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Taxation and accountability in sub-Saharan Africa

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WIDER Working Paper 2023/115

Taxation and accountability in sub-Saharan Africa

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Abstract: Taxation can contribute to state-building through a tax bargain in which taxpayers are willing to increase compliance in return for improved government accountability. There is limited evidence for this in sub-Saharan Africa where it is argued that the fiscal state is weak, with low tax revenues and governments that are not accountable. However, since the early 2000s, sub-Saharan African countries on average have increased tax/gross domestic product ratios significantly and there have also been increases in measures of accountability. Has the increase in taxation promoted improved accountability? This paper analyses data for up to 47 African countries from 1980 to 2019 and shows a robust positive correlation between tax revenue and accountability. Instrumental variable estimation provides support for a causal interpretation. The effect of taxation is only observed for vertical accountability (capturing the quality of elections and party competition), and not for other measures of accountability that capture the role of civil society or the judiciary, consistent with the emergence of a tax bargain. Furthermore, we show that the tax effect is one of the significant determinants of vertical accountability.

Key words: tax revenue, vertical accountability, tax bargain, sub-Saharan Africa

JEL classification: H20, O55

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1 Introduction

An extensive literature addresses the interactions between political systems or state capacity and the tax structure and revenue performance, often focussing on the contribution of taxation to state-building (Besley and Persson 2011; Bräutigam et al. 2008; Cheibub 1998; Gould and Baker 2002; Timmons 2005). Studies on developing countries show how the nature of political regimes relates to taxation (Fauvelle-Aymar 1999; Garcia and von Haldenwang 2016) and posit a link between taxation and accountability (Moore 2015) in the context of a fiscal bargain (Ross 2004) or a governance dividend (Moore 2008): a social contract based on tax bargaining supports representative democracy and the need to raise revenue encourages the institution-building required to strengthen state (bureaucratic) capacity. One may assume that accountability and taxation co-evolve as they reinforce each other. Accountability encourages compliance that increases collection efficiency and revenue. On the basis of evidence that political variables are not robust determinants of revenue performance (Tagem and Morrissey 2023), the focus here is on whether improvements in tax performance support greater accountability. For example, voters who pay more in tax are more likely to become politically engaged to hold government to account through elections. The paper tests the effect of taxation on accountability for 47 sub-Saharan African (SSA) countries from 1980 to 2019. Specifically, performance is measured as the ratio of tax revenue to national income (tax/gross domestic product (GDP)) and we use the measure of vertical accountability from the Varieties of Democracy (V-Dem) database, which captures the ability of citizens to hold government to account through the quality of elections and political participation.

Historically, SSA countries have had low tax revenue performance even compared to other developing countries, in part because some have benefitted from access to significant non-tax resource revenues. On average there was no sustained increase in non-resource tax/GDP between 1980 and 2005, which can be explained to some extent by the fact that revenue from other, especially indirect, taxes rose only slowly to compensate for the losses due to reductions in trade taxes, especially tariffs, from the mid-1980s: trade tax revenue fell from about 6 per cent of GDP in the 1980s to about 4 per cent in the early 2000s (Keen and Mansour 2010: 562). Average revenue/GDP in SSA fell from around 14 per cent in the early 1980s to 11 per cent in the mid-1990s, rising back to 14 per cent by 2009 and over 15 per cent in the mid-2010s; trade tax revenues fell from the mid-1980s; direct tax revenues began to increase from the late 1990s and indirect taxes from the mid-2000s (Gwaindepi 2021: Figures 1 and 3). From around 2000, non-trade taxes and tax/GDP improved, with Oppel et al. (2022) noting that although SSA has low tax/GDP ratios relative to other developing regions, the majority of SSA countries have increased tax/GDP since the early 2000s.

Although consistent with arguments that tax effort is low in SSA because of weak fiscal capacity and/or availability of non-tax revenues (NTRs) (aid or resource rents), low tax/GDP does not necessarily imply poor performance—revenue may be what could be predicted given the structure and circumstances of SSA economies. Tagem and Morrissey (2023) construct a measure of tax capacity based on isolating the trend component (removing cyclical and temporary variations) of tax efficiency, the ratio of actual to potential tax revenue derived from estimating a tax performance regression. For a sample of 39 SSA countries over the period 1985 to 2018, they find that tax capacity has increased, on average, more consistently for low-income than for middle-income countries, so that most countries are achieving their revenue potential given economic conditions. There is some evidence that tax reforms have played a role, increasing efficiency (of the tax system and collection) and reducing distortions (Keen and Mansour 2010), and strengthening tax administration (Moore 2014).

Although various political variables are included in the literature that estimates tax performance, none are consistently significant—various measures of economic performance or structure are the most robust determinants of cross-country variation in tax/GDP ratios.¹ Tagem and Morrissey (2023) confirm this for SSA tax performance and show that only four variables are consistently significant determinants of cross-country variation in SSA tax capacity: tax capacity increases with private consumption, resource rents, and equal distribution of resources (an institutional measure from V-DEM), but decreases with political corruption (also from V-DEM). The finding that greater equity in the allocation of public spending, such as for education and health, supports higher tax capacity is consistent with arguments that sharing benefits of public spending is associated with greater public trust in government and willingness to pay taxes (Moore 2008). Although Tagem and Morrissey (2023) did not find that vertical accountability was a significant direct determinant of tax capacity, it was correlated with equal distribution of resources. As determinants of tax performance differ from those of tax capacity, and political variables are only robust for the latter, our prior is that the principal direction of effects is from tax helping to improve accountability rather than vice versa (but we will allow for reverse causality). This is consistent with a related literature where Ricciuti et al. (2019a, 2019b) show that various indicators of tax and fiscal administrative capacity are associated with greater constraints on the executive and are conducive to improved governance and state capacity, and that constraints on the executive are positively associated with the tax/GDP ratio (Ricciuti et al. 2019b: 376).

This paper contributes to the literature on fiscal capacity and taxation by directly examining the effect that taxation has on accountability and finds that tax revenue correlates positively with accountability scores. We also assess the contributions of the main sub-components of total tax—income taxes, taxes on goods and services, and trade taxes—and find that direct (income) taxation is most strongly correlated with improvements in accountability. Total indirect tax revenue, but not individual components, is also positively associated with accountability. To address omitted variable bias and reverse causality concerns, an instrumental variable (IV) strategy following Morrissey et al. (2016) is employed using external instruments for tax revenue based on terms of trade (ToT) and exchange rate shocks, assuming that these shocks impact on tax revenue but do not directly affect accountability. The IV confirms the results, suggesting a causal interpretation for the relationship between taxation and accountability. We also include a heteroskedasticity-based IV following Lewbel (2012); this improves efficiency, especially if the external instruments are weak, and supports the inference that tax affects vertical accountability. Finally, we show that the magnitude of the effect of taxation is comparable to that of alternative predictors of accountability.

Section 2 reviews the literature on taxation and state/fiscal capacity, including the role of accountability, with a focus on developing countries and especially SSA. Section 3 presents the data and Section 4 outlines the empirical strategy. The results, including the IV estimation and several robustness checks, are presented in Section 5. Section 6 puts the effect of taxation into perspective by considering a few country-specific examples and comparing the explanatory power to that of alternative indicators. Finally, Section 7 summarizes the findings to argue that there is evidence that increases in taxation in SSA have supported improvements in vertical accountability, consistent with a tax bargain generating improvements in electoral participation and quality.

¹ McNabb et al. (2021: Table 1, pp 3–4) summarize the results of studies on determinants of tax revenue, and find that corruption is the only governance variable that is regularly significant.

2 Fiscal capacity, taxation, and accountability

The core proposition that this paper examines is that higher levels of taxation bring about more accountable governments in SSA. While the relationship between taxation and state capacity-building is complex (Moore 2004, 2008, 2015; Prichard 2015), the core of the argument is intuitive. Every government needs revenue. If a government has to raise its revenue from taxing its subjects, it can try to coerce them into paying or encourage (quasi) voluntary compliance. Coercive taxation encourages evasion, so authorities will accept a bargaining process in which taxpayers trade compliance in return for more scrutiny over how the money is spent and raised. This tax bargaining will not only make the ruler more responsive to taxpayers but taxpayers will also demand increased accountability to institutionalize the ruler's responsiveness. Tax bargaining can be direct, in the sense that there is an explicit negotiation and clear exchange (Moore 2008; Prichard 2015) but it is more likely to be indirect. Prichard (2015) distinguishes two forms of indirect tax bargaining: taxpayer resistance and the strengthened political capabilities of taxpayers. The first refers to active avoidance when taxpayers lack the means to negotiate, for example because of collective-action problems. This resistance could undermine the fiscal position of the government, creating incentives for it to make concessions. The second involves the idea that taxation engages taxpayers by raising their stakes in the political process. It could encourage them to coordinate and overcome collective-action problems, potentially strengthening civil society and longer-term political mobilization. The end result of either is that the state becomes more responsive and accountable.

The argument presupposes that governments need taxation to meet their revenue requirements. However, many SSA countries have access to alternative sources of revenue—either in the form of natural resource rents or aid. If this lowers the need to tax, then it might equally reduce tax performance and lower incentives to improve governance and accountability. Countries with access to resource rents have less incentive to increase taxes, and natural resource revenue has been linked with economic mismanagement and a 'political resource curse' (Ross 1999). In contrast there is little convincing evidence that aid has a negative impact on taxation; observed correlations can be explained by poorer countries having lower tax revenue and receiving more aid (Morrissey 2015). As aid is monitored by donors, governments that wish to retain control over how revenues are used are more likely to rely on resource revenues than aid (Altincekic and Bearce 2014).

Besley and Persson (2011) argue that the ability of the state to implement beneficial policies that are conducive to growth and public welfare is related to fiscal capacity (to raise tax revenue) and legal capacity (to enforce contracts and property rights) so that effective checks and balances on executive power support state capacity by encouraging governments to serve the public interest. Following this view of state capacity, Ricciuti et al. (2019a) test the proposition that the administrative capacity of states for public financial management (PFM) (to design, implement and monitor the budget) is enhanced by greater constraints on the executive (from Polity IV, averaged over 1965–2004). They use public expenditure and financial accountability (PEFA) data for up to 47 developing countries over 2005–13 for indicators of administrative capacity.² The results support the hypothesis that constraints on the executive increase administrative capacity in terms of PFM. In a companion paper Ricciuti et al. (2019b) find that indicators of fiscal capacity

² Four indicators of PFM administrative capacity are used: i) the ratio of actual (out-turn) to budget total primary expenditure; ii) the consistency of the composition of actual with budget primary expenditure over previous three years; iii) the ratio of actual to budget revenue; and iv) the quality of public debt management (Ricciuti et al. 2019a: 978–79).

which capture impartiality and effectiveness are positively associated with constraints on the executive, implying that ‘creating mechanisms of accountability and placing constraints on rulers facilitate the existence of a fiscal bargain’ (Ricciuti et al. 2019b: 361).³ This paper considers the related question of how taxation affects accountability.

Accountability, an institutionalized system through which rulers justify their actions to citizens and through which citizens can reward or punish rulers (Schedler 1999), is a precondition, rather than just a constituent element, for full democracy (Lindberg 2013; Lührmann et al. 2020). In principle democracy is not necessary for accountability, although measures to improve accountability have contributed to the process of democratization in SSA (Bratton and Van de Walle 1997; Lindberg 2006). Some measures of accountability are very similar to measures of democracy. This is especially true of the measure we use—vertical accountability—as it is based on indicators of the quality of elections and political competition (see Appendix A). It is therefore closely related to measures of electoral democracy but distinct from other types such as horizontal or diagonal accountability (Lührmann et al. 2020). Vertical accountability between citizens and the state enhances the responsiveness of the state—the ability to meet citizens’ needs. While rulers may respond to public pressure such as tax protests by concessions without improving accountability, responsiveness creates pressures to institutionalize accountability mechanisms (Prichard 2015).

In practice taxpayers will try to hold government accountable by exerting demands on features of specific taxes or the tax structure, or for public spending to provide services, often through lobbying or direct engagement. Evidence on this is limited given the difficulty of getting data for empirical analysis. Qualitative studies, such as Prichard (2015) on Ghana, Kenya, and Ethiopia, provide strong narratives about these links in particular cases. For Somaliland, Eubank (2012) presents evidence that dependence on local tax revenue provided those outside government with the necessary leverage to press for inclusive, representative, and accountable institutions. Some recent studies take an experiment-based approach. Weigel (2020), in the context of a field experiment in a city in the Congo for a property tax collection campaign that increased compliance, finds that citizens demand a greater voice in the government when they are being taxed. In general, how taxpayers respond will depend on their perceptions of the tax cost to them—the greater the perceived burden, the greater the response of taxpayers. In the literature this is commonly addressed in terms of tax visibility. A lab-in-the-field experiment in Uganda by de la Cuesta et al. (2023) finds that when indirect taxes are less visible they have a much lower effect than (visible) direct taxes on the willingness of citizens to pay to punish leaders, interpreted as evidence that visibility drives taxpayer demands for accountability. They support this with survey experiments and observational data showing greater uncertainty about the burden of indirect taxes, underreporting of whether they pay indirect taxes, and that common indirect taxes, once established (in place for long enough that awareness has dissipated), are not highly visible to Ugandan citizens.

The argument that the effect of taxation on accountability will vary according to how visible a tax is—taxpayers’ knowledge and perceptions of the amount of tax they pay determine attitudes towards taxes (Gemmell et al. 2004)—has been recognized since at least Buchanan (1967) and

³ Constraints on the executive are again from Polity IV (averaged over 1965–2004 and 2000–04) and the PEFA data are over 2005–13. Two PEFA variables are used as indicators of the impartiality of the tax system (transparency of information for taxpayers and functioning of the tax appeals system—both are positively correlated with tax/GDP) and four as indicators of effectiveness or coercive aspects (controls for taxpayer registration, quality of tax audits, penalties for non-compliance, and collection efficiency), also positively correlated (weakly for the last two) with tax/GDP (Ricciuti et al. 2019b: 355–57).

Wagner (1976) as a basis of the fiscal illusion literature which argues that voters systematically underestimate their tax burdens (and demand more public expenditure than in a full information setting). Cullis and Lewis (1985), using survey data, confirmed that voters have limited knowledge of sources of government revenue and tax burdens, and that income tax is the relatively ‘visible’ tax. However, the importance of the relative visibility of taxes may be overstated in the context of the effect of the tax/GDP ratio on indicators of accountability at an aggregate level, the level of analysis to which cross-country studies are restricted. Two related issues are of particular relevance. First, at a general conceptual level, one is interested in the motivations of the median voter (or median taxpayer)—the greater their tax burden, the greater the incentive to hold government accountable—and if the median voter-taxpayer is motivated to act this may be observed in country-level measures of accountability. Even if not explicitly stated, the median voter-taxpayer concept underpins cross-country studies of tax/GDP and aggregate indicators of accountability.

Second, it is the perceptions of the tax burden that provide motivation. The usual assumption is that less visible taxes are less likely to be perceived by taxpayers, or at least the tax cost is underestimated. This may not matter at the country level—if the perceived tax burden (of more visible taxes) is sufficient, the median voter will want to hold government responsible and this will encourage accountability, even if they underestimate the burden of less visible taxes. Even if a relatively small proportion of the electorate pay direct taxes, the effect at the median may be to promote accountability, especially if these are the more politically important taxpayers (either as voters or through lobbies such as business groups and entrepreneurs). It is not necessarily the case that direct tax burdens are perceived more accurately than indirect taxes, especially in an environment where taxpayers are informed. Gemmell et al. (2004) assess the accuracy of voter-taxpayer tax-cost perceptions using data from the 1995 British Social Attitudes Survey and show a systematic bias towards overestimation of both income and expenditure tax (value-added tax (VAT)) liabilities, with slightly greater overestimation of VAT liabilities (this is contrary to what may be expected for less visible taxes and may be due to media coverage of increases in VAT rates at the time of the survey as perceptions are influenced, and can be manipulated, by information). Analysis of voters’ tax structure preferences are found to be determined by self-interest (favouring tax reforms they believe will cost less for them) but are distorted by tax misperceptions (so many voters prefer the ‘wrong’ tax reform). What matters most for pressure on accountability is whether or not (median) taxpayers believe they bear a high tax burden, which is likely the case when tax/GDP is increasing, irrespective of the composition of tax revenue.

Nevertheless, taxes on income are the most visible. Sales taxes are less visible, especially where a tax like VAT is embodied in the price, and trade taxes such as import tariffs are among the least visible (consumers may not even be aware of the effect on prices, although firms and businesses will be aware). Changes in the tax composition affect the visibility of taxes, with consequences for the relationship between taxation and accountability. In SSA since the 1980s there has been a steady decrease in the share of revenue provided by trade taxes, initially replaced by sales taxes (especially VAT), with the share of income taxes increasing since the 2000s (discussed earlier in Section 1), driven largely by external factors rather than responding to the demands of domestic taxpayers—e.g., VAT was promoted by the International Monetary Fund (IMF) (Dom 2018). The introduction of new taxes such as VAT, a potential catalyst for tax bargaining (Fjeldstad and Moore 2008), or increases in direct tax rates will have increased the visibility of taxes, which could support greater accountability.

Cross-country evidence for the link between taxation and accountability remains elusive. The body of quantitative evidence is small and often focusses on democracy indicators rather than accountability. Prichard et al. (2018) include NTR and provide evidence for a ‘political resource curse’ but are less conclusive on the role of taxation, while Kato and Tanaka (2018) find a positive effect of the introduction of VAT on democratization. Baskaran and Bigsten (2013) find no

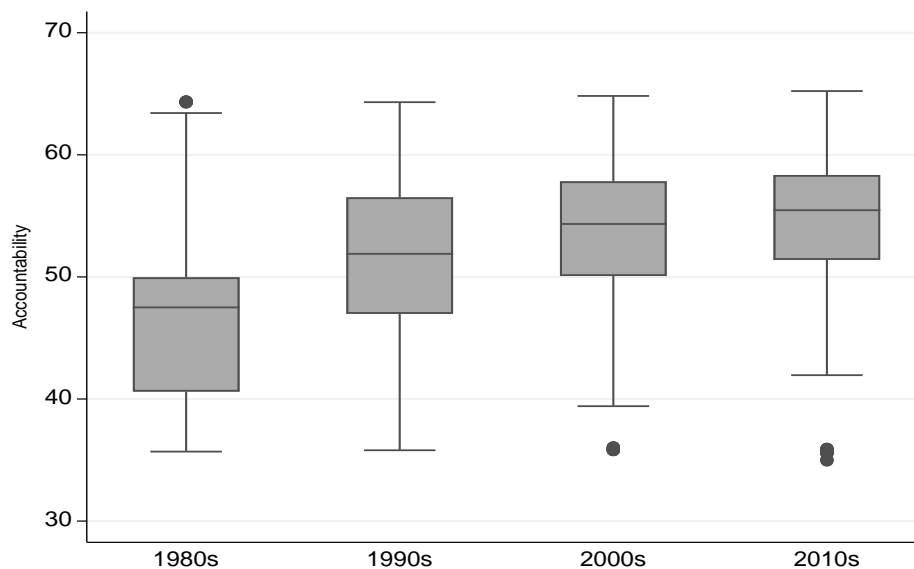
evidence for an impact of taxation on the quality of government, although their indicator is not specifically accountability.

From this review of the literature two sets of hypotheses arise. The general prediction is that there exists a positive correlation between taxation and accountability. Government will ‘buy off’ taxpayers’ compliance by becoming more responsive and accountable. In contrast to Baskaran and Bigsten (2013) and Prichard et al. (2018), we directly test this argument by focussing on (electoral) accountability instead of broader governance or democracy indicators. A second set of predictions involves the composition of taxation. If citizens’ political engagement depends on the salience of a tax and salience varies across different types of taxes, then we should expect the relationship between accountability and taxation to vary accordingly. More specifically, accountability scores should respond more to changes in direct taxation than to changes in indirect taxation on the grounds that the former are more visible.

3 Data overview

Estimation is based on a balanced panel dataset of 47 SSA countries covering the period 1980 to 2019. Definitions of variables, summary statistics, and a list of the countries included can be found in Appendix A. Data on accountability is taken from the Varieties of Democracy (V-DEM) database, version 13 (Coppedge et al. 2022). The core analysis uses the Vertical Accountability index (*v2x_veracc*) introduced by Lührmann et al. (2020) which focuses on the relationship between citizens and their elected representatives to capture the extent to which citizens have the power to hold the government accountable, rescaled from the original (-5 to 5) to range from 0 to 100. The mechanisms of vertical accountability include formal political participation on the part of citizens, such as being able to freely organize in political parties and participate in free and fair elections, including for the chief executive (see Appendix Table A4).

Figure 1: Boxplot of vertical accountability per decade



Note: boxplots of the vertical accountability scores per decade display the interquartile range (between 25th and 75th percentiles) and the median. The ends of the whiskers represent the upper and lower values within 1.5 times the interquartile range beyond the 25th and 75th percentiles. Any points beyond this are considered outliers and receive their own markers.

Source: authors' construction.

Figure 1 gives boxplots for this index per decade. It is clear that since the 1980s accountability scores have improved across SSA. The median accountability value moved from around 47 in the 1980s to around 53 in the 1990s, and on to 58 in the 2010s. However, significant variation remains. Over the first two decades scores ranged from 35 to 65, with Mauritius and Botswana being upper outliers in the 1980s, but by the 1990s Mauritius was no longer an outlier as African countries further democratized. While median accountability scores stabilized towards the end of the 2010s, variation reduced further with scores ranging from 42 to 65—Eritrea being the sole lower outlier with an average score of 36 from 2010 to 2019. This is preferred to the World Bank’s Voice and Accountability Index (Kaufmann et al. 2010) due to the longer time series, wider coverage, and being closer to the concept of accountability we wish to capture.

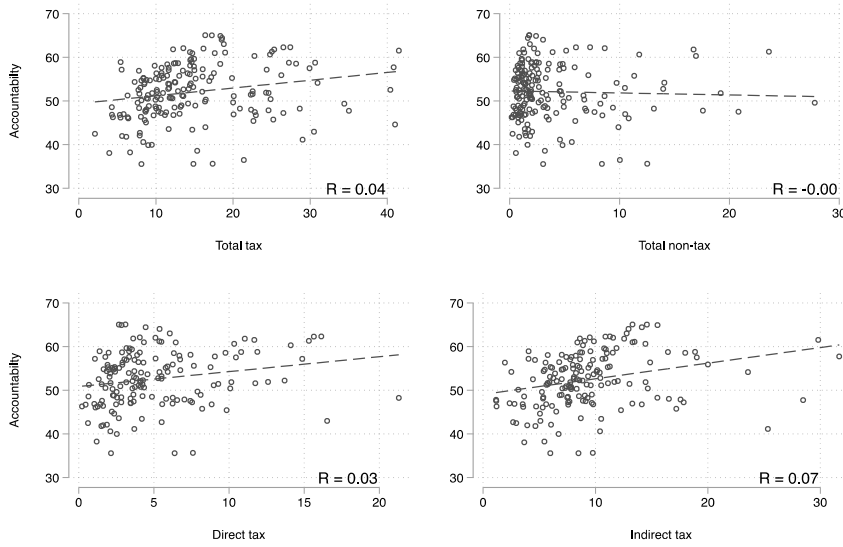
Tax data are obtained from the Government Revenue Dataset (GRD) given its coverage, scope, and consistency (Prichard 2016). We focus on the central government total revenue and total tax and incorporate the main components—direct tax revenue, indirect taxes (taxes on goods and services, trade taxes), and total NTR (proxy for natural resource revenue). Total tax revenue includes resource and non-resource tax revenue, the latter of which may be more useful in econometric analysis of tax performance. However, including the resource-related component to total taxes (almost all of which comes from corporate taxation of resource extraction) is important as it may influence accountability and responsiveness. Total revenue comprises tax and NTR, the latter distinguishable between the resource components (e.g., oil or mining royalties and production-sharing agreements) and non-resource components (e.g., sales of telecommunications licences, fines, and charges due to tax violations). Total natural resource rents are the sum of rents from oil, natural gas, coal (hard and soft), mineral, and forest, with the base obtained as the difference between the value of production at regional prices and the costs of production.⁴ Additional variables are used as instruments or to control for other confounding factors. Summary statistics, definitions, and sources of the variables can be found in Appendix Tables A1–A3.

Figure 2 provides simple bivariate scatter plots using country–decade observations for the entire period of the dependent variable, accountability, and four revenue measures: total tax, total NTR, direct tax revenue, and indirect tax revenue. Total tax correlates positively with accountability scores, whereas total NTR correlates negatively, but only weakly. Direct and indirect taxes seem to correlate positively with accountability scores. Figure 2 highlights two other features. First, there is significant heterogeneity even for countries with similar revenue levels. For example, for countries that raise around 17 per cent of GDP in tax revenue, the accountability score ranges from below 40 to around 65. Second, there appear to be a number of outliers. With respect to total NTR, Equatorial Guinea, the Republic of Congo, and Botswana are the only countries to consistently surpass 20 per cent of GDP (with a few observations for Eritrea and São Tomé and Príncipe). For direct tax revenue the Republic of the Congo and Angola are the two countries in the lower right quadrant that combine relatively high revenue with low accountability scores. Finally, Eswatini, Lesotho, Namibia, and the Seychelles are the four countries to consistently collect more than 20 per cent of GDP as indirect tax revenue (but are unlikely to significantly

⁴ See Oppel et al. (2021) for a definition of taxation variables. For countries defined as resource-rich, both NTRs and resource rents will be high since the resource component of NTR will dominate the non-resource component. For non-resource-rich countries, non-resource components will dominate NTRs and total resource rents will be negligible.

influence the observed correlations).⁵ Of course these plots are merely descriptive and unconditional, so do not account for other factors.

Figure 2: Scatter plots of tax and accountability



Note: the figure displays the scatter plots of the vertical accountability index with total taxation, non-tax revenue, and direct and indirect tax revenue for the full sample 1980–2019. It also fits a linear regression line and shows the R^2 value. The scatter plots are based on country-decade observations.

Source: authors' construction.

4 Empirical strategy

The baseline model is a standard fixed effects (FE) estimator, with ordinary least squares (OLS) estimates for comparison. The baseline FE model has the following specification:

$$Acc_{it} = \alpha_i + \delta_t + \beta_1 Tax_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (1)$$

where Acc_{it} is the vertical accountability score for country i in period t , Tax_{it} is the independent tax variable of interest, and β_1 captures the effect on accountability. The tax variables are all measured as shares of GDP and interpreted as an average effective tax rate; β_1 can be interpreted as what would happen if the average tax rate changed. Regressions include a full set of country FEs, α_i , to account for country-specific time invariant unobservables, year FEs δ_t to account for global developments which affect countries similarly, a vector of control variables X_{it} , and ε_{it} is the standard error term.

The main control variables are income and NTRs. Tax effort and revenues are closely related to the level of economic activity and development (Besley and Persson 2013; Bräutigam et al. 2008).

⁵ Eswatini, Lesotho, and Namibia rely considerably on revenues from the Southern African Customs Union (SACU) with South Africa. SACU members share a common external tariff policy, freely exchange goods internally, and distribute among themselves the pool of excises and customs collected by the union. VAT is the largest source of revenue in Seychelles (OECD/AUC/ATAF 2021 shows that in 2017, VAT accounted for a third of total tax revenues in Seychelles).

If national income also correlates with accountability scores, then this would cause omitted variable bias. However, Englebert and Dunn (2013) find that although income is usually one of the most significant predictors of democracy, it does a poor job at predicting democratization in African countries. Nevertheless GDP per capita is included. A measure of official development assistance is included as aid could have consequences similar to other forms of non-tax income. It might lessen the need for taxation, thus reducing the scope for revenue bargaining (Moore 2008). Alternatively, donors might disburse aid strategically to reward democratization (Kersting and Kilby 2014), development aid (and democracy aid) can positively impact democratic outcomes (Niño-Zarazúa et al. 2022), or more generally aid may support domestic resource mobilization (Morrissey 2015). Omitting aid would risk biasing the coefficient on tax. Finally, a quadratic term is included for tax revenue to capture potential non-linearities in the relationship between tax and accountability.

Tax revenue might be endogenous, resulting in inconsistent FE estimates. Considering (1), endogeneity concerns may arise in two ways. The estimate of β_1 will be biased if the tax variable is correlated with the error term. This may arise if tax is correlated through past accountability scores, so we also estimate an FE lagged dependent variable (FE-LDV) model to ensure that tax levels are (conditionally) uncorrelated with past accountability scores:

$$Acc_{it} = \alpha_i + \delta_t + \beta_1 Tax_{it} + \beta_2 X_{it} + \gamma Acc_{i,t-1} + \varepsilon_{it} \quad (2)$$

where g captures the effect of the lagged dependent variable. This somewhat changes the interpretation of β_1 , as it now only captures the short-run effect of tax on accountability. The FE-LDV is not asymptotically consistent when T is small but as each country is observed on average 37 times, the bias is likely to be negligible (Judson and Owen 1999).

4.1 Instrumental variable approach

As contemporaneous reverse causality (i.e. that accountability has a direct effect on the level of taxation) is possible, we also use an IV estimator to address endogeneity. The purpose of the IV is to use only that part of the variation in the tax variable that is uncorrelated with the error term by finding an instrument that predicts tax but is unrelated to accountability. The IV strategy exploits exogenous shocks to tax revenue following Morrissey et al. (2016), who find that tax revenue performance in developing countries is impacted by (exogenous) ToT and exchange rate shocks. Assuming that these shocks are uncorrelated with accountability scores, conditional on the included controls, they can be used as valid instruments. To ascertain the suitability of the IV empirical strategy, we provide two key tests of validity. First, we include the p -value for the Hansen J test of over-identifying restrictions to test for instrument validity. The null hypothesis is that the instrument set is valid and the model is correctly specified, with a rejection of the null casting doubt on the validity of the instruments. Second, we test the informativeness of the instrument, the weak identification test. The null hypothesis is that the instruments are weak, with a rejection of the null—judged by values of the Kleibergen-Paap (KP) F statistic⁶ being greater than the critical values provided by Stock and Yogo (2002)—indicating a strong correlation between the instrument(s) and the endogenous regressor(s).⁷

⁶ The Kleibergen-Paap F statistic is preferred because the Cragg-Donald Wald statistic is not valid where the independent and identically distributed (*i.i.d*) assumption is violated, as implied by using robust standard errors.

⁷ We also include the p -value of the endogeneity test for the null hypothesis that the purported endogenous variable (i.e. tax revenue) is exogenous. Rejection of the null hypothesis at conventional levels lends credence to the IV strategy.

The exchange rate pressure index (ERPI) proxies for export demand and foreign capital flow shocks, defined as a weighted average of percentage changes of two policy variables—the exchange rate in local currency units (E) and the size of the reserves (RES)—constructed as (Morrissey et al. 2016: 1,693):

$$PI_{it} = W_{E,i} \frac{\Delta E_{it}}{E_{i,t-1}} - W_{RES,i} \frac{\Delta RES_{it}}{RES_{i,t-1}} \quad (3)$$

where PI_{it} is the pressure index in year t in country i , and $W_{E,i}$ and $W_{RES,i}$ are country-specific weights defined as $W_{E,i} = \frac{\sigma_{RES,i}}{\sigma_{RES,i} + \sigma_{E,i}}$, $W_{RES,i} = \frac{\sigma_{E,i}}{\sigma_{RES,i} + \sigma_{E,i}}$. Here, $\sigma_{RES,i}$ is the standard deviation of RES_{it} in country i in 1980–2015, $\sigma_{E,i}$ is the same for E_{it} . To reduce the impact of outliers, the pressure index is transformed:

$$ERPI_{it} = \text{sign}(PI) \times \log(1 + |PI|) \quad (4)$$

The ERPI captures the logic that in response to an adverse balance of payment shock a country can employ two strategies: allow the exchange rate to depreciate or use international reserves to defend the exchange rate. Insofar as exchange rate pressures are linked with trade and capital outflows, they will affect direct taxation through their impact on corporate and personal incomes and can affect indirect tax revenues through exchange rate pass-through to prices.

The second exogenous shock is a ToT index defined as the percentage ratio of the export unit value indices to the import unit value indices measured relative to the base year 2000. This index thus measures the relative prices of a country's exports and imports. When a country's net ToT index increases, its exports become more expensive or its imports become cheaper. As such, ToT shocks are most likely to influence trade taxation, although increased import or export prices might also affect corporate income taxation and indirect taxes via pass-through to prices.

These two instruments are employed to estimate β_1 in a two-stage least squares (2SLS) model, given by:

$$\begin{aligned} Acc_{it} &= \alpha_i + \delta_t + \beta_1 Tax_{it} + \beta_2 X_{it} + \varepsilon_{i,t} \\ Tax_{it} &= \theta_i + \mu_t + \pi_1 ERPI_{it} + \pi_2 ToT_{it} + \pi_3 X_{it} + v_{it} \end{aligned} \quad (5)$$

Equation (5) is identical to the linear model above, except now taxation is treated as endogenous and instrumented by ToT and exchange rate shocks. If the IV strategy is successful, the coefficient β_1 on tax can be given a causal interpretation. For this, two conditions must be fulfilled. First, the instruments must be related to tax revenue; this is tested and fulfilled—at least for one of the instruments (ERPI).

Second, the instruments should not have any direct effect on the accountability scores. The construction of the instruments makes this plausible as they capture relative changes, the short-term impact of economic shocks on tax revenue. While the assumption that shocks are independent of accountability (the exclusion restriction) cannot be tested explicitly, it is intuitively plausible. The measure of vertical accountability captures the ability of citizens to ensure government responsiveness to public demands through the extent of political participation, measured with indicators of the extent of the franchise, the quality of elections, and competition between political parties. Our assumption is that external shocks can have a direct effect on current tax revenue, as found in Morrissey et al. (2016), but not a direct effect on the quality of elections or party competition. An exception is where a shock, especially a severe one, coincides with an

election period and the fear that the outcome may be affected induces the government to interfere with elections and/or restrict party competition. In this case the shock would be associated with a reduction in accountability, which we test.

Such cases are likely to be relatively rare, requiring severe shocks and elections to coincide, and the literature suggests few reasons to believe that exchange rate or ToT shocks directly influence accountability levels. Broader economic crises have been linked to regime change, and economic shocks can affect democratization processes. Military regimes, for example, are more likely than one-party states to democratize following exogenous economic shocks (Geddes 1999), while Teorell (2010) provides evidence that economic shocks measured as growth rates are related to democratization. As vertical accountability is a component of electoral democracy, this would be a concern if economic shocks affect democracy (accountability) other than through taxation. To allow for this possibility, the growth rate is included as a control variable to proxy for economic crises. The ToT shock would be a poor instrument if trade volumes have an effect on electoral democracy (Rigobon and Rodrik 2005; Teorell 2010), even if it is more likely that democracy facilitates increased trade and foreign direct investment (Asiedu and Lien 2011). Given this concern a measure of trade openness is also included in the IV estimation, although evidence suggests that any link is between levels of trade and democracy, whereas the identification strategy relies on shocks.

We also implement an IV strategy with internally generated instruments based on heteroskedasticity in error terms (Lewbel 2012). Identification is achieved by using regressors that are uncorrelated with the product of heteroskedastic errors. Consider the system of equations:

$$\begin{aligned} Acc &= X'\beta + \delta Tax + \varepsilon_1; & \varepsilon_1 &= cU + V_1 \\ Tax &= X'\alpha + \varepsilon_2; & \varepsilon_2 &= U + V_2 \end{aligned} \quad (6)$$

$$E[X\varepsilon_1] = 0; E[X\varepsilon_2] = 0; Cov[Z, \varepsilon_1\varepsilon_2] = 0; Cov[Z\varepsilon_2^2] \neq 0$$

where X represents the control variables included in the regression, U represents potential (unobservable) omitted variables that affect both vertical accountability and tax revenues, and V_1 and V_2 are random error terms. The method, which exploits information contained in heteroskedasticity of ε_2 to construct valid instruments for tax revenue, proceeds in two steps (Baum and Lewbel 2019). First, estimate $\hat{\alpha}$ by OLS linear regression of tax on controls and obtain estimated residuals $\hat{\varepsilon}_2 = tax - X'\hat{\alpha}$. Second, estimate β and δ by an ordinary linear 2SLS regression of Acc_{it} on controls and Tax_{it} using X and $(Z - \bar{Z})\hat{\varepsilon}_2$ as internal instruments, where \bar{Z} is the sample mean of Z (Z is a subset of X or $Z = X$). The standard exogenous assumptions for identification and estimation apply, in addition to $Cov[Z, \varepsilon_1\varepsilon_2] = 0$ and $Cov[Z\varepsilon_2^2] \neq 0$ which are necessary for applying the Lewbel (2012) method. As heteroskedasticity-based instruments are less efficient than external instruments (because they are generated using higher moments) they are applied along with external instruments (the ERPI and ToT shocks) to improve the efficiency of the IV estimator (Baum and Lewbel 2019).

5 Estimates and extensions

The hypothesis tested in section 5.1 is that taxation positively affects accountability scores. This expectation follows from the governance dividend argument that rulers will institutionalize accountability mechanisms in exchange for (quasi) voluntary compliance by taxpayers. Subsequent

sections test whether direct taxation has a greater effect on accountability than indirect taxation, to the extent that the salience and visibility is greater; apply the IV strategies; and summarize robustness analyses (reported in Appendix C).

5.1 Baseline models

The baseline results of regressing accountability on total tax with controls including total NTR (excludes aid) are presented in Table 1. The dependent variable in all regressions is the vertical accountability score. Conditioning on NTR implies that we are examining the effect of tax on vertical accountability while keeping the level of NTR constant, a control for the ‘political resource curse’ argument that accountability might be affected by unearned income. A parsimonious OLS estimate is in column [1] and the specifications become more demanding as additional controls are added in columns [3]–[5]. Column [2] introduces the country and year FEs, while the lagged dependent variable is added in columns [4] and [5]. Standard errors are robust to heteroskedasticity and clustered at the country level in the FE models.

Table 1: Effect of taxation on accountability

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Tax	0.162*** (0.021)	0.232*** (0.053)	0.201*** (0.054)	0.076*** (0.016)	0.083*** (0.029)
NTR	-0.133*** (0.037)	-0.033 (0.053)	-0.012 (0.059)	-0.016 (0.019)	-0.010 (0.021)
GDP per capita			0.558 (0.914)		0.125 (0.246)
Aid (% GNI)			0.594* (0.328)		0.173 (0.112)
Tax ²			-0.000 (0.000)		-0.000 (0.000)
L.Acc				0.733*** (0.029)	0.714*** (0.029)
LT effect				0.283	0.289
N	1,639	1,639	1,526	1,616	1, 508
Groups	47	47	47	47	47
Adj. R ²	0.040	0.398	0.379	0.733	0.708

Note: except for [1], all regressions include country and year FEs. Robust standard errors in parentheses (**p ≤ 0.01, *p ≤ 0.05, *p ≤ 0.1), clustered at the country level for [2]–[5]. NTR is non-tax revenue and both GDP per capita and aid (% GNI—gross national income) are in natural logs. L.Acc is one-year lagged accountability; LT is the long-term effect calculated as $b_1/(1-\gamma)$.

Source: authors’ construction.

The results are relatively stable across the different specifications. All estimations show a positive and significant correlation between tax and accountability.⁸ According to the simple OLS, a one percentage point increase in tax revenue, holding total NTR constant, is associated with a 0.16 increase in the vertical accountability score. The magnitude of this effect grows when we move to the FE estimator, suggesting that unobserved country-specific or year-specific factors lead to a downward bias in the OLS result. The FE estimate is statistically significant at about 0.2. In the FE-LDV models the magnitude of the coefficient decreases to about 0.08 but remains statistically significant. This sharp drop is to be expected, as the coefficient in the LDV model corresponds

⁸ Using resource rents in place of NTR yields almost identical results (only significant for OLS)—see Appendix Table B1. Similar results are also obtained using total revenue rather than tax except that NTR is consistently negative significant and aid is positive weakly significant (Table B2); results for revenue are weaker using resource rents in place of NTR (Table B3).

to the short-run effect (implying a fairly immediate response), while the OLS and FE estimators capture the unrestricted long-term effects. The long-term effect implied by the FE-LDV estimates (the LT effect) at almost 0.3 is greater than the FE estimates.

With respect to the control variables, the general absence of any significance is noteworthy, even though the models were not explicitly constructed to identify determinants of accountability. Lagged accountability is the only consistently significant control across the models, implying significant persistence in the accountability measure. While the estimates on NTR suggest a negative correlation, as predicted by theory, the coefficient is only significant in the OLS model. In contrast to Prichard et al. (2018), the results here do not provide support for a ‘political resource curse’ (although they do if total revenue is used instead of tax, as the coefficient on NTR is negative and significant—see tables B2 and B3). Per capita income levels do not appear to be significant in any of the specifications, consistent with Englebert and Dunn (2013), and the quadratic term is also insignificant. The point estimate on aid is significant in one of the models (and just at 10 per cent).

The estimates from [2] indicate a long-term impact of taxation on accountability of a 0.23 per percentage point increase in the tax-to-GDP ratio. At face value this implies that if, for example, Burundi, which had an average tax ratio of 13.8 per cent during the sample period, were to increase its level of tax revenue to that of Eswatini, which had an average rate of 21.6 per cent, Burundi could improve its vertical accountability score by around 1.82 points. Since Burundi’s average vertical accountability score was 46.96 during the sample period, the results suggest that by increasing the tax ratio by about 7.8 percentage points Burundi could reach a level of vertical accountability on par with Mozambique (average score 48.83). However, to reach Botswana’s level of vertical accountability (average of 61.35), Burundi would have to raise its tax ratio to 50.8 per cent (obviously tax revenue is not the main determinant of accountability levels). Another way to look at this is to assess how much of the in-sample increase in accountability can be explained by taxation over the sample period. The average tax ratio increased from 11.95 per cent in 1980 to 15.24 per cent in 2019, a 3.29 percentage point rise. This translates into an expected 0.76 increase in the average accountability score. On average, the accountability score for SSA improved by 7.05 points over the period; increases in taxation can only account for about 10 per cent of this improvement.

These calculations should be viewed as illustrative only. Different specifications will give rise to different results, and the simple use of point estimates ignores standard errors and the specifications here provide for limited non-linearity. Moreover, the results from the estimations are average effects and mask possible heterogeneous effects. Overall, the effect is small (which is not surprising) but suggests that taxation is positively linked with accountability in both the short and long terms.

5.2 Decomposing the effect of taxation

The relationship between taxation and accountability is not necessarily uniform across different types of taxes. It could depend on the visibility and salience of a tax and, as observed above, how accurately taxpayers know the tax cost. Indirect taxes, such as VAT, are argued to be less visible than direct taxes and therefore less likely to stir up resistance and thus to provoke tax bargaining. The introduction of VAT or increases in the rate may be an exception, although there is likely to be a difference between the visibility of an announced (major) tax reform and perceptions by taxpayers of the burden of tax rates. The specifications used in this analysis are not set up to capture the effect of a tax reform but rather to capture the effect of a change in the aggregate rate; in effect the test is for differences between marginal changes in tax rates.

Table 2 replaces total tax revenue with its main sub-components: direct tax revenue and indirect tax revenue, with the latter comprising revenue from goods and services taxes (GST) (primarily VAT) and trade tax revenue. All models include country and year FEs. Compared to the baseline models we lose one country, and later two countries, due to missing data on the sub-components of tax for Gabon and Djibouti. The first column includes the main sub-components: direct and indirect tax revenue are both significantly and positively related to accountability, but this is not the case when decomposing indirect tax revenue into GST and trade taxes. Across all models, direct taxation remains positively linked with accountability scores, with a coefficient estimate ranging between 0.3 and 0.4 in the long term and 0.10 to 0.12 in the short term. While the coefficient on indirect tax is statistically significant (and positive), neither GST nor trade taxes individually are statistically significant.⁹ Appendix Table B4 provides standardized coefficients for columns [1]–[3], showing that the magnitude of the effect of direct taxes is only slightly larger (0.17–0.21) than that of indirect taxes (0.16) in [1] and greater than the effect of aid in [3].

Table 2: Effect of different taxes on accountability

	[1] FE	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Direct tax	0.339*** (0.112)	0.385*** (0.105)	0.303** (0.124)	0.120*** (0.033)	0.104*** (0.038)
Indirect tax	0.205** (0.097)				
NTR	-0.028 (0.055)	-0.038 (0.075)	-0.008 (0.078)	-0.021 (0.025)	-0.014 (0.027)
GST		0.107 (0.179)	0.151 (0.182)	0.009 (0.064)	0.020 (0.069)
Trade taxes		0.184 (0.114)	0.192 (0.115)	0.045 (0.037)	0.049 (0.039)
GDP per capita			1.079 (1.461)		0.200 (0.416)
Aid			0.705** (0.319)		0.192 (0.123)
L.Acc				0.735*** (0.036)	0.718*** (0.037)
N	1,335	1,219	1,172	1,209	1,164
Groups	46	46	45	46	45
Adj. R ²	0.397	0.395	0.355	0.732	0.700

Note: as for Table 1 except L.Acc is one-year lagged accountability; GST is general sales tax and trade taxes are primarily tariffs. LT not reported as estimates are for tax components.

Source: authors' construction.

Overall, these results are not as clear cut as some theories might predict.¹⁰ The results are consistent with the story that direct taxation is felt particularly hard by taxpayers, who engage in tax bargaining as a consequence. However, the coefficient for indirect taxation is not significantly lower and, on aggregate, indirect taxes are positively correlated with accountability scores (perhaps because the businesses responsible for collecting and paying such taxes are aware and exert pressure on government to be accountable). This is consistent with our earlier argument that it is

⁹ In the underlying data it is not always possible to completely separate GST and trade taxes, as a large part of VAT is collected at the border in many SSA countries and might be counted as trade tax revenue.

¹⁰ Although consistent insofar as direct taxes have a (slightly) greater effect than indirect taxes, these results are not comparable to de la Cuesta et al. (2023), who use a global sample of 194 countries from 1980 to 2018 for extreme bounds analysis of several FE specifications for determinants of various governance indicators (including vertical accountability).

the general burden of taxation that provides motivation for accountability (both direct and indirect taxes tended to increase over time).

5.3 Instrumental variable approaches

Using the lag of the dependent variable does not exclude the possibility of contemporaneous reverse causality. To address this concern, tax revenue is instrumented using the ToT and exchange rate shocks.

Table 3: 2SLS estimation of effect of taxation on accountability

	[1] OLS-FE	[2] OLS-FE	[3] 2SLS-OLS	[4] 2SLS-FE	[5] 2SLS-FE	[6] 2SLS-FE
Panel A: 2SLS estimates						
Total tax	0.232*** (0.053)	0.156** (0.067)	0.728** (0.343)	0.594** (0.292)	0.580** (0.283)	0.509* (0.280)
NTR	-0.033 (0.053)	0.017 (0.083)	0.034 (0.058)	0.044 (0.057)	0.025 (0.055)	0.015 (0.050)
GDP per capita		0.793 (1.727)		-1.581 (2.249)	-2.994 (2.477)	-2.980 (2.562)
Aid (% GNI)		0.741** (0.306)		0.301 (0.391)	0.485 (0.339)	0.424 (0.344)
Exports					3.066*** (0.889)	3.022*** (0.824)
Imports					-2.028 (1.710)	-1.541 (1.730)
Agriculture						-0.093 (0.075)
N	1,639	1,327	1,203	978	978	935
Groups	47	44	39	36	36	36
Adj. R ²	0.398	0.346				
Endog test <i>p</i> -value			0.023	0.024	0.025	0.016
KP F-stat			9.30	33.16	30.56	16.23
Hansen J <i>p</i> -value			0.301	0.648	0.485	0.908
Panel B: First stage regression						
ERPI			-1.671*** (0.389)	-1.690*** (0.224)	-1.653*** (0.217)	-1.540*** (0.271)
Terms of Trade			-0.002 (0.009)	0.006 (0.008)	0.007 (0.008)	0.010 (0.010)
NTR			-0.066 (0.112)	-0.084 (0.156)	-0.069 (0.155)	-0.080 (0.159)
GDP per capita				5.531*** (1.801)	6.899*** (2.302)	7.454*** (2.607)
Aid (% GNI)				0.811*** (0.031)	0.662*** (0.247)	0.623** (0.263)
Exports					-2.230* (1.225)	-2.502** (1.235)
Imports					3.033*** (0.965)	3.105*** (1.015)
Agriculture						-0.037 (0.065)

Note: as for Table 1 except: Panel A presents 2SLS estimates instrumenting tax revenue with the ERPI and ToT shock indicator. Panel B presents the corresponding first stage estimates; Trade ([2] and [4]) and Growth ([2], [4]–[6]) included in both stages but are insignificant so not reported. Eight countries are excluded from the IV due to missing data on total reserves [required for ERPI]: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. Three more countries drop out for [4]–[6] due to estimation procedures: Liberia, Malawi, and São Tomé and Príncipe.

Source: authors' construction.

Table 3 includes both the first and second stage results, respectively panel B and panel A, the standard FE estimates (with and without controls) for reference, and the 2SLS estimates with and

without additional controls. The test statistics confirm the validity of the IV procedure. The p -value of the Hansen J test of over-identifying restrictions fails to reject the null hypothesis that the instrument set is valid, and the model is correctly specified. The Kleibergen-Paap F statistic is above the Stock and Yogo (2002) critical values, demonstrating the strength of the instruments, and the p -value of the endogeneity test permits rejection of the null hypothesis that tax revenue is exogenous. In contrast to Morrissey et al. (2016), the ToT shock does not appear to significantly impact tax revenue and does not pass the first validity test. However, the ERPI is strongly related to tax revenue and is not affected by the inclusion of the controls. At least one of the instruments significantly affects the independent variable of interest. Some control variables are consistently significant in the first stage: GDP per capita, aid, and imports (all in natural logs) are consistently positive while exports are negative (only exports are consistently significant in the second stage and are then positive).

Results from the second stage are provided in columns [3] to [6], respectively with and without controls, of Panel A in Table 3. Columns [1] and [2], also with and without controls, show the OLS-FE results for comparison. The sample size decreases when the controls are included due to missing data for Liberia, Malawi, and São Tomé and Príncipe. Again, taxation positively affects accountability and few control variables are significant. The 2SLS estimates of the coefficients on tax are larger, which suggests the OLS-FE is downward biased due to other unobserved time-varying factors and confirm the positive impact of taxation on vertical accountability scores. Moreover, they suggest a causal interpretation for the relationship between taxation and accountability.¹¹

As a test for the possibility that a shock coincides with an election period and causes the government to interfere with elections, thus potentially invalidating our IV strategy (such shocks would be associated with a reduction in vertical accountability as measured), we employ an interaction term IV where a measure of presidential elections is interacted with the two shocks.¹² The measure of presidential elections is from the V-Dem database (*v2xel_electpres*), a dummy variable which equals one for the year in which a country held a presidential election, and zero otherwise. The interaction terms change the interpretation of the coefficients in equation (5): b_1 captures the effect of taxation on accountability for countries with no presidential elections that year, while the coefficient on the interaction term—say $b_3(Tax_{it} * elections)$ —captures the difference in the tax–accountability relationship between countries with presidential elections in a particular year and all others. The linear combination $b_1 + b_3$ measures the effect of taxes on accountability in countries that held elections in that specific year.

The findings (Appendix Table B7) corroborate our main results: the second stage shows that tax remains significant (albeit weakly) with a much larger coefficient but the interaction and linear combination with elections are insignificant (although elections are significantly associated with higher accountability). For the first stage, the ERPI shock is significant (indicating that for countries without elections, ERPI impacts taxes) but elections and the interaction with elections are insignificant (ToT variables are also insignificant), confirming the validity of our 2SLS results.¹³

¹¹ Estimates using resource rents instead of NTR are in Table B5 and are similar but slightly weaker. Table B6 reports estimates for total revenue, which are again very similar.

¹² Presidential elections are more frequent and more important than parliamentary elections in SSA, so we consider these to be the best indicators of any effects of shocks on electoral accountability in election years.

¹³ The p -value of the endogeneity test permits rejection of the null hypothesis that tax revenue is exogenous and the p -value of the Hansen J statistic cannot reject the null hypothesis that the instrument set is valid, implying that the model is correctly specified (although the KP F statistic is inconclusive).

The significance of elections in the second stage only suggests that accountability is higher in election years, perhaps because indicators such as free and fair elections are measured, whereas the insignificance in the first stage implies no association of shocks with accountability in election years. Table B8 reports corresponding results for total revenue. While elections and interactions are again insignificant in the first stage and the linear combination is insignificant, validating the IV, in the second stage elections are positive and insignificant but the interaction with revenue is also significant and negative, implying that the revenue–accountability relationship was weaker (lower) for countries with presidential elections in a particular year compared to countries without an election.

Finally, we employ a limited-information maximum likelihood (LIML) estimator, which performs better than the standard 2SLS in the presence of weak instruments. The results, reported in Appendix Table B9, are very similar to the 2SLS model in Table 3.

Table 4: Heteroskedasticity-based IV estimation tax and accountability

	[1] Baseline	[2] Lewbel	[3] Lewbel EI	[4] Baseline	[5] Lewbel	[6] Lewbel EI
Panel A: 2SLS estimates						
Tax	0.728** (0.301)	0.190*** (0.050)	0.222*** (0.052)	0.580*** (0.186)	0.051 (0.046)	0.098** (0.046)
NTR	0.034 (0.042)	0.001 (0.029)	0.003 (0.029)	0.025 (0.047)	0.006 (0.041)	0.007 (0.040)
GDP Per Capita				-2.994** (1.519)	0.913 (0.816)	0.568 (0.799)
Aid (% GNI)				0.485* (0.264)	0.766*** (0.224)	0.741*** (0.222)
Growth				0.030 (0.032)	0.053 (0.033)	0.051 (0.032)
Exports				3.066*** (0.659)	1.883*** (0.450)	1.998*** (0.451)
Imports				-2.038** (0.882)	-0.434 (0.678)	-0.577 (0.675)
N	1,203	1,203	1,203	978	978	978
Groups	39	39	39	36	36	36
Hansen J statistic	3.68	35.30	47.18	1.86	28.02	36.81
Hansen J p-value	0.055	0.595	0.203	0.173	0.962	0.803
Panel B: First stage regression						
ERPI	-1.671*** (0.311)			-1.653*** (0.232)		
Terms of Trade	-0.001 (0.003)			0.007** (0.003)		
Non-tax	-0.066 (0.047)			-0.069 (0.057)		
GDP per capita				6.899*** (0.918)		
Aid (% GNI)				0.662*** (0.204)		
Growth				0.028 (0.032)		
Exports				-2.230*** (0.507)		
Imports				3.033*** (0.501)		

Note: as for Table 3 except standard errors are not clustered by country for consistency with Lewbel estimation. Columns: Baseline is the standard 2SLS-FE estimates (slightly different from [5] in Table 3 because not clustered); Lewbel applies Lewbel (2012) using only internal instruments; Lewbel EI uses both internal and external instruments. The internal instruments are generated as shown in the text: $(Z - \bar{Z})\hat{\varepsilon}_2$ (the first stage is not reported for internal instruments). The external instruments are ERPI and ToT shocks. The Hansen J statistic confirms the validity.

Source: authors' construction.

5.4 Placebo test—types of accountability

Another concern is that the accountability measure might be correlated with other aspects of governance, which may imply that our results are picking up taxation's effect on other governance indicators. To address this concern, we regress taxation on four other V-DEM indicators of accountability: diagonal, horizontal, judicial, and total accountability. Diagonal accountability captures oversight by civil society organizations and media activity; horizontal accountability refers to checks and balances between institutions; judicial accountability is a measure of the extent to which the judiciary is held to account; and total accountability measures the constraints through justification of government's actions and potential sanctions (full definitions in Table A3). These indices are all measured on the same scale as the vertical accountability index and, with the exception of judicial accountability, are highly correlated (Table A5). We estimate (2) to test the hypothesis that the relationship between taxation and governance operates through an effect on vertical accountability, between citizens and the state, but not through the other types.

Table 5 presents results based on the parsimonious FE-LDV model to allow for the fact that there is significant persistence in most governance indicators, with robust standard errors clustered at the country level. All estimates except for vertical accountability are statistically insignificant (this is also the case with resource rents instead of NTR, see Table B11). This is consistent with the theoretical predictions and addresses the concern that our previous estimates might have been biased due to correlation between the dependent variable and other governance indicators. Table 6 shows that this also holds for total revenue—the significant effect is only on vertical accountability (this is also the case with resource rents instead of NTR, see Table B12). Note that for both tables, the coefficients on lagged accountability are much larger for the other measures than for vertical accountability, implying both that other accountability measures are less variable and tend to change slowly and are less likely to be affected by other factors that vary over time.

Table 5: Effect of taxation on different accountability measures

	[1] Vertical	[2] Diagonal	[3] Horizontal	[4] Judicial	[5] Accountability
Tax	0.076*** (0.016)	-0.002 (0.008)	0.002 (0.010)	-0.004 (0.018)	0.008 (0.007)
NTR	-0.016 (0.019)	-0.015 (0.011)	-0.021 (0.020)	-0.024 (0.023)	-0.016 (0.011)
L.Vertical Acc	0.733*** (0.029)				
L.Diagonal Acc		0.913*** (0.011)			
L.Horizontal Acc			0.846*** (0.019)		
L.Judicial Acc				0.868*** (0.030)	
L.Accountability					0.904*** (0.010)
N	1,616	1,616	1,616	1,616	1,616
Groups	47	47	47	47	47
Adj. R ²	0.733	0.934	0.832	0.755	0.934

Note: as for Table 1.

Source: authors' construction.

Table 6: Effect of total revenue on different accountability measures

	[1] Vertical	[2] Diagonal	[3] Horizontal	[4] Judicial	[5] Accountability
Total revenue	0.068*** (0.017)	-0.001 (0.008)	0.005 (0.010)	-0.013 (0.016)	0.008 (0.007)
NTR	-0.085*** (0.020)	-0.014 (0.012)	-0.020 (0.020)	-0.015 (0.027)	-0.023* (0.012)
L.Vertical Acc	0.736*** (0.029)				
L.Diagonal Acc		0.913*** (0.011)			
L.Horizontal Acc			0.848*** (0.018)		
L.Judicial Acc				0.870*** (0.029)	
L.Accountability					0.904*** (0.010)
N	1,622	1,622	1,622	1,622	1,622
Groups	47	47	47	47	47
Adj. R ²	0.735	0.934	0.831	0.758	0.934

Note: as for Table 5 except total revenue rather than total tax. Appendix Table B11 with resource revenues instead of NTR is similar except there is a weak negative correlation between revenue and judicial accountability.

Source: authors' construction.

5.5 Sensitivity checks

Appendix C reports sensitivity checks to assess the robustness of the relationship between taxation and accountability. Results are qualitatively unchanged when:

- (i) re-estimating Tables 1 and 2 using five-year averages to address the possible effect of cycles (Tables C1 and C2). Although significance changes in some cases and aid tends to have a greater effect, qualitative results are similar;
- (ii) using lagged values for tax and NTR (Table C3);
- (iii) replacing the year FEs with linear and quadratic time trends, all significant, to capture the trend in accountability scores (Table C4); and
- (iv) dropping one country at a time to assess the impact of potential outliers (Table C5).

6 Tax and accountability in perspective

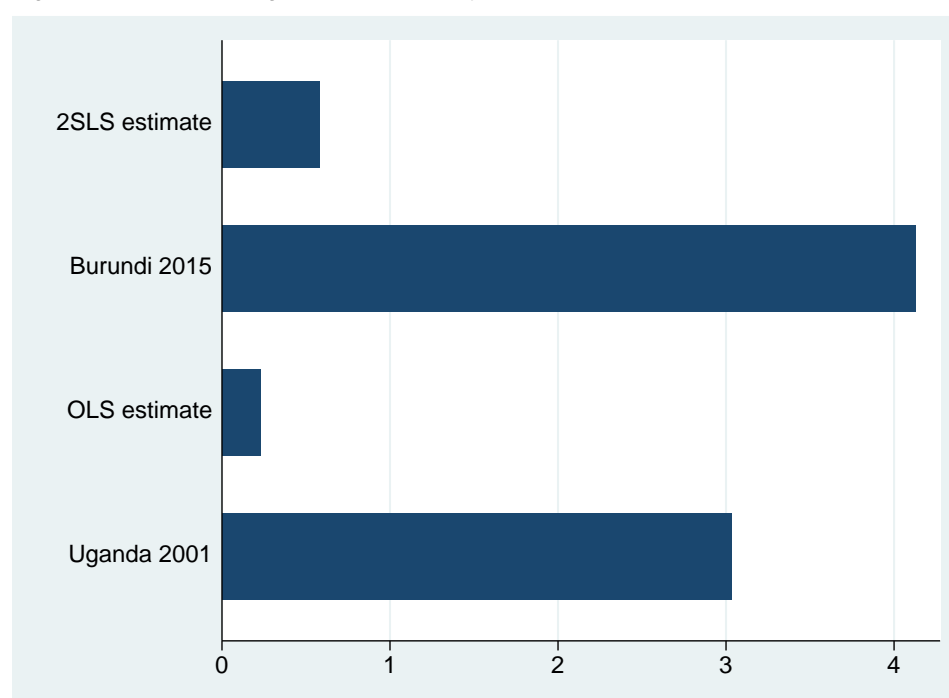
The estimated effect of taxation on accountability scores might appear rather modest in size, posing questions about the importance of taxation for accountability. It is difficult to meaningfully interpret these magnitudes, so this section attempts to put them into context by first comparing them to country-specific political events and subsequent accountability changes and second by comparing them with the magnitude of the effect of alternative determinants.

6.1 Two country examples

In 2015 Burundi's vertical accountability index dropped markedly as components for free and fair ('clean') elections and space for opposition parties were hit particularly hard. On 25 April 2015 incumbent president Pierre Nkurunziza announced his intention to run for a contested third term in the 2015 presidential elections. The announcement sparked a prolonged period of popular

protests which were violently repressed. A coup attempt followed but failed, and the violence continued. Despite the widespread opposition both within and outside his party, Nkurunziza ultimately succeeded with his third-term bid (Daley and Popplewell 2016). However, the elections were far from free and fair. The UN concluded that ‘freedoms of expression, assembly and association, essential conditions for the effective exercise of the right to vote, remained severely impaired’ (MENUB 2015b: 1) and that overall the elections took place in ‘a climate of widespread fear and intimidation’ (MENUB 2015a: 1). These events are clearly captured by Burundi’s accountability index, which dropped by more than five points, as shown in Figure 3.

Figure 3: Absolute changes in accountability scores



Note: shows the absolute changes (from the previous year) in the vertical accountability scores of Burundi and Uganda after, respectively, the 2015 political crisis and 2001 elections (these changes were negative), and includes comparison with the estimated effects on vertical accountability (for the full sample) of a one percentage point increase in the tax/GDP from the baseline FE and 2SLS models.

Source: authors’ construction.

In 2001 Uganda’s index also fell significantly. In 2000 the country formally abandoned its multiparty system and held elections on a no-party basis in the following year. Party activities became subject to strict limitations, but Uganda’s main political party, the National Resistance Movement (NRM), did not go as far as to entirely forbid political opposition. Minor political organizations were allowed a minimal presence as long as they did not constitute an effective challenge to the ruling NRM (Carbone 2003). Nevertheless, this tightening of the political space implies a clear reduction in opportunities for political participation. The scope for citizens to hold governments to account thus decreased, as is noticeable in Uganda’s vertical accountability score, which dropped by nearly three points (Figure 3). As was the case for Burundi, the underlying components which were most affected were the ones related to ‘clean’ elections.

These cases illustrate the conceptual validity of the accountability measure and give a sense of magnitude. Figure 3 compares the absolute changes in the accountability scores of Burundi and Uganda with the estimated effect of taxation on accountability. Both the baseline results and the 2SLS result are included, with respectively a point increase of 0.23 and 0.58 in the accountability score per percentage point increase in the tax ratio. Clearly, the effect of the political events in the

selected countries had a major impact. In comparison, the effect of taxation is very modest in size. Simply taking the 2SLS estimates at face value, Burundi would have to increase its tax ratio by nine percentage points to offset the negative impact of the 2015 political crisis. The equivalent increase for Uganda is four percentage points. However, comparing country-specific events with an econometric cross-country result is not entirely fair. It is worth emphasizing that the estimated effects are average effects with confidence intervals that hide important cross-country heterogeneity (something not examined in this paper). The analysis does not capture the contextual factors that shape country-specific events. A more informative exercise is comparing the explanatory power of tax bargaining to that of alternative factors.

6.2 Alternative influences on accountability

Using the basic model in (1), additional data are included to capture alternative predictors of accountability. This is an additional check for omitted variable bias and allows us to assess the relative magnitude of the effect of taxation. If the effect of taxation on vertical accountability remains unchanged after the inclusion of the alternative predictors, we can be confident that our coefficients in the baseline model are not driven by a failure to take these into account. Given the lack of empirical studies on the determinants of accountability, we borrow from the broader literature on the determinants of democracy instead.

A number of variables often found to be related to democratization are included (Boix 2003; Evans and Rose 2012; Sigman and Lindberg 2017; Teorell 2010): the growth rate of the economy; the urbanization rate; civil society participation index; a measure of the equity in distribution of resources in society to capture effects of inequality; the neo-patrimonialism index; and a measure for how routinely the major print and broadcast media criticize the government (see Table A3). Measures are introduced separately in a regression based on equation (1) which retains NTR, aid and per capita GDP, and we also run a regression including all predictors together. All coefficients are standardized to represent deviations from the mean divided by the standard deviation; the estimated coefficients can be directly compared, interpreted in terms of standard deviations.

Table 7 presents the results. The coefficient estimate on taxation is positive and highly significant. According to the full model in column [4], a one standard deviation in taxation increases accountability by 0.24 points, in line with previous results. Few of the other variables are statistically significant: GDP per capita, NTR, and urban population are never significant; economic growth is only significant in one specification and aid in two.

The largest effect is observed for the variable which measures the extent to which personalistic forms of authority pervade formal institutions (high levels of neo-patrimonialism): a one standard deviation in this measure is associated with a reduction in the accountability score by 0.54 to 0.72 points.¹⁴ Critical media is also consistently significant, with coefficients of 0.25 (full specification in [5]) or 0.46; civil society participation is only significant when critical media is omitted. The estimated effect for taxation is consistently significant, although smaller in magnitude and similar to our estimates without instruments, at around 0.2 points. Thus, while taxation's effect on accountability might appear modest, it is significant.

¹⁴ The neopatrimonialism index combines clientelistic political relationships (clientelism index), strong and constitutionally unconstrained presidents (presidentialism index), and the use of state resources for political legitimization (regime corruption index). Including each component separately confirms negative, significant relationships with vertical accountability.

Table 7: Determinants of vertical accountability

	[1]	[2]	[3]	[4]	[5]
Tax	0.238*** (0.065)	0.184*** (0.052)	0.211*** (0.062)	0.184*** (0.058)	0.177*** (0.055)
NTR	-0.003 (0.043)	0.022 (0.033)	0.010 (0.031)	0.004 (0.035)	0.023 (0.032)
Aid (% GNI)	0.105* (0.060)	0.042 (0.052)	0.118** (0.047)	0.042 (0.057)	0.057 (0.045)
GDP per capita	0.081 (0.162)	-0.032 (0.115)	0.249 (0.153)	0.140 (0.130)	0.096 (0.114)
Urban pop.	-0.040 (0.244)	0.078 (0.186)	0.048 (0.166)	0.037 (0.197)	0.106 (0.146)
Growth	0.023 (0.016)	0.013 (0.011)	0.021* (0.012)	0.015 (0.014)	0.014 (0.010)
Equal distribution of resources	0.037 (0.149)				-0.017 (0.079)
Neo-patrimonialism index		-0.721*** (0.131)			-0.538*** (0.137)
Critical media			0.460*** (0.079)		0.249*** (0.074)
Civil society participation				0.462*** (0.077)	0.061 (0.097)
N	47	47	47	47	47
Groups	1,501	1,507	1,501	1,501	1,501
Adj. R ²	0.381	0.520	0.483	0.463	0.550

Note: OLS estimates, variables as defined in text; coefficients are standardized to represent deviations from the mean divided by the standard deviation.

Source: authors' construction.

7 Conclusions

According to the tax bargaining argument, taxation and governance are linked. In their quest for revenue, governments directly or indirectly have to bargain with taxpayers to secure tax compliance. In return for their compliance, taxpayers demand scrutiny over how their money is raised and spent. This bargaining process will, over time, make the ruler more responsive to taxpayers' needs, giving rise to accountability mechanisms. We investigate this for a sample of 47 African countries over 1980 to 2019 and find a robust positive correlation between tax revenue and vertical accountability (capturing quality of elections and participation). Several approaches to IV estimation confirm the results and provide support for a causal interpretation. The effect of taxation is only observed for vertical accountability (not for four other measures of accountability). We also consider other potential determinants, and only neo-patrimonialism (negative) and critical media (positive) appear to have a greater effect than tax on vertical accountability.

Context is important: although SSA has low tax/GDP ratios relative to other developing regions, the majority of SSA countries have increased tax/GDP since the early 2000s; direct tax revenues began to increase from the late 1990s and indirect taxes from the mid-2000s. While we find evidence that direct taxes have a greater effect on accountability than indirect taxes, both are significant and comparable. We infer that it is general perceptions of the tax burden that motivate the public (voter-taxpayers) to engage in the political process and exert pressure for increased accountability through elections. Thus, as tax/GDP ratios have risen, vertical accountability has improved.

The evidence points to a clear link between tax and accountability on average across SSA, although cross-country analysis with aggregate variables is not suited to address the mechanisms at play (the

results are consistent with several qualitative country studies). The relationship is likely to be stronger in some countries and weak, or even absent, in others—political factors specific to each country will be more important determinants of levels of accountability, while economic circumstances and events are the drivers of tax/GDP ratios. Nevertheless, at the margin, public responses to tax burdens are a factor that influences changes in accountability and the findings support the argument for a governance dividend from taxation.

The effect of tax on accountability is statistically significant and additional analysis confirms that similar results hold for total domestic revenue (including resource and NTRs). The effect is modest but not inconsequential: the average tax ratio increased from 12 per cent in 1980 to 15 per cent in 2019, three percentage points, and our estimates suggest this would increase the average vertical accountability score by 0.75 points. On average, the accountability score for SSA improved by 7.05 points over the period; the increase in taxation accounts for about 10 per cent of this improvement. Given that vertical accountability provides an aggregate measure of the quality of electoral systems and processes so that public pressure motivated by tax burdens can only be one indirect pressure, this is a meaningful effect. From a policy perspective this is good news, as many donor agencies have appealed to the state-building narrative in their support for domestic resource mobilization. This paper presents evidence in support of that position.

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Appendix A: Data

List of countries

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

Table A1: Summary statistics

Variable	Mean	Std. Dev	Min.	Max.	N
Vertical accountability	51.62	7.04	34.94	65.22	1,880
Total tax	13.22	8.27	0.57	60.95	1,709
Total non-tax	3.40	4.90	0	43.94	1,676
Direct tax	4.52	3.84	0.12	30.22	1,380
Indirect tax	8.40	5.51	0.37	48.62	1,481
Goods and services tax	4.43	2.90	0.04	18.30	1,380
Trade tax	3.95	4.67	0.00	40.86	1,414
Diagonal accountability	52.37	8.04	31.78	66.39	1,880
Horizontal accountability	49.48	8.33	30.59	66.67	1,880
Judicial accountability	52.26	9.35	26.31	71.89	1,880
Total accountability	51.28	7.77	31.03	65.76	1,880
GDP per capita	1,818.08	2,387.93	165.93	16,992.03	1,769
Log GDP per capita	6.98	0.95	5.11	9.74	1,769
Aid	10.77	10.79	-0.25	94.95	1,734
Exchange rate	3,601,390	1.56e+08	0.00	6.72e+09	1,867
Total reserves	1.95e+09	6.35e+09	40,812.32	5.51e+10	1,475
Terms of trade index	118.61	43.63	21.40	357.58	1,779
GDP per capita growth	1.28	6.70	-41.59	140.48	1,722
Trade openness	66.89	37.64	1.22	348.00	1,551
Exports	28.96	20.17	0.61	166.72	1,551
Imports	37.93	20.55	0.59	191.46	1,551
Natural resource rents	10.81	10.73	0	70.36	1,774
Urban population	35.67	16.72	4.34	89.74	1,880
Equal resources	40.05	20.79	3.5	93.4	1,880
Critical media	51.16	12.43	16.99	76.3	1,880
Civil society participation	57.28	24.61	3.5	95.4	1,880

Note: variable definitions and sources in Table A3.

Source: authors' construction.

Table A2: Mean and percentage change of key variables

	Year span	Mean					% change				
		VA	Total tax	Total revenue	Non-tax revenue	Resource rents	VA	Total tax	Total revenue	Non-tax revenue	Resource rents
Angola	1980–2019	44.14	29.72	31.25	3.14	29.24	1.18	2.33	0.66	137.87	8.61
Benin	1980–2019	55.45	9.19	10.31	1.30	5.72	0.39	2.49	2.45	13.81	-0.56
Botswana	1980–2019	61.35	24.32	40.97	16.18	2.32	-0.09	0.39	0.44	1.08	13.55
Burkina Faso	1980–2019	53.72	9.88	11.26	1.33	8.73	0.44	2.46	2.46	14.66	2.87
Burundi	1980–2019	46.96	13.76	15.06	1.33	18.27	1.04	0.51	0.94	33.36	3.68
Cabo Verde	1980–2019	60.01	15.84	19.20	3.49	29.53	0.47	1.88	1.69	3.16	0.91
Cameroon	1980–2019	49.86	10.42	14.72	4.68	7.55	0.10	1.92	0.43	4.12	3.26
Central African Republic	1980–2019	49.72	9.00	10.14	1.06	9.72	1.17	-0.57	-0.15	28.73	1.70
Chad	1980–2019	45.62	7.07	9.50	1.77	16.49	0.78	11.78	6.81	50.55	6.29
Comoros	1980–2019	52.82	6.82	8.62	1.64	1.33	0.81	1.64	3.87	18.75	4.05
Congo, Dem. Rep.	1980–2019	46.64	6.00	7.05	1.13	21.00	0.51	7.54	-7.41	2.32	6.22
Congo, Rep.	1980–2019	49.65	12.20	30.69	18.43	35.88	0.24	1.34	3.03	7.11	7.05
Côte d'Ivoire	1980–2019	52.64	12.29	14.63	2.24	3.99	0.50	-0.55	-1.02	8.95	1.39
Djibouti	1980–2019	49.53	16.53	20.46	3.80	0.57	0.19	-1.03	-0.55	5.57	2.35
Equatorial Guinea	1980–2019	46.97	11.43	25.51	14.23	33.89	0.57	3.14	0.08	10.86	3.48
Eritrea	1980–2019	36.04	21.54	34.62	16.28	5.74	-0.13	2.18	-1.60	7.83	52.93
Eswatini	1980–2019	48.50	21.62	22.94	1.32	5.23	0.08	2.36	2.19	6.72	2.03
Ethiopia	1980–2019	46.94	9.77	12.90	3.19	16.86	0.97	1.03	0.96	1.26	0.67
Gabon	1980–2019	50.66	20.21	27.18	4.62	26.50	0.24	1.08	-0.49	12.08	6.23
Gambia, The	1980–2019	54.07	8.15	9.69	1.05	3.44	0.23	1.44	1.89	17.36	5.10
Ghana	1980–2019	54.59	7.86	8.94	1.38	9.99	0.49	6.00	6.51	18.18	2.86
Guinea	1980–2019	47.71	8.81	9.56	0.75	15.95	0.58	10.67	9.44	7.44	-2.81
Guinea-Bissau	1980–2019	50.04	4.95	7.88	2.53	18.05	1.43	10.8	16.39	30.61	0.01
Kenya	1980–2019	53.07	9.48	16.62	1.14	3.90	0.21	2.38	2.21	5.83	-1.31
Lesotho	1980–2019	51.12	38.50	43.79	6.14	5.06	1.68	1.44	1.18	1.88	1.75
Liberia	1980–2019	51.91	10.90	12.75	1.70	21.34	1.07	0.87	1.38	26.08	1.42
Madagascar	1980–2019	52.28	8.24	8.64	0.39	5.09	0.54	1.26	1.30	16.42	3.97
Malawi	1980–2019	54.52	7.61	8.45	0.88	8.17	0.42	2.89	1.82	6.92	2.72
Mali	1980–2019	54.18	10.80	13.28	2.46	6.02	0.48	2.27	2.71	16.63	5.65
Mauritania	1980–2019	48.49	10.14	15.61	6.52	12.90	1.24	0.76	2.01	7.44	4.00

Mauritius	1980–2019	64.23	16.92	18.71	1.80	0.02	-0.19	1.89	2.00	10.60	-2.54
Mozambique	1980–2019	48.83	11.98	13.78	1.79	11.46	1.11	4.36	4.06	8.67	3.02
Namibia	1980–2019	55.89	28.03	31.33	2.98	3.87	0.64	1.14	1.30	1.81	43.84
Niger	1980–2019	51.99	7.68	8.63	0.90	7.02	1.24	0.81	0.63	4.90	3.95
Nigeria	1980–2019	51.05	7.17	16.04	10.43	14.72	0.42	3.43	-0.37	5.88	8.12
Rwanda	1980–2019	48.21	10.04	11.21	1.18	6.86	0.28	3.55	3.86	7.63	2.75
São Tomé and Príncipe	1980–2019	55.51	10.87	15.46	4.69	3.23	1.32	4.17	11.29	62.30	-0.93
Senegal	1980–2019	58.99	13.10	14.23	1.14	2.64	0.27	0.91	0.83	40.91	1.73
Seychelles	1980–2019	54.23	30.44	37.59	7.38	0.86	0.47	0.38	0.37	2.28	1.43
Sierra Leone	1980–2019	51.17	7.52	7.92	0.52	12.23	0.98	4.62	4.00	42.35	3.63
South Africa	1980–2019	58.18	23.03	28.32	5.29	5.68	0.47	0.95	0.97	1.60	1.56
Sudan	1980–2019	47.76	6.59	11.03	2.75	5.64	-0.10	-0.07	0.36	18.88	140.53
Tanzania	1980–2019	56.09	8.64	9.58	0.86	6.93	0.05	1.49	1.50	6.42	-0.46
Togo	1980–2019	50.64	10.67	12.36	1.70	9.67	0.44	0.53	0.21	7.68	0.47
Uganda	1980–2019	49.87	6.63	7.18	0.42	15.50	0.31	14.06	15.81	27.90	-1.67
Zambia	1980–2019	54.33	16.75	17.46	1.65	11.52	0.22	-0.36	0.03	9.39	3.77
Zimbabwe	1980–2019	50.86	19.47	21.55	1.70	6.63	-0.07	8.90	10.93	17.81	3.35

Note: VA represents vertical accountability.

Source: authors' construction.

Table A3: Variable definitions and sources

Variable	Description	Source
Vertical accountability	Extent to which citizens have the power to hold the government accountable through elections and participation in political parties.	V-Dem
Total tax [revenue]	Total tax revenue excluding social contributions and including resource-related taxes [Total revenue also includes NTR], as a percentage of GDP.	GRD
Non-tax revenue	Total non-tax revenue, excluding official development assistance grants, as a percentage of GDP.	GRD
Direct tax	Total direct taxes (% GDP): the sum of taxes on income, profits and capital gains, taxes on payroll and workforce and property tax.	GRD
Indirect tax	Total indirect tax revenue, including goods and services taxes, taxes on international trade and other taxes. Expressed as a percentage of GDP.	GRD
Goods and services tax	Taxes on goods and services, including value-added tax and excises. Expressed as a percentage of GDP.	GRD
Trade tax	Total taxes on international trade, expressed as a percentage of GDP.	GRD
Diagonal accountability	Range of actions and mechanisms that citizens, CSOs, and an independent media can use to hold the government accountable.	V-DEM
Horizontal accountability	Power of state institutions to oversee the government by demanding information, questioning officials, and punishing improper behaviour. Checks between institutions and limits on abuse of power.	V-DEM
Judicial accountability	Judicial accountability refers to the extent to which judges are found responsible for serious misconduct.	V-DEM
Total accountability	Government accountability measures the constraints on the government's use of political power, through requirements for justification for its actions and sanctions.	V-DEM
GDP per capita	GDP per capita is the gross domestic product divided by population. Data are in constant 2015 US dollars.	WDI
Log GDP pc	Natural logarithm of GDP per capita.	calculation
Aid	Net aid consists of disbursements of loans made on concessional terms and grants. Expressed as a percentage of gross national income (GNI).	WDI
Exchange rate	Official exchange rate calculated as an annual average based on monthly averages (local currency units relative to the US dollar).	WDI
Total reserves	Holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and of foreign exchange under the control of monetary authorities.	WDI
Terms of trade index	Net barter terms of trade index: ratio of export unit value indexes to the import unit value indexes, measured relative to the base year 2000.	WDI
GDP per capita growth	Economic growth rate, calculated as the percentage change in GDP per capita (constant 2015 US dollar).	WDI
Trade	Trade volume (imports plus exports) as a share of GDP.	WDI
Urban population	People living in urban areas, as a percentage of the total population.	WDI
Equality	The equal distribution of resources index measures the extent to which resources—both tangible and intangible—are distributed in society.	V-DEM
Critical media	How routinely the major print and broadcast media criticize the government.	V-DEM
Total natural resource rents	Sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Expressed as a percentage of GDP.	WDI
Neopatrimonialism index	Clientelism index; unconstrained presidents (presidentialism index) and the use of state resources for political legitimization (regime corruption index).	V-DEM
Civil society	Are major CSOs routinely consulted; participation in CSOs; are women prevented from participating; and is legislative candidate nomination within party organization highly decentralized or through primaries?	V-DEM

Note: WDI = World Development Indicators; CSO = civil society organizations.

Source: authors' construction.

Table A4: Composition of the vertical accountability index

Category	Variable	Name	Description
Indicators	Electoral regime index	v2x_elecreg	At this, are regularly scheduled elections on course, as stipulated by election law or well-established precedent?
	Per cent suffrage	v2elsuffrage	What percentage of adult citizens has the legal right to vote in national elections?
	Elected chief executive	hoEel	Is the chief executive (head of state or government) directly elected in multiparty elections, or directly by elected parliament?
Clean elections	Election Management Body (EMB) autonomy	v2elembaut	Does the EMB have autonomy from government to apply election laws and administrative rules impartially?
	EMB capacity	v2elembcap	Does the EMB have sufficient resources to administer a well-run national election?
	Election voter registry	v2elrgstry	In this national election, was there a reasonably accurate voter registry in place and was it used?
	Election other voting irregularities	v2elirreg	Was there evidence of other intentional irregularities by incumbent and/or opposition parties, and/or vote fraud?
	Election government intimidation	v2elintim	Were opposition candidates/parties/campaign workers subjected to repression, intimidation, violence, or harassment by the government, the ruling party, or their agents?
	Election free and fair	v2elfrfair	Based on all aspects of the pre-election period, election day, and the post-election process.
	Elections multiparty	v2elmulpar	Was this national election multiparty?
Political Parties	Party ban	v2psparban	Are any political parties banned?
	Barriers to parties	v2psbars	How restrictive are barriers to forming a party?
	Opposition parties' autonomy	v2psoppaut	Are opposition parties independent and autonomous of the ruling regime?

Note: the vertical accountability index is created using Bayesian structural equation models with measures for (1) having clean elections; (2) the percentage of the enfranchised population; (3) the way in which the chief executive is elected; and (4) the quality of the party system. The clean elections variable is a function of the dichotomous indicator of the presence of elections which is weighed by the seven measures of clean elections. The quality of the party system is a function of the three political party variables. For more details see Lührmann et al. (2020).

Source: authors' construction based on Coppedge et al. (2022).

Table A5: Correlation matrix of accountability indicators

	Vertical	Diagonal	Horizontal	Judicial	Total
Vertical	1				
Diagonal	0.807	1			
Horizontal	0.763	0.788	1		
Judicial	0.438	0.480	0.512	1	
Total	0.891	0.967	0.881	0.523	1

Source: authors' construction using V-Dem data.

Appendix B: Additional results

Table B1: Effect of taxation on accountability, controlling for resource rents

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Tax	0.123*** (0.020)	0.214*** (0.062)	0.188* (0.109)	0.070*** (0.017)	0.074** (0.030)
Resource rents	-0.124*** (0.015)	-0.029 (0.030)	-0.041 (0.028)	-0.006 (0.009)	-0.010 (0.010)
GDP per capita			0.395 (1.078)		-0.027 (0.265)
Aid (% GNI)			0.526 (0.425)		0.125 (0.131)
Tax ²			-0.000 (0.000)		-0.000 (0.000)
L.Acc				0.753*** (0.027)	0.743*** (0.027)
LT effect				0.282	0.286
N	1,647	1,647	1,526	1,622	1,554
Groups	47	47	47	47	47
Adj. R ²	0.040	0.393	0.394	0.745	0.739

Note: except for [1], all regressions include country and year FEs. Robust standard errors in parentheses (**p ≤ 0.01, *p ≤ 0.05, *p ≤ 0.1), clustered at the country level for [2]–[5]. NTR is non-tax revenue. L.Acc is one-year lagged accountability; LT is the long-term effect calculated as $b_1/(1-\gamma)$.

Source: authors' construction.

Table B2: Effect of total revenue on accountability

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Total revenue	0.163*** (0.020)	0.227*** (0.048)	0.264* (0.146)	0.068*** (0.017)	0.109** (0.045)
NTR	-0.297*** (0.043)	-0.267*** (0.057)	-0.218*** (0.067)	-0.085*** (0.020)	-0.075*** (0.025)
GDP per capita			0.702 (0.888)		0.142 (0.235)
Aid (% GNI)			0.625* (0.323)		0.187* (0.102)
Tax ²			-0.001 (0.002)		-0.001 (0.001)
L.Acc				0.736*** (0.028)	0.717*** (0.028)
LT effect				0.258	0.385
N	1,644	1,644	1,536	1,622	1,519
Groups	47	47	47	47	47
Adj. R ²	0.040	0.393	0.379	0.735	0.711

Note: except for [1], all regressions include country and year FEs. Robust standard errors in parentheses (**p ≤ 0.01, *p ≤ 0.05, *p ≤ 0.1), clustered at the country level for [2]–[5]. NTR is non-tax revenue. L.Acc is one-year lagged accountability; LT is the long-term effect calculated as $b_1/(1-\gamma)$.

Source: authors' construction.

Table B3: Effect of total revenue on accountability, controlling for resource rents

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Total revenue	0.078*** (0.017)	0.130*** (0.044)	0.189 (0.160)	0.041*** (0.015)	0.095* (0.054)
Resource rents	-0.127*** (0.014)	-0.050* (0.026)	-0.060** (0.024)	-0.017* (0.010)	-0.023** (0.010)
GDP per capita			0.637 (1.064)		0.090 (0.290)
Aid (% GNI)			0.731* (0.404)		0.210 (0.129)
Tax ²			-0.001 (0.003)		-0.001 (0.001)
L.Acc				0.746*** (0.026)	0.733*** (0.025)
LT effect				0.161	0.355
N	1,679	1,679	1,615	1,654	1, 592
Groups	47	47	47	47	47
Adj. R ²	0.040	0.379	0.385	0.730	0.725

Note: except for [1], all regressions include country and year FEs. Robust standard errors in parentheses (**p ≤ 0.01, **p ≤ 0.05, *p ≤ 0.1), clustered at the country level for [2]–[5]. NTR is non-tax revenue. L.Acc is one-year lagged accountability; LT is the long-term effect calculated as $b_7/(1-\gamma)$.

Source: authors' construction.

Table B4: Effect of different taxes on accountability, standardized coefficients

	[1] FE	[1] FE	[1] FE
Direct tax	0.185*** (0.061)	0.210*** (0.057)	0.166** (0.068)
Indirect tax	0.160** (0.076)		
NTR	-0.019 (0.039)	-0.026 (0.052)	-0.006 (0.054)
GST		0.044 (0.074)	0.062 (0.075)
Trade tax		0.122 (0.075)	0.128 (0.076)
GDP per capita			0.145 (0.197)
Aid			0.128** (0.058)
N	1,335	1,219	1,172
Groups	46	46	45
Adj. R ²	0.397	0.395	0.355

Note: as for Table 2 in text except coefficients standardized (beta normalized).

Source: authors' construction.

Table B5: 2SLS estimation of effect of taxation on accountability, resource rents

	[1] OLS-FE	[2] OLS-FE	[3] 2SLS-OLS	[4] 2SLS-FE	[5] 2SLS-FE	[6] 2SLS-FE
Panel A: 2SLS estimates						
Total tax	0.213*** (0.062)	0.144* (0.074)	0.762* (0.404)	0.729** (0.366)	0.729** (0.355)	0.692* (0.364)
Resource rents	-0.029 (0.030)	-0.060* (0.032)	0.037 (0.058)	-0.009 (0.069)	-0.028 (0.063)	-0.025 (0.062)
GDP per capita		0.304 (1.964)		-2.629 (2.696)	-4.502 (3.099)	-4.701 (3.284)
Aid (% GNI)		0.492 (0.388)		-0.141 (0.526)	0.061 (0.462)	-0.005 (0.467)
Growth		0.038 (0.032)		0.018 (0.045)	0.022 (0.044)	0.025 (0.046)
Trade		1.121 (1.121)		1.274 (1.599)		
Exports					3.600*** (0.990)	3.623*** (0.989)
Imports					-2.460 (1.836)	-2.091 (1.926)
Agriculture						-0.062 (0.077)
N	1,647	1,371	1,223	1,006	1,006	963
Groups	47	44	39	36	36	36
Adj. R ²	0.393	0.359				
Endog test <i>p</i> -value			0.022	0.014	0.013	0.005
KP F-stat			4.84	18.32	18.10	11.09
Hansen J <i>p</i> -value			0.483	0.963	0.771	0.817
Panel B: First stage regression						
ERPI			-1.477*** (0.474)	-1.590*** (0.265)	-1.561*** (0.259)	-1.452*** (0.309)
Terms of Trade			-0.002 (0.008)	0.004 (0.007)	0.006 (0.007)	0.007 (0.008)
NTR			-0.078 (0.077)	-0.047 (0.087)	-0.031 (0.083)	-0.026 (0.083)
GDP per capita				5.102*** (1.681)	6.449*** (2.118)	6.886*** (2.423)
Aid (% GNI)				0.876*** (0.285)	0.750*** (0.220)	0.703*** (0.235)
Exports					-2.005* (1.094)	-2.250** (1.086)
Imports					2.782*** (0.833)	2.813*** (0.857)
Agriculture						-0.037 (0.064)

Note: as for Table B1 except: Panel A presents 2SLS estimates instrumenting with ERPI and ToT shock. Panel B presents the corresponding first stage estimates; trade and growth included in first stage but insignificant (not reported). The *p*-value of the endogeneity test rejects the null hypothesis that tax revenue is exogenous. The Kleibergen-Paap (KP) F statistic implies the instruments are strongly correlated with the endogenous regressor. The *p*-value of the Hansen *J* statistic cannot reject the null hypothesis that the instrument set is valid, and the model is correctly specified. Eight countries are excluded from the IV due to missing data on total reserves [required for ERPI]: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. Three more countries drop out for [4]–[6] due to estimation procedures: Liberia, Malawi, and São Tomé and Príncipe.

Source: authors' construction.

Table B6: 2SLS estimation of effect of total revenue on accountability

	[1] OLS-FE	[2] OLS-FE	[3] 2SLS-OLS	[4] 2SLS-FE	[5] 2SLS-FE	[6] 2SLS-FE
Panel A: 2SLS estimates						
Total revenue	0.227*** (0.048)	0.163*** (0.055)	0.698** (0.343)	0.560** (0.258)	0.553** (0.252)	0.498** (0.251)
NTR	-0.266*** (0.056)	-0.176** (0.073)	-0.665** (0.316)	-0.538** (0.240)	-0.543** (0.238)	-0.501** (0.239)
GDP per capita		1.100 (1.655)		-0.950 (1.981)	-1.844 (2.011)	-1.952 (2.025)
Aid (% GNI)		0.810*** (0.293)		0.495 (0.366)	0.658** (0.332)	0.579* (0.344)
Growth		0.056* (0.032)		0.037 (0.038)	0.040 (0.038)	0.041 (0.042)
Trade		0.739 (1.028)		0.996 (1.376)		
Exports					2.271*** (0.763)	2.323*** (0.684)
Imports					-1.341 (1.407)	-0.974 (1.410)
Agriculture						-0.097 (0.076)
N	1,644	1,342	1,215	1,000	1,000	957
Groups	47	44	39	36	36	36
Adj. R ²	0.398	0.356				
Endog test <i>p</i> -value			0.036	0.030	0.029	0.016
KP F-stat			7.12	36.42	34.31	18.90
Hansen J <i>p</i> -value			0.205	0.550	0.476	0.934
Panel B: First stage regression						
ERPI			-1.607*** (0.439)	-1.704*** (0.203)	-1.690*** (0.206)	-1.592*** (0.259)
Terms of Trade			0.002 (0.009)	0.008 (0.008)	0.009 (0.008)	0.011 (0.009)
NTR			0.903*** (0.106)	0.863*** (0.145)	0.872*** (0.147)	0.861*** (0.153)
GDP per capita				5.142*** (1.714)	5.662*** (2.126)	5.850** (2.375)
Aid (% GNI)				0.631* (0.362)	0.533* (0.318)	0.474 (0.341)
Exports					-0.834 (1.328)	-0.963 (1.356)
Imports					1.820* (0.951)	1.812* (0.963)
Agriculture						-0.038 (0.060)

Note: as for Table B5 except total revenue instead of tax and NTR instead of resource rents.

Source: authors' construction.

Table B7: 2SLS estimation of effect of taxation on accountability (interaction terms)

	2SLS-OLS	2SLS-FE	2SLS-FE
Panel A: 2SLS estimates			
Total tax	1.018 (0.693)	1.409* (0.762)	1.489** (0.590)
NTR	-0.663 (0.585)	-0.004 (0.290)	-0.078 (0.263)
GDP per capita		-2.427 (2.952)	-2.170 (2.010)
Aid (% GNI)		0.205 (1.477)	1.672 (1.603)
Growth		0.101 (0.121)	0.129 (0.127)
Trade		-3.751 (3.733)	
Exports			3.998 (2.623)
Imports			-8.747* (4.510)
Presidential elections	11.302 (8.196)	18.656* (10.129)	23.28* (12.808)
Presidential elections * Tax	-0.320 (0.238)	-1.282 (0.790)	-1.673 (1.036)
N	1,203	978	978
Groups	39	36	36
Endog test <i>p</i> -value	0.018	0.031	0.085
KP F-stat	10.41	2.56	1.77
Hansen J <i>p</i> -value	0.821	0.784	0.629
Linear combination: tax + (elections * tax)	0.355 (0.376)	0.127 (0.245)	-0.184 (0.570)
Panel B: First stage regression			
ERPI	-2.533** (1.235)	-1.864*** (0.711)	-1.462** (0.727)
ERPI_Elections	1.458 (1.237)	0.674 (0.072)	0.343 (0.753)
Terms of Trade	-0.024 (0.024)	-0.007 (0.018)	-0.001 (0.017)
Terms of Trade_Elections	0.023 (0.021)	0.009 (0.015)	0.006 (0.015)
Presidential elections	-0.938 (3.187)	-2.386 (2.048)	-1.951 (2.012)
NTR	0.304 (0.219)	-0.202 (0.192)	-0.147 (0.191)
GDP per capita		4.435*** (1.458)	4.266*** (1.290)
Trade		4.159** (1.694)	
Exports			-2.419 (1.952)
Imports			7.289*** (2.468)

Note: as for Table B5 except Panel A presents estimates with interaction terms for presidential elections and the instruments; aid (% GNI) and growth included in the first stage but insignificant (not reported).

Source: authors' construction.

Table B8: 2SLS effect of total revenue on accountability (interaction terms)

	2SLS-OLS	2SLS-FE	2SLS-FE
Panel A: 2SLS estimates			
Total revenue	1.070 (0.715)	1.401** (0.685)	1.117*** (0.335)
NTR	-1.345 (0.881)	-1.318** (0.626)	-1.129*** (0.396)
GDP per capita		-3.040 (3.132)	-1.470 (1.571)
Aid (% GNI)		-0.319 (1.356)	0.827 (1.138)
Growth		0.138 (0.118)	0.171 (0.107)
Trade		-3.434 (3.284)	
Exports			2.762 (2.209)
Imports			-5.403 (3.628)
Presidential elections	12.096 (7.921)	18.498** (8.221)	20.45** (8.461)
Presidential elections * Revenue	-0.576 (0.456)	-1.006** (0.511)	-1.163** (0.548)
N	39	36	36
Groups	1,215	1,000	1,000
Endog test <i>p</i> -value	0.016	0.033	0.109
KP F-stat	1.17	2.80	1.94
Hansen J <i>p</i> -value	0.660	0.742	0.451
Linear combination: Rev+(elections*Rev)	0.495 (0.505)	0.395 (0.404)	-0.046 (0.496)
Panel B: First stage regression			
ERPI	-2.487* (1.282)	-1.781*** (0.682)	-1.424** (0.703)
ERPI_Elections	1.442 (1.236)	0.575 (0.707)	0.275 (0.723)
Terms of Trade	-0.021 (0.024)	-0.006 (0.016)	0.001 (0.015)
Terms of Trade_Elections	0.022 (0.020)	0.009 (0.012)	0.007 (0.013)
Presidential elections	-4.768 (3.155)	-2.351 (1.860)	-1.888 (1.830)
NTR	1.281*** (0.215)	0.794*** (0.181)	0.833*** (0.180)
GDP per capita		4.707*** (1.366)	4.646*** (1.204)
Trade		3.882** (1.649)	
Exports			-2.236 (1.861)
Imports			6.741*** (2.426)

Note: as for Table B7 except total revenue instead of tax.

Source: authors' construction.

Table B9: LIML estimation of effect of taxation on accountability

	[1] OLS-FE	[2] 2SLS-LIML	[3] 2SLS-LIML	[4] 2SLS-LIML	[5] 2SLS-LIML
Panel A: Estimates					
Total tax	0.232*** (0.053)	0.782** (0.415)	0.606** (0.305)	0.606** (0.309)	0.509* (0.280)
NTR	-0.033 (0.053)	0.038 (0.064)	0.045 (0.058)	0.026 (0.057)	0.015 (0.050)
GDP per capita			-1.656 (2.306)	-3.184 (2.637)	-2.986 (2.567)
Aid (% GNI)			0.293 (0.397)	0.471 (0.347)	0.424 (0.344)
Growth			0.024 (0.041)	0.029 (0.041)	0.033 (0.042)
Trade			1.166 (1.474)		
Exports				3.124*** (0.938)	3.023*** (0.826)
Imports				-2.106 (0.171)	-1.543 (1.731)
Agriculture					-0.093 (0.075)
N	1,639	1,203	978	978	935
Groups	47	39	36	36	36
Adj. R ²	0.398				
Endog test <i>p</i> -value		0.024	0.024	0.025	0.016
KP F-stat		9.30	33.12	30.56	16.23
Hansen <i>J</i> <i>p</i> -value		0.317	0.650	0.491	0.908
Panel B: First stage					
ERPI		-1.671*** (0.389)	1.690*** (0.224)	-1.653*** (0.217)	-1.540*** (0.271)
Terms of Trade		-0.002 (0.009)	0.006 (0.008)	0.007 (0.008)	0.010 (0.010)
NTR		-0.066 (0.112)	-0.084 (0.156)	-0.069 (0.155)	-0.080 (0.159)
GDP per capita			5.531*** (1.801)	6.899*** (2.302)	7.454*** (2.608)
Aid (% GNI)			0.812*** (0.315)	0.662*** (0.247)	0.623** (0.263)
Growth			0.031 (0.037)	0.028 (0.037)	0.019 (0.034)
Trade			0.657 (0.975)		
Exports				-2.230*** (1.225)	-2.502** (1.235)
Imports				3.033*** (0.965)	3.105*** (1.015)
Agriculture					-0.037 (0.065)

Note: as for Table B5 except LIML estimation.

Source: authors' construction.

Table B10: Heteroskedasticity-based IV estimation total revenue and accountability

	[1] Baseline	[2] Lewbel	[3] Lewbel EI	[4] Baseline	[5] Lewbel	[6] Lewbel EI
Panel A: 2SLS estimates						
Total revenue	0.523*** (0.195)	0.170*** (0.047)	0.190*** (0.049)	0.434*** (0.134)	0.030 (0.040)	0.072* (0.040)
NTR	-0.469*** (0.182)	-0.143*** (0.052)	-0.162*** (0.053)	-0.379*** (0.124)	-0.024 (0.053)	-0.060 (0.052)
GDP Per Capita				-1.046 (1.076)	1.298** (0.639)	1.059* (0.642)
Aid (% GNI)				0.468*** (0.238)	0.737*** (0.218)	0.709*** (0.215)
Growth				0.046 (0.032)	0.059* (0.033)	0.058* (0.033)
Exports				2.076*** (0.511)	1.690*** (0.439)	1.729*** (0.439)
Imports				-1.244* (0.680)	-0.455 (0.647)	-0.535 (0.634)
N	1,215	1,215	1,215	1,000	1,000	1,000
Groups	39	39	39	36	36	36
Hansen J statistic	6.93	41.09	52.02	4.14	32.38	42.46
Hansen J p-value	0.009	0.379	0.116	0.042	0.903	0.621
Panel B: First stage regression						
ERPI	-1.642*** (0.328)			-1.769*** (0.256)		
Terms of Trade	0.009*** (0.004)			0.014*** (0.003)		
Non-tax	0.889*** (0.053)			0.827*** (0.057)		
GDP per capita				5.396** (0.144)		
Aid (% GNI)				0.863*** (0.199)		
Growth				0.014 (0.032)		
Exports				-1.044* (0.577)		
Imports				2.063*** (0.579)		

Note: as for Table B6 except standard errors not clustered by country. Columns: baseline is the standard 2SLS-FE estimates; Lewbel applies Lewbel (2012) using only internal instruments; Lewbel EI uses both internal and external instruments. The internal instruments are generated as shown in the text: $(Z - \bar{Z})\hat{\epsilon}_2$. The external instruments are still the exchange rate pressure index (ERPI) and terms of trade shocks. Baum and Lewbel (2019) show that combining internal and external instruments improves the efficiency of the IV estimation.

Source: authors' construction

Table B11: Effect of tax revenue on different accountability measures, resource rents

	[1] Vertical	[2] Diagonal	[3] Horizontal	[4] Judicial	[5] Accountability
Tax revenue	0.070*** (0.017)	0.003 (0.010)	-0.000 (0.011)	0.001 (0.018)	0.009 (0.009)
Resource rents	-0.006 (0.009)	-0.000 (0.006)	-0.007 (0.007)	-0.006 (0.008)	0.000 (0.006)
L.Vertical acc.	0.753*** (0.027)				
L.Diagonal acc.		0.919*** (0.009)			
L.Horizontal acc.			0.855*** (0.020)		
L.Judicial acc.				0.865*** (0.030)	
L.Accountability					0.915*** (0.008)
N	1,622	1, 622	1, 622	1, 622	1, 622
Groups	47	47	47	47	47
Adj. R ²	0.745	0.935	0.842	0.751	0.938

Note: as for Table B1.

Source: authors' construction.

Table B12: Effect of total revenue on different accountability measures, resource rents

	[1] Vertical	[2] Diagonal	[3] Horizontal	[4] Judicial	[5] Accountability
Total revenue	0.041*** (0.015)	-0.004 (0.006)	-0.003 (0.008)	-0.021* (0.012)	0.001 (0.006)
Resource rents	-0.017* (0.010)	-0.000 (0.006)	-0.007 (0.007)	-0.007 (0.008)	-0.002 (0.006)
L.Vertical acc.	0.746*** (0.026)				
L.Diagonal acc.		0.921*** (0.009)			
L.Horizontal acc.			0.856*** (0.019)		
L.Judicial acc.				0.866*** (0.030)	
L.Accountability					0.913*** (0.008)
N	1,654	1,654	1,654	1,654	1,654
Groups	47	47	47	47	47
Adj. R ²	0.730	0.935	0.836	0.754	0.934

Note: as for Table B2.

Source: authors' construction.

Appendix C: Robustness

Table C1: Effect of taxation on accountability using five-year averages

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Tax revenue	0.161*** (0.044)	0.254*** (0.067)	0.197** (0.089)	0.125** (0.048)	0.085 (0.057)
NTR	-0.160** (0.080)	-0.057 (0.079)	0.046 (0.108)	-0.035 (0.056)	0.034 (0.063)
GDP per capita			0.566 (1.757)		0.677 (0.940)
Aid (% GNI)			0.745*** (0.252)		1.238** (0.473)
Trade (% GDP)			1.090 (1.176)		0.383 (0.718)
L.Acc				0.481*** (0.048)	0.439*** (0.057)
LT effect				0.241	0.152
N	346	346	289	309	263
Groups		47	44	47	44
Adj. R ²	0.037	0.497	0.471	0.627	0.574

Notes: as for Table 1.

Source: authors' construction.

Table C2: Effect of tax components on accountability using five-year averages

	[1] FE	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Direct tax	0.373*** (0.110)	0.420*** (0.105)	0.333** (0.124)	0.250** (0.110)	0.211* (0.124)
Indirect tax	0.156 (0.118)				
NTR	-0.076 (0.074)	-0.043 (0.087)		-0.009 (0.059)	0.017 (0.058)
GST		0.053 (0.229)	0.274 (0.204)	0.823 (0.151)	0.137 (0.154)
Trade tax		0.159 (0.127)	0.189 (0.119)	0.115 (0.074)	0.117 (0.073)
GDP per capita			-0.016 (1.365)		0.922 (0.886)
Aid (% GNI)			0.658** (0.269)		1.214*** (0.446)
L.Acc				0.398*** (0.065)	0.371*** (0.070)
N	298	278	268	255	251
Groups	46	46	45	46	45
Adj. R ²	0.497	0.505	0.471	0.588	0.561

Note: as for Table 2.

Source: authors' construction.

Table C3: Effect of tax on accountability using lags

	[1] Lags, 0	[2] Lags, 1	[3] Lags, 3	[4] Lags, 5
Tax	0.232*** (0.053)	0.230*** (0.055)	0.216*** (0.046)	0.202*** (0.040)
NTR	-0.033 (0.053)	-0.053 (0.046)	-0.040 (0.037)	-0.004 (0.036)
N	1,639	1,600	1,517	1,436
Groups	47	47	47	47
Adj. R ²	0.398	0.390	0.362	0.335

Note: as for Table 1.

Source: authors' construction.

Table C4: Effect of taxation on accountability including time trends

	[1] OLS	[2] FE	[3] FE	[4] FE-LDV	[5] FE-LDV
Tax	0.144*** (0.019)	0.208*** (0.049)	0.204** (0.092)	0.074*** (0.015)	0.081*** (0.027)
NTR	-0.131*** (0.036)	-0.022 (0.053)	-0.022 (0.053)	-0.023 (0.018)	-0.015 (0.021)
GDP per capita		0.437 (0.881)	0.436 (0.882)		0.115 (0.244)
Aid (% GNI)		0.509* (0.299)	0.511* (0.300)		0.185* (0.097)
Tax ²			-0.000 (0.000)		-0.000 (0.000)
L.Acc				0.733*** (0.028)	0.712*** (0.029)
Trend	25.83*** (5.009)	31.997*** (8.837)	31.898*** (9.360)	14.294*** (2.869)	14.690*** (3.192)
Trend ²	-0.006*** (0.001)	-0.008*** (0.002)	-0.008*** (0.002)	-0.004*** (0.001)	-0.004*** (0.008)
LT effect				0.279	0.283
N	1,639	1,526	1,526	1,616	1, 508
Groups	47	47	47	47	47
Adj. R ²	0.235	0.355	0.354	0.726	0.701

Note: as for Table 1.

Source: authors' construction.

Table C5: Effect of tax on accountability excluding one country at a time

Excluded	Coeff.	Std. error	p-value	
Angola	0.262	0.053	0.000	***
Benin	0.230	0.053	0.000	***
Botswana	0.232	0.054	0.000	***
Burkina Faso	0.220	0.052	0.000	***
Burundi	0.245	0.052	0.000	***
Cabo Verde	0.234	0.054	0.000	***
Cameroon	0.234	0.053	0.000	***
Central African Republic	0.235	0.053	0.000	***
Chad	0.231	0.055	0.000	***
Comoros	0.229	0.053	0.000	***
Congo, Democratic Republic	0.219	0.051	0.000	***
Congo, Republic	0.237	0.060	0.000	***
Côte d'Ivoire	0.233	0.053	0.000	***
Djibouti	0.228	0.053	0.000	***
Equatorial Guinea	0.229	0.054	0.000	***
Eritrea	0.233	0.053	0.000	***
Eswatini	0.248	0.053	0.000	***
Ethiopia	0.232	0.053	0.000	***
Gabon	0.237	0.054	0.000	***
Gambia, The	0.228	0.053	0.000	***
Ghana	0.208	0.047	0.000	***
Guinea	0.237	0.054	0.000	***
Guinea-Bissau	0.225	0.053	0.000	***
Kenya	0.240	0.054	0.000	***
Lesotho	0.221	0.059	0.000	***
Liberia	0.230	0.053	0.000	***
Madagascar	0.229	0.053	0.000	***
Malawi	0.234	0.053	0.000	***
Mali	0.228	0.053	0.000	***
Mauritania	0.235	0.053	0.000	***
Mauritius	0.228	0.053	0.000	***
Mozambique	0.233	0.055	0.000	***
Namibia	0.227	0.054	0.000	***
Niger	0.230	0.053	0.000	***
Nigeria	0.229	0.053	0.000	***
Rwanda	0.235	0.054	0.000	***
São Tomé and Príncipe	0.230	0.055	0.000	***
Senegal	0.235	0.053	0.000	***
Seychelles	0.241	0.054	0.000	***
Sierra Leone	0.235	0.054	0.000	***
South Africa	0.227	0.053	0.000	***
Sudan	0.226	0.053	0.000	***
Tanzania	0.235	0.053	0.000	***
Togo	0.234	0.053	0.000	***
Uganda	0.238	0.054	0.000	***
Zambia	0.235	0.054	0.000	***
Zimbabwe	0.215	0.055	0.000	***

Note: regressions of vertical accountability on total tax revenue; include non-tax revenue, country and time FEs, with one country at a time excluded. The standard errors are clustered at the country level. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Source: authors' construction.