before. There is no significant effect on direct taxation, for which the estimates turn around zero. For revenue from goods and services, the estimates are overall insignificant, except for the period three to five years after the reform. However, the suggested impact of 9 per cent is only marginally significant at the 10 per cent level. Again, there is no evidence for an impact on trade taxation. We do have to note that despite our efforts to control for cross-sectional dependence, the CD test rejects the null-hypothesis of no cross-sectional dependence in the majority of the models. Nevertheless, the CCEMG models confirm previous findings. There is little evidence for a systematic relationship between the presence of a SARA and improved revenue performance.

4.2 Instrumental Variable Approach

In the preceding section we examined the revenue effect of SARAs by controlling for past revenue. In this section we recognise that we cannot exclude the possibility that there are still other time-varying factors which might confound the revenue effect of SARAs. We resort to an instrumental variable procedure to deal with this. As discussed in section 3.2, we use a three-step procedure.

Table 2: Determinants of SARA presence

	I	II
UK aid share	0.213***	0.276***
	(0.041)	(0.051)
FR aid share	-0.277***	-0.185***
	(0.033)	(0.046)
Total aid		-0.014
		(0.062)
Ex-UK Colony		0.846***
		(0.166)
IMF mid-term		0.565***
		(0.138)
IMF short-term		-0.151
		(0.241)
Trend		0.120***
		(0.009)
N	1389	1232
Pseudo R^2	0.233	0.509
Correctly specified (%)	85.9	88.9

Notes: The models report the estimated average partial effects from a probit for the presence of a semi-autonomous revenue authority. Column I reports the baseline results from a probit model with UK and French aid shares as the independent variables. Column II adds control variables. Robust standard errors in parentheses. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1.

The first step of our IV estimation models the probability of the SARA reform as a function of the agenda-setting power of the UK and France in country i, proxied for by their contribution to total aid received by country i. The results from the first step probit model are given in Table 2. The reported coefficients are the average partial effects. Column I only includes the aid shares, while column II adds the controls. The predicted values from the second specification will be used in the 2SLS estimation. The results shown here are merely illustrative. We will formally test the validity of the predicted probabilities as instruments when we discuss Table 3.

Overall, the results are supportive of our model. We clearly see that the proposed instruments are both correlated with SARA presence. Moreover, their apparent relation is consistent with our intuition. The larger the UK as a donor the more likely is the presence of a SARA. More specifically, a one percentage point increase in the UK's aid share increases the probability of observing a SARA by 3.4 per cent (column II). The more agenda setting power France has, proxied by its share of aid, the less likely is the presence of a SARA. It is important to note that we are controlling for the identity of the former colonial power: former UK colonies are about 10 per cent more likely to adopt the SARA reform than former colonies of other European states, implying that the estimates on the aid shares are picking up more than structural differences between the two.[5] Contrary to short-term programmes, medium-term IMF programmes appear to increase the likelihood of a SARA reform. This is to be expected given their more conditional nature and the IMF's reputation as a supporter of the SARA reform. Finally, the linear time trend is highly significant, which corresponds to the observation that SARAs have increasingly been introduced since the 1990s.

Panel A in Table 3 reports the results from the 2SLS estimation, described in equation 4, for the four different tax types. The first-stage results are found in Panel B. The key message here is that when instrumenting SARA presence, our previous conclusion still holds. We do not find any statistical evidence for a positive or negative impact of SARAs on tax revenue. The estimates do suggest that medium-term IMF programmes have increased revenue from goods and services. This is plausible given the IMF's support to the introduction of VAT across the continent. Noteworthy, there is no evidence for any correlation between total aid and taxation.

It is important to note that these results are not driven by weak instruments. It is clear from the first-stage results that our instruments are significant predictors of SARA presence. The strong predictive power of the instruments is also confirmed by the Kleibergen-Paap F-statistics, which are always above 19. In addition, we run a placebo test to check the plausibility of our exclusion restriction. We consider the effect of our instruments, the aid shares, on taxation when no SARA is present. If the instruments are truly exogenous and thus only affect tax revenue through the SARA reform, then we expect tax revenue to be uncorrelated with the aid shares when no SARA is present. Table A.6 in the Appendix shows the results from a simple regression of tax revenue on the aid shares, controlling only for time and country fixed effects, and shows that aid shares are uncorrelated with tax revenue. We are

Table 3: 2SLS estimation - Revenue effect of SARAs

	Total	Direct	G&S	Trade
	Panel A: 2SLS estimates			
SARA	-0.058	0.571	-0.240	-0.108
	(0.180)	(0.367)	(0.328)	(0.334)
Total aid	0.045	0.045	-0.122	0.072
	(0.031)	(0.055)	(0.083)	(0.055)
IMF mid-term	0.044	0.017	0.076**	-0.016
	(0.031)	(0.072)	(0.036)	(0.058)
IMF short-term	0.059	0.125	0.018	0.022
	(0.065)	(0.126)	(0.116)	(0.111)
N	1139	926	912	944
Groups	42	40	42	41
KP F-stat	49.44	31.84	19.79	21.94
	Panel B: First-stage regression			
Pr(SARA)	0.931***	0.798***	0.715***	0.734***
	(0.132)	(0.142)	(0.161)	(0.157)
Total aid	0.020	-0.035	-0.020	-0.017
	(0.032)	(0.034)	(0.034)	(0.033)
IMF mid-term	-0.047	-0.030	-0.029	-0.029
	(0.037)	(0.043)	(0.043)	(0.043)
IMF short-term	-0.002	0.043	0.039	0.029
	(0.031)	(0.041)	(0.041)	(0.041)

Notes: The table reports the estimates of the effect of SARAs on tax revenue. Panel A presents 2SLS estimates instrumenting SARA presence with the predicted probability of SARA presence using UK and French aid shares. Panel B presents the corresponding first-stage estimates. All models include country and year fixed effects. Robust standard errors in parentheses, clustered at the country level. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1. The KP F-stat reports the Kleibergen-Paap F statistic which tests the strength of the instruments.

thus confident that our instrumental variable approach and its conclusions are valid. The IV results presented in this section further strengthen our scepticism about a positive revenue impact of SARAs in sub-Saharan Africa.

In sum, the findings from the different models fail to provide support for the hypothesis that SARAs have increased total tax revenues in sub-Saharan Africa on average. This contrasts with earlier findings in the literature, and can be explained by the fact that previous studies failed to control for the pre-reform trends in revenue collection. More specifically, as we argued above, if the SARA reform is linked with a negative pre-reform shock to revenue, then this biases the SARA coefficient upwards in a static model. In that case the static models most likely pick up a recovery effect which would have occurred regardless of the SARA reform. We cannot be certain about the drivers of this null effect, and reiterate that it is the average revenue effect. Two interpretations are possible: either SARAs never work or the average is masking a heterogeneous effect which depends on the nature of the SARA, such that "good" and "bad" SARAs cancel each other out. Further exploring the nature of different SARAs

is beyond the scope of this paper, and would require currently unavailable data on both de jure and de facto measures of their autonomy. We leave this for future research. However, it is clear from the evidence that a revenue improvement is not a given.

4.3 Sensitivity Checks

We perform a number of sensitivity checks to assess the robustness of the lack of a systematic relationship between the presence of a semi-autonomous revenue authority and revenue mobilisation. All of these tests are reported in the Supplementary Materials to this paper. Specifically, we show that our results are unchanged when:

(i) we recode our SARA dummies relying on the establishment dates used by Ahlerup et al. (2015), with results in Table B.1;

(ii) we introduce additional controls, reported in Table B.2;

(iii) we use system GMM estimators with varying lags, reported in Table B.3 and Table B.4;

(iv) to address possible outliers, we trim the top and bottom 5 per cent of the dependent variable for the dynamic models in Table B.5 and for the IV model in Table B.6.

5 Alternative Outcomes

Revenue performance is not the only criterion on which SARAs are advocated, so here we explore effects on a number of alternative outcome measures. Given the lack of evidence for a direct revenue impact, we are led to the question whether SARAs have had more indirect effects on tax capacity across sub-Saharan Africa. Whilst increasing revenue has been the primary objective of the reform, an IMF survey documented additional reasons ranging from catalysing broader revenue reform to addressing corruption (Kidd and Crandall, 2006). Moreover, there might be other benefits. Along with the rise of SARAs we have, for example, seen the consolidation of professional networks of African tax administrators.[6] The extent to which this has been driven by the creation of SARAs is an open question, but given the organisational similarities it is not implausible that they have at least facilitated greater cooperation. Assessing the overall impact of a SARA would thus require us to take into account a much broader array of indicators. Unfortunately, this is not possible due to data limitations.

Instead, this section looks at tax effort, revenue volatility and corruption. The analyses of tax effort and volatility can be thought of as robustness checks since they represent alternative revenue performance measures. Moreover, they have been used as broader measures of the tax or fiscal capacity of a state (e.g. Baskaran and Bigsten, 2013). Corruption, on the other hand, can be seen as an intermediate outcome linking the SARA reform to revenue performance as corrupt tax administrations were one of

the key elements identified as holding back revenue collection (Chand and Moene, 1999; Jenkins, 1994; Flatters and Macleod, 1995). We first introduce the alternative outcome measures and then discuss the results from our baseline model, the dynamic within estimator (results from all dynamic panel estimators are included in the Supplementary Materials).

5.1 Tax Effort

The governmentâĂŹs tax effort is defined as the ratio between what is actually collected and what should be collected given the economic structure of the country (Mkandawire, 2010; Baskaran and Bigsten, 2013). One of the initial motivations for the SARA reform was the observed political interference in the tax collection process, leading to a shortfall between what should be levied and what is collected. By granting tax administrations a level of autonomy, they are supposedly ring-fenced from further interference. In turn, this should lead to a more effective application of tax rules, and therefore the revenue gap should decrease, increasing the tax effort variable. The tax effort variable is calculated as follows:

$$TaxEffort_{i,t} = \frac{Tax_{i,t}}{\widehat{Tax}_{i,t}} \quad (5)$$

$$\widehat{Tax}_{i,t} = \beta X_{i,t} + \alpha_i + \delta_t + \epsilon_{i,t} \quad (6)$$

where $\widehat{Tax_{i,t}}$ is the countryâĂŹs taxable capacity, or its predicted total tax revenue given equation 6. This predicted revenue is the result of an estimation which takes into account country, α_i, and year, δ_t, fixed effects in addition to a vector, $X_{i,t}$, of economic determinants of taxation for country i in year t. Following the literature (Bird, 2008; Brown and Martinez-Vazquez, 2015; Chelliah et al., 1975; Le et al., 2012; Lotz and Morss, 1967; Mkandawire, 2010; Gupta, 2007), this vector includes import and export measures to proxy for the economyâĂŹs trade openness, the value-added share of the agricultural sector in the economy (being difficult to tax), GDP per capita, demographic variables including the age dependency ratios for the young and old as well as the urbanisation rate. A ratio lower than one suggests that a particular country is not collecting as much as it potentially could, while a ratio higher than one points to a collection effort higher than what is predicted by the countryâĂŹs economic structure. An additional advantage of using the tax effort is that it allows us to flexibly include controls into our dynamic specifications. Including control variables in our baseline models was challenging because of the limited number of observations in the individual time-series underlying the CCEMG estimator. As before, we log-transform the tax effort variable.

5.2 Revenue Volatility

Fiscal policy is often highly dependent on the political cycle in developing countries (Shi and Svensson, 2006). According to von Haldenwang et al. (2014), this is, with regard to taxation, often worsened by weak tax administrations. However, given their autonomy, SARAs are less influenced by the whims of government, which should result in a steady collection of tax revenue. Thus, SARAs should reduce the volatility in tax revenue.

Following von Haldenwang et al. (2014), we define revenue volatility as the absolute percentage deviation, but from a three-year moving average instead of a quadratic trend. For every country i in each year t we measure revenue volatility as follows:

$$Vol_{i,t} = \frac{abs(Tax_{i,t} - \overline{Tax}_{i,t})}{\overline{Tax}_{i,t}} \tag{7}$$

where $Tax_{i,t}$ is the actual tax revenue collected and $\overline{Tax}_{i,t}$ is a three-year moving average. Since we are taking absolute values of the deviations from the moving average, our outcome measure is strictly positive, with higher values indicating higher levels of volatility. In line with the rest of the paper we log-transform our volatility measure to reduce the effect from outliers.

5.3 Corruption

Finally, we look at an intermediate variable linking the SARA reform to increased revenue, control of corruption. By the end of the 1980s service provision by way of the public sector was heavily questioned as a model. The civil service in developing countries was argued to suffer from severe political patronage."In such a situation the tax administration will be perceived as being inefficient, incompetent and corrupt [... this] directly affects the citizensâĂŹ willingness to voluntarily comply with the tax laws" (Jenkins, 1994, p.76). Modelling tax administrations after independent central banks, i.e. reducing political dependence and reforming managerial practices, especially with regard to human resources, would lower corruption, increase professionalism and ultimately result in higher revenue (Chand and Moene, 1999). Fjeldstad (2003) finds that, after the Tanzania Revenue Authority was created, corruption initially decreased, but returned again over time.

To examine the corruption effect of SARAs we use three corruption measures from the recently released Varieties of Democracy (V-DEM) dataset, version 7.1 (Coppedge et al., 2017). It has greater coverage both across time and countries than alternatives, going back to 1900 in some cases. Moreover, V-DEM corruption measures can be disaggregated. So we are able to not only look at overall political corruption, but also at public sector and executive corruption (McMann et al., 2016). Precise data definitions can be found in Table A.3 in the Appendix. We examine all three indicators, but are particularly interested in the public sector corruption index. This seems the most relevant, since it explicitly attempts to get at the "use of public office for personal gain" in the bureaucracy.

5.4 Results

To test these hypotheses, we rerun our baseline dynamic model presented in equation (1), but replace the dependent variable with our alternative outcome variables. We only present the fixed effects model; conclusions are unchanged when use the CCEMG estimator, reported in Tables B.7 in the Supplementary Materials.

In line with our previous findings, Table 4 provides no support for a significant effect of SARAs on any of the alternative outcomes. The results from the estimation with the simple before/after SARA dummy are presented in Panel A, while Panel B shows the evolution of the effect over time. The coefficients on the SARA dummies are generally close to zero, and nearly always insignificant. Only for tax effort during the first two years after the establishment of the SARA do we find a marginally significant (at the 10 per cent level) and positive impact of about 4 per cent. Regarding the tax effort estimation, we note that the total number of countries has dropped to 41 since we are unable to estimate the tax effort for Comoros, Cote d'Ivoire, Gabon, Niger, and Sao Tome and Principe due to missing data.

Table 4: Alternative outcomes - Within estimator

	Tax Effort I	Tax Volatility II	Political Corruption III	Public Sector Corruption IV	Executive Corruption V
	Panel A: SARA before-after				
SARA	0.021	-0.094	-0.001	0.007	0.004
	(0.023)	(0.200)	(0.004)	(0.005)	(0.005)
L.Tax effort	0.770***				
	(0.055)				
L.Tax volatility		0.160***			
		(0.040)			
L.Political corruption index			0.927***		
			(0.011)		
L.Public sector corruption				0.905***	
				(0.015)	
L.Executive corruption					0.921***
					(0.013)
N	1040	1278	1610	1610	1610
Groups	41	46	46	46	46
adj. R^2	0.614	0.032	0.879	0.837	0.854
	Panel B: SARA over time				
SARA, years 1-2	0.041*	-0.157	0.001	0.003	0.000
	(0.021)	(0.294)	(0.002)	(0.005)	(0.003)
SARA, years 3-5	0.009	0.166	0.003	0.007	0.007
	(0.034)	(0.210)	(0.004)	(0.008)	(0.005)
SARA, years 6-10	0.023	-0.260	-0.004	0.006	0.001
	(0.028)	(0.268)	(0.006)	(0.006)	(0.009)
SARA, years >10	-0.004	-0.184	-0.004	0.010	0.008
	(0.028)	(0.226)	(0.006)	(0.009)	(0.008)
L.Tax effort	0.770***				
	(0.055)				
L.Tax volatility		0.157***			
		(0.039)			
L.Political corruption index			0.926***		
			(0.011)		
L.Public sector corruption				0.905***	
				(0.015)	

Continued on next page

L.Executive corruption					0.921*** (0.013)
N	1040	1278	1610	1610	1610
Groups	41	46	46	46	46
adj. R^2	0.613	0.033	0.879	0.837	0.854

Notes: The table reports the estimated effects of SARAs on several alternative outcome measures. (I) Tax effort is measured as the ratio of actual tax collection over what should be collected given the economic structure of the country. (II) Tax volatility is measured as the absolute percentage deviation of total tax revenue from a three-year moving average. (III) Aggregate measure of political corruption. (IV) Combined measure of public sector bribery and embezzlement. (V) Combined measure of executive bribery and embezzlement. Panel A includes a single before and after dummy, taking the value 1 if a SARA is present. Panel B includes a series of SARA dummies capturing post-treatment effects. All models account for country and year fixed effects. Robust standard errors in parentheses clustered at the country level. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1.

This section broadened the scope of our assessment of semi-autonomous revenue authorities by looking at their impact on a number of alternative indicators. The inclusion of tax effort and tax volatility into the analysis can be interpreted as a robustness check on our baseline results. Moreover, they are informative as broader measures of the state's tax or fiscal capacity. Alternatively, control of corruption can be seen as an intermediate outcome connecting the SARA reform to revenue performance. However, the results fail to find any significant impact of semi-autonomous revenue authorities on either tax effort, volatility or corruption. We take this as confirmation of our baseline results and are therefore further strengthened in our belief that overall SARAs have done little to improve the tax capacity of African states.

6 Conclusion

Over the past 30 years semi-autonomous revenue authorities (SARAs) have been introduced across sub-Saharan Africa. By ring-fencing tax administrations from politics and by introducing new public management practices, this reform would boost tax collection. However, the empirical evidence on the revenue effect of the SARA reform is limited and inconclusive. Moreover, this existing literature fails to account for the trends in tax revenue prior to the introduction of a SARA. This leads to an overestimation of the revenue effect of SARAs since the SARA reform often followed a negative revenue shock.

This paper re-examines the revenue effect of semi-autonomous revenue authorities in sub-Saharan Africa, taking into account these trends in pre-reform tax collection. We show that once these are controlled for, the positive revenue effect of SARAs disappears. This result is consistent across different dynamic panel estimators. Moreover, it holds true when we instrument for the presence of a SARA using donor influence. Overall, there is little statistical evidence for a systematic relationship between SARAs and total tax revenues in SSA. This is confirmed when we extend the analysis to alternative measures of tax capacity: tax effort, revenue volatility, and corruption (one of the channels through which SARAs are argued to raise revenue), are unaffected by their presence. Earlier estimations which

omit past revenue are, therefore, most likely picking up a recovery effect, which would have occurred anyway, as opposed to a causal revenue effect.

While SARAs do not demonstrably increase (or decrease) revenue collected on average, this does not imply that SARAs may not provide other benefits. Some countries have introduced SARAs and subsequently seen an increase in tax collection, but this should not simply be attributed to the SARA in itself. Along with the rise of SARAs we have, for example, seen the consolidation of professional networks of African tax administrators. Moreover, the scope of this paper was limited to the average revenue effect of SARAs when compared to conventional tax administrations. The lack of an average revenue effect might be masking heterogeneous effects depending on differences in *de jure* or *de facto* autonomy across SARAs. Further contextualising the SARA reform in future research, therefore, has the potential to provide us with a more detailed understanding of tax administration and institutional reform in developing countries.

Endnotes

1. Simply looking at the figure may give the impression that revenue increases following the SARA. However, this does not allow for the suggestion of a general trend increase in revenue over the full period, interrupted by some declines. Unfortunately, there is no obvious way to include the trend for control countries (no way to centre on 0) in the Figure, but this is allowed for in the estimation.
2. Certain studies assume that Ghana has continuously had a SARA since the late 1980s. In the 1980s Ghana had three separate semi-autonomous revenue administrations. However, their autonomy was reversed as they were brought back into the ministry of finance in 1991, before being legally re-instated in 1998 and operationally in 2001 (Prichard, 2009; Von Soest, 2008). Full integration of the three authorities only came about in 2009 (GRA, 2009).
3. Almost immediately after establishing the Zimbabwe Revenue Authority economic crisis struck Zimbabwe leading to a collapse in the tax ratio. Including Zimbabwe in the sample would bias our estimation towards a null-result.
4. Other countries like South Sudan are considering the establishment of a SARA at the time of writing.
5. We note that most non-British colonies that adopted SARAs are countries where the UK has been a significant donor since the 1990s (notably Mozambique and Rwanda).
6. We thank the referees for bringing this to our attention.

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A Appendix

Table A.1: SARA creation dates in different studies

Country	Operational est.	Ebeke et al. (2016)	Sar (2016)	Ahlerup et al. (2015)	ITD (2010)	Fjeldstad & Moore (2009)	Mann (2004)
Angola	2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Botswana	2005	2003	n.a.	2005	2004	n.a.	2005
Burundi	2010	2010	n.a.	2010	2010	n.a.	n.a.
Ethiopia	2009	1997	1997	2002	2009	2002	2002
Gambia	2007	2005	n.a.	2005	n.a.	2005	n.a.
Ghana	2010	1985	n.a.	1985	2010	1985	1986
Kenya	1996	1996	1995	1995	1995	1995	1996
Lesotho	2003	2001	2001	2003	n.a.	2003	2003
Liberia	2014	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malawi	2000	2000	1998	1995	2000	1995	2000
Mauritius	2005	2005	n.a.	2005	2006	2005	n.a.
Mozambique	2007	2006	n.a.	2006	n.a.	n.a.	n.a.
Rwanda	1998	1998	1997	1998	1998	1998	2000
Sierra Leone	2003	2003	n.a.	2002	2002	2002	2002
South Africa	1998	1997	1997	1997	1997	1997	1997
Swaziland	2011	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tanzania	1996	1996	1996	1996	1996	1996	1996
Togo	2014	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Uganda	1992	1992	1991	1991	n.a.	1991	1992
Zambia	1994	1994	1994	1994	1993	1994	1994
Zimbabwe	2002	2001	2001	2001	n.a.	2001	2000

Table A.2: Sources for SARA creation dates

Country	Legal est.	Operational est.	Legal source	Operat. Source*
Angola	15/12/2014	2015	http://www.agt.minfin.gov.ao	Inferred
Botswana	01/08/2004	2005	http://www.burs.org.bw	Inferred
Burundi	11/07/2009	2010	http://www.obr.bi	http://www.obr.bi
Ethiopia	14/07/2008	2009	http://www.erca.gov.et	Inferred
Gambia	Aug-04	2007	IMF (2011)	IMF (2011)
Ghana	31/12/2009	2010	http://www.gra.gov.gh	Inferred
Kenya	01/07/1995	1996	http://www.kra.go.ke	Mann (2004)
Lesotho	01/01/2001	2003	http://www.lra.org.ls	http://www.lra.org.ls
Liberia	19/09/2013	2014	Yates (2014)	Yates (2014)
Malawi	1998	2000	http://www.mra.mw/	http://www.mra.mw/
Mauritius	30/09/2004	2005	http://www.mra.mu	Inferred
Mozambique	22/03/2006	2007	http://www.at.gov.mz	http://www.at.gov.mz
Rwanda	08/11/1997	1998	http://www.rra.gov.rw	IMF (1999)
Sierra Leone	13/09/2002	2003	http://www.nra.gov.s	Inferred
South Africa	05/09/1997	1998	http://www.gov.za	Inferred
Swaziland	2008	2011	http://www.sra.org.sz	http://www.sra.org.sz
Tanzania	1995	1996	http://www.tra.go.tz	http://www.tra.go.tz
Togo	10/12/2012	2014	https://www.otr.tg	https://www.afdb.org
Uganda	05/09/1991	1992	https://www.ura.go.ug	Mann (2004)
Zambia	1993	1994	http://www.zambia.gov.zm	https://www.zra.org.zm
Zimbabwe	11/02/2000	2002	http://www.zimra.co.zw	http://www.zimra.co.zw

Notes: *If no specific information is available, then the operational dummy is coded as one depending on the legal establishment. Generally, legal and operational establishment years will be the same. However, if a SARA was legally established in the second half of the calendar year, then the first year of operations is considered to be the next one.

Table A.3: Variable definitions and sources

Variable Name	Definition	Source
SARA	Dummy capturing the operational presence of a SARA.	Author
Total taxes	Total tax revenue, excluding social contributions (% of GDP)	GRD
Direct taxes	Total direct taxes, excluding social contributions but including resource taxes. Includes taxes on income, profits and capital gains, taxes on payroll and workforce and taxes on property (% of GDP).	GRD
Taxes on goods & services	Total taxes on goods and services, which include sales and excise taxes (% of GDP).	GRD
Trade taxes	Total taxes on international trade, including both import and export taxes (% of GDP).	GRD
Total aid	Net ODA received (% of GNI)	WDI
UK aid share	Net bilateral aid from UK (% of total net bilateral aid)	WDI
FR aid share	Net bilateral aid from France (% of total net bilateral aid)	WDI
IMF mid-term	Includes the following programmes: Extended Credit Facility, External Fund Facility, Poverty Reduction and Growth Facility, Structural Adjustment Facility	Dreher (2006), IMF MONA
IMF short-term	Includes the following programmes: Stand-by Credit Facility, Rapid Credit Facility, Exogenous Shocks Facility, Stand-By Arrangement	Dreher (2006), IMF MONA
Ex-UK Colony	Dummy variable taking the value one if the country is a former UK colony, zero otherwise.	La Porta et al. (2008)
Dep. share, old	Age dependency ratio, old (% of working-age population)	WDI
Dep. share, young	Age dependency ratio, young (% of working-age population)	WDI
Urban population	Urban population (% of total)	WDI
GDP per cap.	GDP per capita (2010 USD)	WDI
Exports	Exports of goods and services (% of GDP)	WDI
Imports	Imports of goods and services (% of GDP)	WDI
Agriculture	Agriculture, value added (% of GDP)	WDI
Democracy index	Aggregate measure of electoral democracy, scaled from 0 to 1, capturing the extent to which the ideal of electoral democracy (=1) is achieved .	V-DEM
Political corruption	Aggregate measure of political corruption, scaled from 0 to 1 with higher values corresponding to higher levels of corruption.	V-DEM
Public sector corruption	Combined measure of public sector bribery and embezzlement, scaled from 0 to 1 with higher values corresponding to higher levels of corruption.	V-DEM
Executive corruption	Combined measure of executive bribery and embezzlement, scaled from 0 to 1 with higher values corresponding to higher levels of corruption.	V-DEM

Notes: GRD - Government Revenue Dataset; WDI - World Bank Development Indicators; IMF MONA - International Monetary Fund Monitoring of Fund Arrangements; V-DEM - Varieties of Democracy.

Table A.4: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
SARA	0.14	0.35	0	1	1656
Total tax	14.5	8.09	0.6	54.31	1496
Direct tax	4.76	3.82	0.12	28.11	1196
Goods and services tax	4.65	3.03	0	16.8	1178
Trade tax	4.52	4.60	0.03	36.41	1212
Total net aid	12.38	12.85	-0.26	181.1	1544
UK Aid	5.81	8.35	0	65.01	1626
FR aid share	20.17	22.47	0	94.92	1626
IMF mid-term	0.36	0.48	0	1	1656
IMF short-term	0.11	0.31	0	1	1649
Ex-UK Colony	0.42	0.49	0	1	1548
Age dependency ratio, old	6.25	1.54	3.85	14.09	1652
Age dependency ratio, young	83.33	13.51	27.46	106.71	1652
Urban population	34.26	16.27	4.34	87.16	1652
GDP per cap.	1817.52	2706.92	115.79	20333.94	1588
Exports	30.9	20.05	2.52	124.39	1482
Imports	43.87	33.69	2.98	424.82	1482
Agriculture	28.05	16.52	0.89	93.98	1324
Democracy index	0.36	0.21	0.04	0.86	1656
Tax effort	0.99	0.49	0.06	3.85	1090
Total tax	0.13	0.19	0	3.16	1331
Political corruption index	0.63	0.21	0.15	0.97	1656
Public sector corruption	0.64	0.23	0.05	0.98	1656
Executive corruption	0.63	0.24	0.06	0.98	1656

Unit root test

In the analysis we assumed that the main variables follow a stationary process. This is not a trivial assumption. The consistency of the estimators depends on it. We, therefore, formally test the stationarity assumption using two panel unit root tests. Both tests extend the standard Dickey-Fuller test to panel time-series. The null-hypothesis for both is non-stationarity in all country series, whereas the alternative is stationarity in at least some countries. However, the Maddala and Wu (1999) test does not take into account cross-section dependence, while the Pesaran (2007) allows for it. Table A.5 contains the results. We present alternative specifications for the inclusion of lags and trends. Overall, the null of non-stationarity is mostly rejected.

Table A.5: Panel unit root tests

	No trend		*With trend*	
	0 lags	1 lag	0 lags	1 lag
	Panel A: Total tax revenue			
Maddala and Wu (1999)	0.000	0.004	0.000	0.000
Pesaran (2007)	0.000	0.000	0.000	0.000
	Panel B: Direct tax revenue			
Maddala and Wu (1999)	0.000	0.010	0.000	0.000
Pesaran (2007)	0.000	0.000	0.000	0.000
	Panel C: Goods & services revenue			
Maddala and Wu (1999)	0.000	0.000	0.000	0.004
Pesaran (2007)	0.000	0.130	0.002	0.961
	Panel D: Trade tax revenue			
Maddala and Wu (1999)	0.000	0.000	0.000	0.000
Pesaran (2007)	0.000	0.073	0.183	0.929

Notes: Null-hypothesis for panel unit root test: series has a unit root. P-values reported. Maddala and Wu (1999) assume cross-sectional independence. Pesaran (2007) allows for cross-sectional dependence.

Table A.6: Placebo IV test

	Total	Direct	G&S	Trade
UK aid share	-0.001	-0.011	-0.003	-0.006
	(0.015)	(0.022)	(0.027)	(0.018)
FR aid share	0.002	0.031	0.050	0.014
	(0.019)	(0.034)	(0.040)	(0.034)
N	1065	826	788	823
Groups	46	44	46	46
adj. R^2	0.069	0.005	0.190	0.050

Notes: The model estimates the impact of UK and French aid on revenue for the countries and periods when no SARA is present. No additional controls were included except for country and time fixed effects. Robust standard errors in parentheses, clustered at the country level. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1.

B Supplementary Materials

Table B.1: Dynamic panel - Alternative SARA dummy

	Stat. FE		Dyn. FE		CCEMG	
	I	II	III	IV	V	VI
	Panel A: Total tax revenue					
SARA	0.108***		0.003		-0.001	
	(0.032)		(0.019)		(0.016)	
SARA, years 1-2		0.091		0.023		0.006
		(0.057)		(0.034)		(0.015)
SARA, years 3-5		0.100**		0.001		0.001
		(0.049)		(0.029)		(0.030)
SARA, years 6-10		0.097**		0.001		-0.000
		(0.043)		(0.025)		(0.037)
SARA, years >10		0.143***		-0.007		0.020
		(0.045)		(0.027)		(0.037)
L.Total			0.781***	0.781***	0.314***	0.307***
			(0.016)	(0.016)	(0.088)	(0.089)
N	1496	1496	1440	1440	1278	1278
Groups	46	46	46	46	46	46
adj. R^2	0.084	0.083	0.674	0.673	0.274	0.299
CD p-val.					0.089	0.111
	Panel B: Direct tax revenue					
SARA	0.265***		0.043		-0.035	
	(0.053)		(0.030)		(0.027)	
SARA, years 1-2		0.213**		0.056		-0.002
		(0.088)		(0.048)		(0.025)
SARA, years 3-5		0.204***		0.026		-0.027
		(0.075)		(0.041)		(0.037)
SARA, years 6-10		0.249***		0.034		-0.043
		(0.068)		(0.037)		(0.033)
SARA, years >10		0.485***		0.088**		-0.008
		(0.076)		(0.043)		(0.041)
L.Direct			0.808***	0.805***	0.288***	0.267***
			(0.017)	(0.017)	(0.085)	(0.087)
N	1196	1196	1134	1134	984	984
Groups	44	44	44	44	44	44
adj. R^2	0.088	0.099	0.718	0.718	0.889	0.894
CD p-val.					0.066	0.034
	Panel C: Goods & services revenue					
SARA	0.095		0.006		0.029*	
	(0.058)		(0.032)		(0.016)	
SARA, years 1-2		0.069		0.015		-0.055
		(0.096)		(0.053)		(0.042)
SARA, years 3-5		0.061		-0.006		-0.013
		(0.081)		(0.044)		(0.051)
SARA, years 6-10		0.142*		0.024		-0.066
		(0.073)		(0.040)		(0.111)
SARA, years >10		0.079		-0.037		-0.233
		(0.083)		(0.046)		(0.198)
L.Goods & Services			0.796***	0.795***	0.106	0.287
			(0.017)	(0.017)	(0.166)	(0.277)
N	1176	1176	1107	1107	928	928
Groups	46	46	46	46	46	46
adj. R^2	0.157	0.156	0.737	0.737	0.433	0.455
CD p-val.					0.000	0.000
	Panel D: Trade tax revenue					
SARA	0.074		-0.035		-0.015	
	(0.065)		(0.042)		(0.037)	

Continued on next page

SARA, years 1-2		0.175		-0.010		0.043
		(0.110)		(0.072)		(0.033)
SARA, years 3-5		0.158*		-0.019		-0.018
		(0.092)		(0.059)		(0.061)
SARA, years 6-10		-0.052		-0.065		-0.029
		(0.083)		(0.053)		(0.077)
SARA, years >10		0.083		-0.017		-0.012
		(0.093)		(0.061)		(0.089)
L.Trade			0.794***	0.792***	0.317***	0.302***
			(0.019)	(0.019)	(0.058)	(0.063)
N	1212	1212	1144	1144	969	969
Groups	46	46	46	46	46	46
adj. R^2	0.063	0.065	0.632	0.632	0.283	0.306
CD p-val.					0.000	0.000

Notes: The table reports estimates of the effect of SARAs on the log of tax revenue. The SARA dummies were constructed using SARA introduction years from Ahlerup et al. (2015). Panel A presents the estimates for total tax revenue; Panel B for direct tax revenue; Panel C for revenue from goods and services and Panel D for trade tax revenue. Uneven columns include a single before and after dummy, taking the value 1 if a SARA is present. Even columns include a series of SARA dummies capturing post-treatment effects. Models I through IV account for country and year fixed effects. Standard errors in parentheses (significance indicated as ***p < 0.01, **p < 0.05, *p < 0.1). In models V and VI were corrected for small time series bias using Jackknife corrected standard errors. The p-value of the cross-section dependence (CD) test is reported. The null-hypothesis is no cross-sectional dependence in the majority of the models.

Table B.2: Dynamic FE model with controls

	Total		Direct		Goods & Services		Trade	
	I	II	III	IV	V	VI	VII	VIII
SARA	0.040		0.087*		0.072		-0.022	
	(0.029)		(0.046)		(0.069)		(0.052)	
SARA, years 1-2		0.057**		0.090**		0.094		0.036
		(0.025)		(0.035)		(0.091)		(0.062)
SARA, years 3-5		0.035		0.073		0.065		-0.041
		(0.035)		(0.049)		(0.064)		(0.063)
SARA, years 6-10		0.045		0.103		0.072		-0.053
		(0.037)		(0.065)		(0.074)		(0.059)
SARA, years >10		-0.005		0.098		-0.008		-0.047
		(0.044)		(0.070)		(0.082)		(0.062)
L.Total	0.685***	0.683***						
	(0.072)	(0.072)						
L.Direct			0.722***	0.722***				
			(0.056)	(0.056)				
L.Goods & Services					0.693***	0.691***		
					(0.050)	(0.051)		
L.Trade							0.766***	0.763***
							(0.050)	(0.051)
Age dep. ratio, old	-0.138	-0.135	0.011	0.003	-0.157	-0.132	-0.009	0.009
	(0.118)	(0.120)	(0.198)	(0.207)	(0.176)	(0.178)	(0.220)	(0.225)
Age dep. ratio, young	0.244**	0.265**	0.279	0.276	-0.265	-0.244	0.126	0.129
	(0.115)	(0.115)	(0.198)	(0.204)	(0.243)	(0.241)	(0.267)	(0.271)
Urban population	-0.070	-0.070	0.094	0.096	0.164	0.172	0.396**	0.391**
	(0.098)	(0.096)	(0.153)	(0.154)	(0.156)	(0.154)	(0.179)	(0.183)
GDP per cap.	0.069	0.074	0.032	0.030	-0.011	-0.011	-0.077	-0.074
	(0.053)	(0.052)	(0.110)	(0.110)	(0.133)	(0.132)	(0.149)	(0.150)
Exports	0.030	0.029	0.054	0.055	0.102*	0.103*	-0.020	-0.021
	(0.036)	(0.036)	(0.052)	(0.052)	(0.057)	(0.057)	(0.055)	(0.056)
Imports	0.080*	0.079*	0.073	0.073	0.019	0.017	0.157**	0.158**
	(0.041)	(0.041)	(0.074)	(0.074)	(0.063)	(0.063)	(0.059)	(0.061)
Agriculture	-0.015	-0.021	-0.058	-0.057	-0.056	-0.059	0.037	0.039
	(0.082)	(0.083)	(0.110)	(0.111)	(0.107)	(0.106)	(0.123)	(0.124)
IMF short-term	0.049	0.050	-0.024	-0.025	-0.004	-0.001	-0.007	-0.005
	(0.041)	(0.042)	(0.058)	(0.057)	(0.041)	(0.042)	(0.048)	(0.050)
IMF mid-term	-0.011	-0.013	-0.047**	-0.047*	0.021	0.017	-0.058*	-0.058*
	(0.018)	(0.018)	(0.023)	(0.024)	(0.017)	(0.016)	(0.030)	(0.031)
Democracy index	0.135*	0.140*	0.263*	0.262*	-0.295**	-0.283**	0.135	0.137
	(0.077)	(0.077)	(0.132)	(0.134)	(0.109)	(0.111)	(0.130)	(0.130)
N	1079	1079	890	890	891	891	893	893
Groups	41	41	40	40	42	42	41	41
Adj. R^2	0.679	0.679	0.688	0.687	0.684	0.685	0.657	0.657

Notes: The table reports the estimates of the effect of SARAs on the log of tax revenue. The dependent variables are listed at the top. Robust standard errors in parentheses, clustered at the country level. All models include time and year fixed effects. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1.

Table B.3: System GMM - Revenue effect of SARAs

	Total tax		Direct tax		Indirect tax		Trade tax	
	I	II	III	IV	V	VI	VI	VIII
SARA	0.013		0.046		0.016		0.023	
	(0.083)		(0.049)		(0.059)		(0.051)	
SARA, years 1-2		0.026		0.074		0.352		0.056
		(0.076)		(0.098)		(0.227)		(0.083)
SARA, years 3-5		-0.020		0.062		0.167		-0.019
		(0.088)		(0.098)		(0.226)		(0.051)
SARA, years 6-10		-0.039		0.072		0.211		0.077
		(0.106)		(0.121)		(0.306)		(0.089)
SARA, years >10		-0.040		-0.018		0.123		0.046
		(0.077)		(0.146)		(0.344)		(0.073)
L.Total	0.941***	1.114***						
	(0.327)	(0.351)						
L.Direct			0.841***	0.873***				
			(0.105)	(0.125)				
L.Goods & Services					0.933***	0.937***		
					(0.104)	(0.144)		
L.Trade							1.039***	1.046***
							(0.077)	(0.084)
N	1440	1440	1134	1134	1107	1107	1144	1144
Groups	46	46	44	44	46	46	46	46
# instr.	41	50	41	49	41	49	41	49
M1	0.037	0.025	0.000	0.009	0.001	0.002	0.041	0.032
M2	0.083	0.084	0.693	0.551	0.918	0.838	0.651	0.486
M3	0.172	0.162	0.481	0.533	0.043	0.063	0.192	0.267
Hans. p-val.	0.107	0.969	0.286	0.878	0.079	0.157	0.553	0.944
Diff. Hans. J	0.195	0.925	0.668	1.000	0.202	0.861	0.765	0.994

Notes: The table reports the results of a system GMM estimation of the effect of SARAs on the log of tax revenue. The system GMM is chosen over the difference GMM since the SARA dummy is a persistent process and because past changes in the SARA dummy convey reasonable information about its present level (Blundell and Bond, 1998). We collapse the columns of the instrument matrix and restrict the number of lags on the dependent variable by setting h = 3, 4. We treat the SARA dummy as predetermined and restrict the lags to 2,3. Uneven columns include a single before and after dummy, taking the value 1 if a SARA is present. Even columns include a series of SARA dummies capturing post-treatment effects. Robust standard errors in parentheses, the Windmeijer (2005) correction was applied. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1. We report the p-values for the Hansen-J test, which tests the overall validity of the instruments (null-hypothesis), as well as the p-value for the difference-in-Hansen test. The M1-M3 tests present the p-values of a serial correlation test for respectively a first, second and third-order autocorrelation process.

Table B.4: System GMM - Alternative lag lengths

	2 lags		3 lags		4 lags		10 lags	
	I	II	III	IV	V	VI	VII	VIII
	Panel A: Total tax revenue							
SARA	0.013		0.030		0.050		0.066	
	(0.083)		(0.069)		(0.074)		(0.164)	
SARA, years 1-2		0.026		0.053		-0.031		-0.688
		(0.076)		(0.132)		(0.078)		(0.466)
SARA, years 3-5		-0.020		-0.030		-0.113		-0.833
		(0.088)		(0.120)		(0.100)		(0.529)
SARA, years 6-10		-0.039		-0.040		-0.116		-0.836
		(0.106)		(0.133)		(0.113)		(0.874)
SARA, years >10		-0.040		-0.034		0.022		-0.766*
		(0.077)		(0.084)		(0.305)		(0.424)
L.Total	0.941***	1.114***	0.914***	1.078***	0.807***	0.947***	0.783***	0.770***
	(0.327)	(0.351)	(0.323)	(0.363)	(0.305)	(0.330)	(0.259)	(0.277)
N	1440	1440	1440	1440	1440	1440	1440	1440
Groups	46	46	46	46	46	46	46	46
# instr.	41	50	43	54	45	57	57	70
M1	0.037	0.025	0.039	0.036	0.046	0.039	0.030	0.023
M2	0.083	0.084	0.082	0.086	0.080	0.085	0.112	0.269
M3	0.172	0.162	0.174	0.184	0.178	0.185	0.167	0.152
Hans. p-val.	0.107	0.969	0.272	0.967	0.353	0.976	0.855	1.000
Diff. Hans. J	0.195	0.925	0.146	0.800	0.130	0.533	0.133	0.628
	Panel B: Direct tax revenue							
SARA	0.046		0.035		0.040		-0.276	
	(0.049)		(0.042)		(0.039)		(0.419)	
SARA, years 1-2		0.074		-0.032		0.172		0.700
		(0.098)		(0.248)		(0.381)		(0.784)
SARA, years 3-5		0.062		-0.053		0.169		-0.807
		(0.098)		(0.265)		(0.404)		(0.882)
SARA, years 6-10		0.072		-0.056		0.202		-0.987
		(0.121)		(0.344)		(0.505)		(0.673)
SARA, years >10		-0.018		-0.126		0.163		0.408
		(0.146)		(0.415)		(0.591)		(0.617)
L.Direct	0.841***	0.873***	0.876***	0.862***	0.861***	0.848**	0.950***	0.464**
	(0.105)	(0.125)	(0.106)	(0.297)	(0.120)	(0.335)	(0.161)	(0.211)
N	1134	1134	1134	1134	1134	1134	1134	1134
Groups	44	44	44	44	44	44	44	44
# instr.	41	49	43	53	45	56	57	69
M1	0.000	0.009	0.001	0.009	0.001	0.006	0.007	0.009
M2	0.693	0.551	0.690	0.668	0.691	0.622	0.761	0.149
M3	0.481	0.533	0.481	0.488	0.473	0.636	0.627	0.268
Hans. p-val.	0.286	0.878	0.254	0.959	0.427	0.990	1.000	1.000
Diff. Hans. J	0.668	1.000	0.663	0.990	0.681	1.000	1.000	1.000
	Panel C: Goods & services revenue							
SARA	0.016		0.060		0.061		0.091	
	(0.059)		(0.052)		(0.050)		(0.295)	
SARA, years 1-2		0.352		0.279		0.414		0.330
		(0.227)		(0.370)		(0.501)		(0.563)
SARA, years 3-5		0.167		0.095		0.247		0.257
		(0.226)		(0.371)		(0.525)		(0.545)
SARA, years 6-10		0.211		0.095		0.276		0.307
		(0.306)		(0.434)		(0.608)		(0.569)
SARA, years >10		0.123		0.082		0.239		0.289
		(0.344)		(0.503)		(0.671)		(0.579)
L.Indirect	0.933***	0.937***	0.942***	1.016***	0.939***	0.974***	0.967***	0.962***
	(0.104)	(0.144)	(0.080)	(0.142)	(0.080)	(0.246)	(0.143)	(0.206)
N	1107	1107	1107	1107	1107	1107	1107	1107
Groups	46	46	46	46	46	46	46	46
# instr.	41	49	43	53	45	56	57	69
M1	0.001	0.002	0.001	0.003	0.002	0.125	0.004	0.013
M2	0.918	0.838	0.912	0.835	0.911	0.665	0.627	0.627
M3	0.043	0.063	0.045	0.069	0.044	0.096	0.028	0.180
Hans. p-val.	0.079	0.157	0.098	0.736	0.246	0.975	0.915	0.999
Diff. Hans. J	0.202	0.861	0.107	0.300	0.113	0.715	1.000	1.000
	Panel D: Trade tax revenue							
SARA	0.023		0.022		0.003		-0.213	
	(0.051)		(0.043)		(0.046)		(0.349)	
SARA, years 1-2		0.056		-0.261		-0.486		0.657

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		(0.083)		(0.926)		(0.533)		(0.839)
SARA, years 3-5		-0.019		-0.321		-0.550		0.558
		(0.051)		(0.994)		(0.577)		(0.923)
SARA, years 6-10		0.077		-0.379		-0.633		0.748
		(0.089)		(1.111)		(0.672)		(1.101)
SARA, years >10		0.046		-0.306		-0.542		0.632
		(0.073)		(1.276)		(0.909)		(1.275)
L.Trade	1.039***	1.046***	1.044***	0.993***	1.059***	0.931***	0.969***	0.926***
	(0.077)	(0.084)	(0.080)	(0.172)	(0.099)	(0.199)	(0.143)	(0.195)
N	1144	1144	1144	1144	1144	1144	1144	1144
Groups	46	46	46	46	46	46	46	46
# instr.	41	49	43	53	45	56	57	69
M1	0.041	0.032	0.046	0.067	0.047	0.055	0.040	0.051
M2	0.651	0.486	0.678	0.638	0.680	0.678	0.602	0.607
M3	0.192	0.267	0.193	0.173	0.204	0.188	0.173	0.929
Hans. p-val.	0.553	0.944	0.074	0.915	0.089	0.954	0.970	1.000
Diff. Hans. J	0.765	0.994	0.105	1.000	0.076	0.611	1.000	0.385

Notes: The table reports the results of a system GMM estimation of the effect of SARAs on the log of tax revenue. Alternative lag lengths were used as shown at the top. Panel A presents the estimates for total tax revenue; Panel B for direct tax revenue; Panel C for revenue from goods and services and Panel D for trade tax revenue. Uneven columns include a single before and after dummy, taking the value 1 if a SARA is present. Even columns include a series of SARA dummies capturing post-treatment effects. Robust standard errors in parentheses, the Windmeijer (2005) correction was applied. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1. We report the p-values for the Hansen-J test, which tests the overall validity of the instruments (null-hypothesis), as well as the p-value for the difference-in-Hansen test. The M1-M3 tests present the p-values of a serial correlation test for respectively a first, second and third-order autocorrelation process.

Table B.5: Dynamic panel - Trimmed

	Stat. FE		Dyn. FE		CCEMG	
	I	II	III	IV	V	VI
	Panel A: Total tax revenue					
SARA	0.052**		0.007		-0.003	
	(0.023)		(0.014)		(0.020)	
SARA, years 1-2		0.051		0.029		-0.035
		(0.038)		(0.022)		(0.059)
SARA, years 3-5		0.066*		-0.001		0.006
		(0.034)		(0.021)		(0.042)
SARA, years 6-10		0.070**		0.011		-0.014
		(0.033)		(0.020)		(0.063)
SARA, years >10		0.000		-0.022		-0.006
		(0.036)		(0.022)		(0.069)
L.Total			0.771***	0.771***	0.342***	0.247***
			(0.017)	(0.018)	(0.067)	(0.078)
N	1348	1348	1262	1262	1054	1054
Groups	46	46	46	46	46	46
adj. R^2	0.099	0.100	0.660	0.660	0.300	0.346
CD p-val.					0.029	0.058
	Panel B: Direct tax revenue					
SARA	0.217***		0.059**		0.009	
	(0.038)		(0.024)		(0.027)	
SARA, years 1-2		0.194***		0.072**		0.047
		(0.059)		(0.036)		(0.048)
SARA, years 3-5		0.172***		0.036		0.054
		(0.052)		(0.031)		(0.058)
SARA, years 6-10		0.259***		0.069**		0.044
		(0.053)		(0.033)		(0.073)
SARA, years >10		0.317***		0.079**		0.014
		(0.062)		(0.038)		(0.106)
L.Direct			0.755***	0.753***	0.277***	0.261***
			(0.020)	(0.020)	(0.085)	(0.084)
N	1078	1078	1006	1006	854	854
Groups	43	43	43	43	43	43
adj. R^2	0.176	0.178	0.688	0.687	0.956	0.959
CD p-val.					0.002	0.001
	Panel C: Goods & services revenue					
SARA	0.128***		0.047*		0.040	
	(0.041)		(0.027)		(0.037)	
SARA, years 1-2		0.078		0.092**		0.018
		(0.061)		(0.040)		(0.110)
SARA, years 3-5		0.151***		0.030		0.241**
		(0.055)		(0.035)		(0.108)
SARA, years 6-10		0.187***		0.045		0.259*
		(0.057)		(0.037)		(0.135)
SARA, years >10		0.021		-0.018		0.224*
		(0.065)		(0.042)		(0.130)
L.Goods & Services			0.703***	0.702***	0.216	0.251
			(0.022)	(0.022)	(0.147)	(0.193)
N	1060	1060	970	970	765	765
Groups	46	46	46	46	46	46
adj. R^2	0.166	0.170	0.614	0.615	0.319	0.375
CD p-val.					0.004	0.001
	Panel D: Trade tax revenue					
SARA	-0.072		-0.077**		-0.088*	
	(0.046)		(0.032)		(0.049)	
SARA, years 1-2		0.064		-0.043		-0.005
		(0.069)		(0.050)		(0.025)
SARA, years 3-5		-0.030		-0.063		-0.013

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		(0.062)		(0.043)		(0.049)
SARA, years 6-10		-0.109*		-0.091**		-0.080
		(0.064)		(0.045)		(0.072)
SARA, years >10		-0.382***		-0.165***		-0.113
		(0.069)		(0.049)		(0.115)
L.Trade			0.725***	0.714***	0.129	0.064
			(0.022)	(0.023)	(0.104)	(0.101)
N	1091	1091	1013	1013	832	832
Groups	45	45	45	45	45	45
adj. R^2	0.055	0.086	0.556	0.557	0.637	0.656
CD p-val.					0.000	0.000

Notes: The table reports estimates of the effect of SARAs on the log of tax revenue. The original sample was trimmed at the top and bottom 5th percentile. Panel A presents the estimates for total tax revenue; Panel B for direct tax revenue; Panel C for revenue from goods and services and Panel D for trade tax revenue. Uneven columns include a single before and after dummy, taking the value 1 if a SARA is present. Even columns include a series of SARA dummies capturing post-treatment effects. Models I through VI account for country and year fixed effects. Standard errors in parentheses. In models V and VI Windmeijer (2005)'s finite sample correction was applied. Whereas models VII and VIII were corrected for small time series bias using Jackknife corrected standard errors. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1.In models V and VI were corrected for small time series bias using Jackknife corrected standard errors. The p-value of the cross-section dependence (CD) test is reported. The null-hypothesis is no cross-sectional dependence in the majority of the models.

Table B.6: 2SLS estimation - Trimmed

	Total	Direct	G&S	Trade
	Panel A: 2SLS estimates			
SARA	-0.172	0.359	-0.404	-0.256
	(0.141)	(0.279)	(0.285)	(0.292)
Total aid	0.030	-0.011	-0.091	0.081
	(0.032)	(0.041)	(0.070)	(0.055)
IMF mid-term	0.046	0.031	0.078*	0.018
	(0.032)	(0.064)	(0.045)	(0.053)
IMF short-term	0.055	0.195*	0.081	-0.036
	(0.065)	(0.109)	(0.103)	(0.081)
N	1044	857	845	876
Groups	42	38	41	40
KP F-stat	43.92	36.70	24.03	27.36
	Panel B: First-stage regression			
Pr(SARA)	0.907***	0.835***	0.795***	0.792***
	(0.137)	(0.138)	(0.162)	(0.151)
Total aid	0.004	-0.031	-0.030	-0.032
	(0.036)	(0.036)	(0.036)	(0.033)
IMF mid-term	-0.038	-0.033	-0.007	-0.021
	(0.036)	(0.044)	(0.041)	(0.042)
IMF short-term	0.024	0.051	0.075**	0.056
	(0.035)	(0.042)	(0.038)	(0.036)

Notes: The table reports the estimates of the effect of SARAs on tax revenue. The original sample was trimmed at the top and bottom 5th percentile. Panel A presents 2SLS estimates instrumenting SARA presence with the predicted probability of SARA presence using UK and French aid shares. Panel B presents the corresponding first stage estimates. All models include country and year fixed effects. Robust standard errors in parentheses, clustered at the country level. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1. The KP F-stat reports the Kleibergen-Paap F statistic which tests the strength of the instruments.

Table B.7: Alternative outcomes - CCEMG

	Tax Effort I	Tax Volatility II	Political Corruption III	Public Sector Corruption IV	Executive Corruption V
	Panel A: SARA before-after				
SARA	-0.004	-0.290	-0.004	-0.013	-0.013
	(0.017)	(0.658)	(0.007)	(0.009)	(0.010)
L.Tax effort	0.410***				
	(0.069)				
L.Tax volatility		-0.189			
		(0.165)			
L.Political corruption index			0.689***		
			(0.033)		
L.Public sector corruption				0.704***	
				(0.030)	
L.Executive corruption					0.759***
					(0.035)
N	912	1123	1472	1472	1472
Groups	41	46	46	46	46
adj. R^2	0.721	0.113	0.622	0.529	0.639
CD p-val.	0.375	0.499	0.003	0.010	0.039
	Panel B: SARA over time				
SARA, years 1-2	0.008	-0.662	-0.026	-0.011	-0.015
	(0.020)	(0.551)	(0.025)	(0.014)	(0.011)
SARA, years 3-5	0.003	-0.564**	-0.021	-0.036	-0.015
	(0.022)	(0.229)	(0.017)	(0.022)	(0.014)
SARA, years 6-10	0.001	-0.080	-0.015	-0.032*	-0.027
	(0.018)	(0.417)	(0.014)	(0.018)	(0.021)
SARA, years >10	-0.011	-0.768**	-0.055	-0.057*	-0.027
	(0.020)	(0.316)	(0.037)	(0.030)	(0.033)
L.Tax effort	0.306***				
	(0.071)				
L.Tax volatility		-0.227			
		(0.164)			
L.Political corruption index			0.665***		
			(0.035)		
L.Public sector corruption				0.634***	
				(0.036)	
L.Executive corruption					0.750***
					(0.040)
N	912	1123	1472	1472	1472
Groups	41	46	46	46	46
adj. R^2	0.733	0.171	0.637	0.552	0.653
CD p-val.	0.949	0.593	0.004	0.111	0.010

Notes: The table reports the estimated effects from a CCEMG model of SARAs on several alternative outcome measures. (I) Tax effort is measured as the ratio of actual tax collection over what should be collected given the economic structure of the country. (II) Tax volatility is measured as the absolute percentage deviation of total tax revenue from a three-year moving average. (III) Aggregate measure of political corruption. (IV) Combined measure of public sector bribery and embezzlement. (V) Combined measure of executive bribery and embezzlement. Panel A includes a single before and after dummy, taking the value 1 if a SARA is present. Panel B includes a series of SARA dummies capturing post-treatment effects. Standard errors in parentheses, corrected for small time series bias using Jackknife corrected standard errors. ***p $\leq$ 0.01, **p $\leq$ 0.05, *p $\leq$ 0.1. The p-value of the cross-section dependence (CD) test is reported. The null-hypothesis is no cross-sectional dependence in the majority of the models.