Journal of Institutional Economics (2023), **19**, 444–457
doi:10.1017/S1744137422000406

CAMBRIDGE UNIVERSITY PRESS

RESEARCH ARTICLE

No taxation without state-assigned property rights: formalization of individual property rights on land and taxation in sub-Saharan Africa

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(Received 16 December 2021; revised 23 September 2022; accepted 29 September 2022)

Abstract
The arguments that property rights and taxation positively affect development are well established in separate literatures, but the link between property rights and taxation is under-studied. To address this gap, we theorize, in the fiscal contract tradition, that property rights assigned and upheld by the state, as opposed to other political authorities, increase individual assent to taxation. We apply this argument to property rights on land in sub-Saharan-Africa, where the majority of land is governed by traditional authorities. Empirically we examine (1) the link between the state-assinged property rights on land and assent to taxation using individual-level data from Afrobarometer, and (2) the effect of state-led formalization, measured through novel data on state-produced cadastral records, and revenue from taxes on individuals in a panel of 37 sub-Saharan African countries across 35 years. We find support for our argument that there is no taxation without state-assigned property rights.

Key words: Afrobarometer; cadastre; property rights; sub-Saharan Africa; taxation

1. Introduction

Tax systems that can raise revenue from a broad tax base are strongly linked with higher levels of human development through channels, ranging from public goods provision to redistributive social policies and higher quality of government (Besley and Persson, 2009; Moore *et al.*, 2018; Ricciuti *et al.*, 2019). The literature on the institutional sources of variation in tax compliance and outcomes has focused on the impacts of state capacity and regime type (Besley and Persson, 2009; Jahnke and Weisser, 2019; Prichard *et al.*, 2018). However, limited attention has been given to the foundational political economy institution – property rights.

Understanding the relationship between property rights and taxation is particularly pressing in sub-Saharan Africa (SSA) where low fiscal capacity, weak property rights and underdevelopment have coalesced. Average tax-to-GDP ratios are below other regions and increasing at a slower rate (OECD, 2021: 1). Fiscal weakness in SSA has been linked to, as a cause and result, economic underdevelopment (Caldeira *et al.*, 2019) and poor governance (von Soest, 2007). On the other hand, where governments systematically solicit citizens for taxes, this increases government responsiveness and accountability (Prichard, 2015), and political engagement of citizens (Weigel, 2020). Structural constraints on tax revenue include: historical legacies, with exploration of the effect of pre-colonial state history (Kjær, 2009) and debate about the impact of colonialism (Acemoglu *et al.*, 2001;

Frankema, 2010); weak political institutions, with democratization not producing the expected revenue gains (Prichard *et al*., 2018; Ricciuti *et al*., 2019) and corruption eroding assent (Ali *et al*., 2014; Jahnke and Weisser, 2019). A surprising omission from this literature is the nature of the property rights regime. While the effects of property rights on development have been studied in this context (see Fenske, 2011 for a review), the effect on tax has not. This is true of both the literature that has examined the individual-level predictors of tax assent, largely focusing on public goods provision (Ali *et al*., 2014; D'Arcy, 2011), and the institutionalist literature, where good measures of property rights institutions have been lacking.

We address the gaps in these literatures theoretically by bringing property rights on land into the framework of fiscal contract theory.[1] Building on the insight that the recognition by a public authority is a key distinction between property rights and possession, we argue that if that authority is the state, then state-assigned and thereafter upheld property rights (state-led formalization of property rights) are likely to generate assent to pay tax. Where an alternative authority assigns and adjudicates property rights, as is the case with the majority of land in SSA, this may undermine individual incentives to pay tax to the state. In other words, we argue: 'No taxation without state-assigned property rights!'.

We test the observable implication of this argument using Afrobarometer survey data, finding empirical support for it. If state-assigned property rights matter for tax consent, does this translate into actual tax revenues? To answer this question, we examine the link between the extent of state-led formalization of individual property rights and tax revenues in a cross-country panel of sub-Saharan African countries over 35 years, and find a robust positive association between our *cadastre* indicator and revenues from taxes on individuals. In their totality we treat these findings as providing support to our argument that a type of property-assigning authority is an important constitutive element of the fiscal contract between individuals and the state.

Our research contributes to the literature in several ways. First, to the literature on fiscal contract theory we bring an emphasis on a hitherto overlooked factor – property rights regimes. Second, we extend to the context of SSA previous research on the effects of institutions on tax compliance (Steinmo, 2018) and on the effects of state-administered property rights on land on tax outcomes within the historical European context (D'Arcy and Nistotskaya, 2018; Nistotskaya and D'Arcy, 2018). Finally, in the broad debate on institutions and development, we nuance the property rights–development link. In contrast to Acemoglu *et al*.'s (2001) well-known argument that Europeans established extractive rather than property-rights-protecting institutions in areas where they could not settle due to high mortality, we emphasize that African polities did experience settlement and the emergence of sound property rights institutions. However, this was afforded only to a small group of people, leading to deleterious effects on tax and broader development outcomes.

2. Theoretical framework: state-assigned property rights and the fiscal contract

Dominant arguments in the fiscal contract literature postulate that the possibility of political representation (Prichard, 2015) and the benefits of public goods (Ali *et al*., 2014; author reference) are at the heart of citizen consent to taxation. Without opposing the core of these arguments, we suggest that state-assigned and thereafter upheld property rights (state-led formalization) are an important private good that draws citizens into a sound fiscal contract with the state. Not only does state-led formalization of property rights brings citizens and the state into a direct relationship, it may also incentivize citizens to pay taxes demanded by the state because the state provides citizens with a private good (property rights) that they could not produce themselves. Once a person's individual property rights are state-assigned – in other words underpinned by state authority – that person also depends on the

[1] Our focus on property rights on land is motivated by the paper's focus on SSA where: (1) more than half of the region's population works in and lives from agriculture (World Bank, 2022), making land central to most people's livelihoods and (2) land continues to have major political significance for people (Boone, 2014), not least through its links to identity (Chimhowu, 2019; Slavchevska *et al*., 2021) and its 'salience as arenas for the production of history' (Berry, 2002: 640).

https://doi.org/10.1017/S1744137422000406 Published online by Cambridge University Press

state to sustain these rights.[2] Since the state is a public authority that depends on taxation, state-led formalization of property rights may induce citizen assent to pay taxes to support the authority that underpins their property rights.

Our argument departs from the observation that without recognition by a public authority an economic resource is merely a possession, while recognition makes it property (Hodgson, 2015: 688).[3] We extend this argument by highlighting the importance of the authority that assigns property rights. If the political authority assigning property rights is the state, which depends on taxation, this may incentivize individuals holding state-assigned property rights to pay tax. If property rights are assigned by a different political authority than the state, this may undermine individual incentives to pay tax to the state, even if the state recognizes such rights.

In SSA, the principal public authority assigning property rights on land is traditional authority. Column 2 Table 1 shows that in all but three SSA states (Mauritius, South Africa and Rwanda) neo-customary land remains the main form of land tenure. In other words, traditional authorities, rather than the state, are the main authority assigning property rights on land, regardless of whether neo-customary tenure is recognized by the state or not. In 45 SSA countries the average share of land governed by traditional authorities is 59% of the total land, ranging from 97.7 (Somalia) to 2.2 (Rwanda) %, with 19 countries having at least 80% of the land under neo-customary tenure (Table 1). At the same time less than half of land under neo-customary tenure is recognized by the state or circa 20% of total land (column 3 Table 1). Given that land is fundamental not only to the livelihoods of Africa's people, but to their very 'being and identity' (Tafira, 2015), and considering that most property rights on land in SSA are assigned by traditional authority, this may weaken incentives for individuals to pay taxes to the state – a public authority, which is of secondary importance to their land rights.

The origins of the current situation are historical. While some of the larger pre-colonial polities, such as the Buganda kingdom, had developed tax systems (Reid, 2002), the prevalence of non-sedentary agriculture undertaken in tenurial systems where property rights were relational created a revenue conundrum for colonial powers. To create an extractable surplus, they encouraged the growth of export-driven cash crop production, taxable primarily through trade taxes (Boone, 2019; Frankema, 2010). Within the zones of intensive commercial crop production, individual property rights were formalized through Torrens title – a system of private rights registration and transfer on land was presided over by the colonial state (Dickerman, 1989). However, the great majority of land was under the so-called neo-customary property rights regimes under the authority of traditional chiefs and elders. Power to allocate land, adjudicate disputes and impose taxes underpinned traditional authority, thereby localizing political relationships (Boone, 2014: 28).

As a result of this history tenurial regimes in post-colonial African states today are extremely complex and diverse (see Alden Wily, 2018; Fenske, 2011; Slavchevska *et al.*, 2021 for country examples), but could be categorized into two broad types: statist and neo-customary. The later are 'land regimes in which state-backed local leaders who are officially recognised as neo-customary or traditional exercise state-sanctioned authority within communities recognised as autochthonous or indigenous by the state, including authority over land allocations and land-dispute adjudication', while under statist regimes 'the central state itself is the land allocator and dispute adjudicator' (Boone, 2015: 172).

[2]While property rights are themselves a private good – in that use by one actor precludes use by another – upholding property rights is a public service that requires continuous investment to ensure that the information about the property rights distribution is accurate. Cadastral records that keep information on land/real estate ownership require regular updates in order to represent an accurate picture of ownership patterns by capturing changes brought about by both human activity (such as subdivisions of plots and their sales) and by natural causes (such as climate change). Cadastral maintenance cannot be taken for granted, particularly in the context of SSA, which has the highest rates of urbanization and population growth of any world region (World Bank, 2022). Therefore, state assignment of individual rights (e.g. receiving a freehold title) is not a one-shot, but a repeated, game.

[3]For the ongoing debate concerning the definition of property rights either as 'legally sanctioned rights' or as 'economic rights' (mere possession or physical control), see *Journal of Institutional Economics*, 11(4), 2015.

https://doi.org/10.1017/S1744137422000406 Published online by Cambridge University Press

Table 1. Neo-customary rights in SSA, 2015

Country	1 Legal recognition of neo-customary rights	2 Neo-customary tenure, % of the country land area	3 Neo-customary, registered or lawfully occupied and used, % of the country land area
Countries in the sample			
Angola	3	76.9	0
Benin	3	77.9	16.7
Botswana	3	62.3	31
Burkina Faso	4	83.3	83.3
Burundi	1	93	0
Cameroon	2	81	9
Central African Republic	1	81.4	0
Chad	2	88.9	0
Comoros	1	97.3	No data
Congo, Democratic Republic of	2	86.4	0.9
Congo, Republic of	2	87	1.4
Cote d'Ivoire	3	74.5	0.1
Ethiopia	3	81.1	14.7
Gabon	2	82.9	0.3
Ghana	4	79.6	79.6
Guinea	3	92.2	9.3
Guinea-Bissau	2	61.6	No data
Kenya	4	55	55
Lesotho	3	76.8	76.8
Liberia	3	72.6	31.7
Madagascar	3	76	11.9
Malawi	4	65	65
Mali	4	89.1	0
Mauritania	2	96.4	5
Mauritius	1	No data	No data
Mozambique	4	72	67.4
Namibia	3	36	36
Niger	3	81.8	10
Nigeria	3	82.3	82.3
Rwanda	1	2.2	0
Senegal	2	69.5	58

(*Continued*)

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Table 1. (*Continued.*)

Country	1 Legal recognition of neo-customary rights	2 Neo-customary tenure, % of the country land area	3 Neo-customary, registered or lawfully occupied and used, % of the country land area
Sierra Leone	3	91.4	91.4
South Africa	4	13	13
South Sudan	4	95.4	95.4
Sudan	2	87.5	0.1
Eswatini (former Swaziland)	3	54	54
Tanzania	4	70	70
Togo	3	83	0
Uganda	4	41	41
Zambia	3	67.5	67.5
Zimbabwe	2	42.4	42.4
Not in the sample			
Gambia	3	86.5	86.5
Eritrea	1	91.5	0
Somalia	No data	97.7	0
Equatorial Guinea	2	70.8	0
Average		59	19.4

Note: Data in column 1 presents the strength of legal recognition of neo-customary rights, based on Alden Wily *et al*. (2016) for all countries, except for Liberia and South Africa, which are from Alden Wily (2018), where '4' stands for a strong recognition and '1' for minimal or no legal recognition of community and other neo-customary rights on land. Data in columns 2 and 3 is from Alden Wily (2015).

Neo-customary land rights vary considerably across countries (Alden Wily, 2018) and categories of people (Slavchevska *et al*., 2021), but their defining characteristic and point of distinction from state-assigned individual property rights is that they are 'usually earned through 'son of the soil' entitlements' (Chimhowu, 2019: 898). This means that while neo-customary rights can be either individual, familial or communal, and can be recognized by the state (as is the case in Burkina Faso, Ghana, Kenya, Malawi, Mali, Mozambique, South Sudan, South Africa, Tanzania and Uganda) or not (as is the case in Burundi, Comoros Mauritius and Rwanda), they are held by virtue of membership in a community that claims indigeneity to that place and are assigned by traditional authority, not the state.[4] For example, although in parts of Ghana neo-customary land rights are recognized by the state (columns 1 and 3 Table 1), land is ultimately under the authority of the paramount chief (the *stool*), and is allocated through processes of negotiation within the matrilineage group (Goldstein and Udry, 2008: 984). Land use rights (ranging from selling land to planting trees) depends on relationship to the group; for example, whether an individual is indigenous to the village or not; or whether the land is inherited patrilineally or matrilineally (Otsuka *et al*., 2003: 82). This contrasts with individual state-assigned property rights, which, compared to the relational nature of neo-customary rights, are

[4]Tenure regimes are particularly complex in countries such as Nigeria or Tanzania that nationalized land ownership, but neo-customary tenure persists *de facto*. Our argument seems holding even in these contexts as in practice traditional authority continues to assign property rights (Otsuka *et al*., 2003; Slavchevska *et al*., 2021).

https://doi.org/10.1017/S1744137422000406 Published online by Cambridge University Press

more impersonal: any individuals from anywhere can hold them through a relationship with the state rather than through relations with local political actors and within group/family/kinship networks.

Whichever political authority assigns property rights is therefore consequential for the type of public authority individuals form direct relationship with, in relation to land – the fundamental asset in African people's lives. As a fiscal contract framework emphasizes that the contract is a result of bargaining and exchange within a *direct relationship* between citizens and the state, the fact that citizens are in relation to a different political authorities with respect to their property rights may matter for assent to tax. Therefore, we hypothesize that:

H1: where the extent of state-led formalization of individual property rights on land is greater, citizens more readily assent to pay taxes to government.

3. Analysis

3.1 Individual-level analysis

3.1.1 Data and method

To test H1, we employ individual-level data from the seventh round of the Afrobarometer surveys (Afrobarometer, 2019). Given the paper's focus on SSA, we focused on individuals from 32 sub-Saharan African countries (see Table A1 online appendix). Our primary variable of interest is the availability of government information on land ownership (*land*). Such information may only be available where the state is actively engaged in directly assigning land property rights and keeps records of land ownership. The Afrobarometer question we employ asks how likely it is that if the respondent went to the government office to find out who owns a piece of land in their community, they could get this information. There are four substantive answers, ranging from 'not at all likely' to 'very likely' (Table A2 online appendix provides a full description of all questions and constructed variables). This question captures the perceived extent of state-led formalization of property rights on land in the respondent's area.[5] In the context of fiscal exchange, individual perceptions of the state's role in land rights management is a relevant indicator because individuals routinely 'base their actions on their perceptions' of institutions (Kaufmann *et al.*, 2009: 4). Similarly to citizens basing their voting decisions on the perceived performance of the government and entrepreneurs basing their investment decisions on the perceived impartiality of the government (Nistotskaya *et al.*, 2015), citizens are more likely to support the state through tax contributions if they perceive the state as the rights-assigning authority. Figure A1 (online appendix A) presents the spatial distribution of the values of the key explanatory variable across SSA. Our key concept of interest is citizen assent to paying taxes to government. We capture this with the well-established question used in the literature on tax compliance (D'Arcy, 2011), asking whether people must pay taxes (Q38c),[6] measured on a 5-point Likert scale.

Following the literature on the causes of tax compliance in the African context (Ali *et al.*, 2014; D'Arcy, 2011), we control for satisfaction with services provided by the state, comparative treatment by the state, trust in political institutions, and a set of personal socioeconomic characteristics (age and its square term, gender, place of residence (urban/rural), education, employment status, and wealth). We control for the influence of traditional authorities in a local area through a question capturing how often respondents have contacted traditional leaders. We also control for country fixed effects (α_j). We estimate the following equation for each individual i and country j:

$$Assent\ to\ taxation_{ij} = \beta_1\ Land_{ij} + \beta_j\ Controls_{ij} + \alpha_j + \varepsilon_{ij} \quad (1)$$

[5]Although the question does not specify that the ownership is held under state-assigned private individual property rights rather than neo-customary, given that the overwhelming majority of land under neo-customary tenure exists without formal registration by the state (column 3 Table 1), we treat this question as implying individual state-assigned rights.

[6]'For each of the following statements, please tell me whether you disagree or agree? The tax authorities always have the right to make people pay taxes'.

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Table 2. Access to information on land ownership and assent to paying taxes: ordered probit regression estimates

	Dependent variable: assent to pay taxes				
	1	2	3	4	5
Land	0.21*** (0.03)	0.19*** (0.03)	0.19*** (0.04)	0.17*** (0.03)	0.15*** (0.03)
Satisfaction with services		0.11*** (0.02)	0.09*** (0.02)	0.04** (0.02)	0.04* (0.02)
Partiality			−0.13*** (0.05)	−0.10** (0.04)	−0.10** (0.04)
Trust in political institutions				0.07*** (0.01)	0.007*** (0.01)
Resort to traditional authority					0.006 (0.05)
Female (*d*)	−0.03** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)	−0.03** (0.01)	−0.03* (0.02)
Age	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Age^2	0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)	−0.00 (0.00)	−0.00 (0.00)
Education	0.18*** (0.04)	0.19*** (0.04)	0.20*** (0.04)	0.24*** (0.04)	0.24*** (0.04)
Working (*d*)	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	0.01 (0.02)
Urban (*d*)	−0.03 (0.02)	−0.02 (0.02)	−0.03 (0.03)	−0.06** (0.03)	−0.07** (0.03)
Wealth	0.12*** (0.02)	0.12*** (0.02)	0.10** (0.02)	0.13*** (0.02)	0.14*** (0.02)
Country fixed effects	yes	yes	yes	yes	yes
Observations (*n*)	35,123	33,156	29,026	26,542	24,060
Countries (*n*)	32	32	32	32	32

Note: Coefficients are as follows: for *land*, 'very likely' (reference category 'not at all likely'); for *partiality*, 'always' (reference category 'never'); for *education*, 'secondary/high school completed' (reference category 'no formal education'); for *traditional leader*, 'often' (reference category 'never'); robust standard errors are in parentheses, standard errors clustered at country level; '*d*' = dichotomous variable; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In the main specification, we use ordered probit regression (with standard errors clustered at the country level) to estimate the impact of the perceived extent of state-assigned property rights on land on citizen assent to paying taxes to government.

3.1.2 Results

Table 2 report the coefficients from the ordered probit regressions. The coefficient for the primary variable of interest – *land/very likely* – is statistically significant (at the 99% confidence level) across all models and positively signed, suggesting that individuals who are very likely to find information from the government about land ownership in their communities are also more likely to agree with the statement that the government has the right to make people pay taxes.

The variable capturing the standard fiscal exchange theory (*satisfaction with services*) enters statistically significant and positively signed, suggesting that people who are satisfied with the services provided by the state are more likely to agree to pay taxes to government. Similar results are obtained for *trust in political institutions*: individuals with higher levels of trust in major political institutions are more likely to assent to taxation. The coefficient for *partiality* enters statistically significant and negatively signed, suggesting that those who are of the opinion that their ethnic group is treated unfairly – be it sometimes, often or always – exhibit less acceptance of government demands for taxation,

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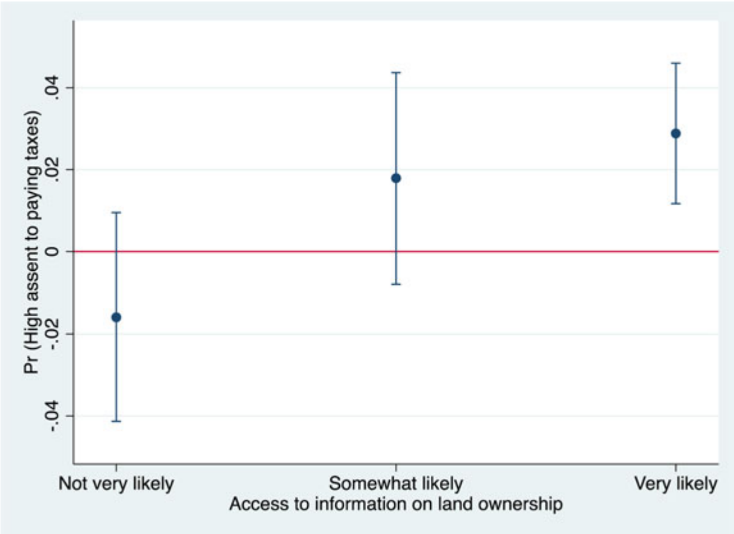

Figure 1. Marginal effects of *land* on assent to paying tax.
Note: marginal effects at 95% confidence interval are calculated for *land* = 'very likely'; outcome 1 = citizens 'agree' and 'strongly agree' to paying taxes, outcome 0 = otherwise.

compared to those who think their ethnic group is never treated unfairly. Resort to traditional authority enters statistically not significant. Among variables capturing the demographic and socio-economic status of respondents, *gender*, *education*, and *wealth* enter statistically significant across all models. Respondents who are better educated and possess durable goods are more likely to agree the government tax demands, while women tend to disagree. *Age* and its squared term, *employment status*, and *place of residence (urban/rural)* fall below the threshold.

To facilitate the interpretation of the main results, we calculated marginal effects of *land* for the dichotomized outcome, where 'strongly disagree', 'disagree' and 'neither' are recorded as zero and 'agree' and 'strongly agree' as one. Figure 1 visualizes the estimates from probit regressions, suggesting that when respondents find it very likely to find information on land ownership from government, the probability of them agreeing that the government has a right to collect tax increases by 2.9% points, with a margin for error of 1.7 at the 95% confidence interval.[7]

To ascertain the robustness of these results, we re-run the analysis using additional control variables and different measures for the same underlying concepts (online appendix A5 provides a detailed discussion of the measurements, modeling choices and results) and also employing a logistic maximum likelihood estimator (online appendix A6). We find the results from these robustness checks to be substantively similar to the main analysis. Thus the data reveals a correlation between being more likely to agree to pay taxes and being able to easily find information on land ownership from government.

3.2. Country-level analysis

Despite strong empirical support to our hypothesis, the question remains whether the increased role of the state in the assignment of land property rights leads to higher tax revenue? Extant research has shown that the creation of state records of land ownership (cadastres) in the European context led to better tax outcomes (D'Arcy and Nistotskaya, 2018; Nistotskaya and D'Arcy, 2018). We extent this work to the SSA context and examine the link between the extent of the state-led formalization of individual property rights on land and tax revenues in multivariate panel data analysis.

[7]Table A4 of online appendix reports marginal effects from Model 5 Table 2 and Figure A2 visualizes marginal effects for *land*.

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3.2.1 Data and method

We focus on revenue from taxes on individuals because they most immediately reflect our theoretical concern with the fiscal contract between individuals and the state. In the data we use (UNU-WIDER, 2021) direct taxes on individuals essentially stand for income taxes. We acknowledge that property taxes would have been an apposite outcome measure for our research purposes. Property taxes, however, are a poorly-developed fiscal instrument in SSA,[8] and the data coverage for SSA countries in the dataset is also subpar. This makes property taxes an unsuitable choice for the empirical examination of the research question at hand.

The data on formalization of individual property rights by the state come from our original dataset on the extent of state-administered cadastral records. We define cadastre as a public record containing information on (a) a land/real estate asset and (b) the party that holds (c) interests over the asset. In other words, a cadastre record contains three pieces of information – what, who and which (interest) – contained in two interlinked documents: a description (location, boundaries, dimensions) of a spatial unit that uniquely identifies it and a description of people/organizations and their rights, restrictions and responsibilities over the spatial unit. Only when the latter is linked to descriptions [narrative or cartographic (map)] of parcels does a country receives a positive base value, which is further weighted by percentage of the country's territory covered by cadastre.

Cadastrification is central to the process of formalization of rights to land by the state. The suitability of cadastres as a measure of formalization has been recognized in the literature (Yoo and Steckel, 2016), but the scarcity of cross-country data on cadastres is a long-standing issue that has precluded its utilization in empirical research. We address this gap in the multidisciplinary literature by creating the *cadastre* indicator, capturing the extent of state-led formalization of individual property rights on land. The coding principles, underlying sources, and the validity of the resulting measure are discussed in online appendix B. Since we are interested in individual rights, cadastrified state and customary land is not part of the score.[9]

Our data are an unbalanced panel data for 37 SSA countries across 35 years (1980–2015). Due to missing data for both *cadastre* and tax, there are 803 country-level observations for the focal relation, constituting on average 21 years of observations per country (min. = 5, max. = 36). Table C1 online appendix provides description of all variables and data sources pertaining to the cross-country analysis, and Table C2 provides summary statistics.

Defining a model to estimate the effects of institutions is challenging given the competing biases: omitted variable bias and post-treatment bias. Since such models can be specified in a number of different ways, we 'tie our hands' by adopting the empirical strategy from Acemoglu *et al.* (2019) as our primary research design. Specifically, we employ a dynamic (linear) panel model for revenues from taxes on individuals where we control for country and year fixed effects, as well as for up to four lags of the dependent variables. Equation (2) specifies the model: (Y_{ct}) is a log of the share of individual taxes in GDP in country c at time t and $Cadastre_{ct}$ is our explanatory variable. The α_c denotes a full set of country fixed effects, which absorb the effect of any time-invariant country characteristics; δ_t denotes a full set of year fixed effects, and ε_{ct} is an error term that includes all time-varying effects on the outcome variable. The specification includes up to $p = 4$ lags of the dependent variable, where γ_j is the estimated coefficient for lag $j \leq 4$. The lag structure addresses the issue of the residual serial correlation in the error term, and also serves as a control for trends in tax levels before a cadastral reform. We also estimate the long-term impact of *cadastre* using the formula from Acemoglu *et al.* (2019: 59).

$$y_{ct} = \beta\, Cadastre_{ct} + \sum_{j=1}^{p} \gamma_j y_{ct-j} + \alpha_c + \delta_t + \varepsilon_{ct} \tag{2}$$

[8]70% of observations in our sample have values of less than 0.1 (share of GDP) on property taxes. Effective property taxation requires an efficient cadastral system and also efficient property valuation (D'Arcy and Nistotskaya, 2022), but 'valuation rolls across most of Africa are incomplete and severely out-of-date' (Zebong *et al.*, 2017: 1).

[9]For example, Mauritius has a complete cadastre, but 22% of the land is state owned (Truth and Justice Commission, 2011: 31), resulting in Mauritius's score of 0.78.

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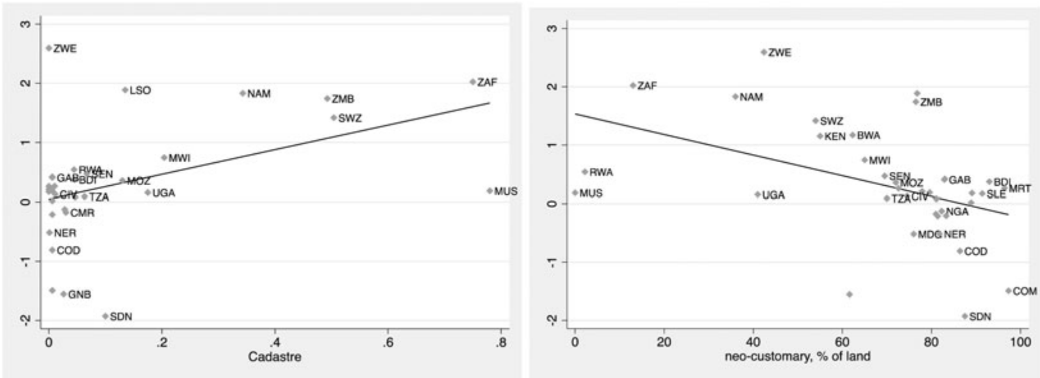

Figure 2. *Cadastre* and revenue from taxes on individuals in SSA (left panel), neo-customary property rights and revenue from taxes on individuals in SSA (right panel).

Note: The left panel is a scatterplot of *cadastre* and log revenue from taxes on individuals (UNU-WIDER, 2021). To maximize the number of observations both variables are taken for the year 2004, $r = 0.44^{***}$, $N = 33$. The right panel is a scatterplot of estimated land area under customary tenure recognized and unrecognized (Column 2 Table 1) and log revenue from taxes on individuals (UNU-WIDER, 2021). Data for the share of land under neo-customary authority was compiled in 2015, but could be best attributed to the 2000s. Due to the limited data coverage for tax revenue, to maximize the number of observations the data for all countries is for 2004, except for Madagascar (2002), Botswana (2003), Burkina Faso (2003) and Kenya (2005). $r = 0.44^{***}$, $N = 37$.

3.3.2 Results

Figure 2 plots (log) revenue from taxes on individuals on the vertical axis and *cadastre* (left panel) and an estimated land area under neo-customary tenure (right panel) on the horizontal axis, displaying a very clear association pattern between the variables of interest. On average, countries with a higher extent of cadastral records have higher tax revenues and, conversely, countries with a higher extent of neo-customary rights have lower tax revenues.

To examine this association further, we employ the *within*-estimator to estimate the impact of *cadastre* on the log of revenue from taxes on individuals as a share of GDP as per the specification in equation (1). Table 3 reports the results. In columns 1–3 *cadastre* enters statistically significant, positively signed and in the magnitude of about half a percentage point instantaneous increase of revenue from this tax (as a share of GDP) in response to a transition from no cadastral system at all to a cadastral system that documents all state-assigned private property rights. In Column 4, where we control for four lags of the dependent variable, the estimate for *cadastre* is positively signed, but slightly smaller and falls below the accepted significance level. However, the long-run estimates of *cadastre* enter statistically significant across all models, suggesting an increase in tax collection in the region of 2–2.8% points several years after the cadastral reform.

A critical threat to the validity of the reported estimates comes from the presence of time-varying economic and political factors that may simultaneously impact cadastre and tax outcomes. This requires the inclusion of sound confounders, but some of them may be affected by the treatment variable, resulting in post-treatment bias. For example, the level of economic development may affect both cadastre and revenues from taxes on individuals, but it is also a post-treatment covariate as the expansion of cadastre may affect GDP per capita, and, thereby, cadastre may influence tax via GDP per capita. Therefore, in order to control for the level of economic development, we use the Economic Complexity Index (ECI) – a measure of economic sophistication that is predictive of variations in income and economic growth (Hidalgo, 2021). This measure is only available since 1995, resulting in unbalanced panel data for 27 SSA countries across 21 years (1995–2015). Due to missing data for the outcome variable in the 2000s, there are 371 country-level observations for the focal relations, constituting on average 14 years of observations per country (min. = 4, max. = 21). We include three covariates – *population size*, *level of democracy*, and *impartial bureaucracy* – since each may have an effect on both cadastre and tax revenues.

https://doi.org/10.1017/S1744137422000406 Published online by Cambridge University Press

Table 3. *Cadastre* and revenue from direct taxes on individuals: main results

	DV: (log) revenue from taxes on individuals			
	1	2	3	4
Cadastre	0.60** (0.23)	0.51* (0.29)	0.48* (0.26)	0.40 (0.31)
Y_{t-1}	0.78*** (0.04)	0.88*** (0.09)	0.89*** (0.10)	0.86*** (0.07)
Y_{t-2}		−0.12 (0.09)	−0.12 (0.11)	−0.10 (0.11)
Y_{t-3}			0.01 (0.06)	0.11 (0.09)
Y_{t-4}				−0.07 (0.05)
Long-run effect	2.79*** (0.94)	2.16** (1.02)	2.23** (0.93)	1.98* (1.02)
Observations	762	710	659	608
Countries in sample	39	39	39	39

Note: The table reports the within estimates of *cadastre* on (log) revenue from taxes on individuals as a share of GDP. Unbalanced panel of 39 countries. All models include a full set of country and year fixed effects. Standard errors clustered at the country level (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C3 of the online appendix reports the results of this analysis that are substantively similar to those reported above. In models with time-varying confounders without and with lags of time-varying covariates (Model 1 and Models 2–5 correspondingly) *cadastre* enters statistically significant and signed positively as expected. The size of the estimates suggests a 0.8–1.5% point increase of revenue from the taxes on individuals in response to a full cadastre. These findings provide additional support for the conjecture that countries where the state assigns individual property rights on land to a greater extent, collect more tax revenue from individuals.

The results of our cross-country analysis speak to the positive association between the extent of state-assigned individual property rights on land and revenue from taxes on individuals. We, however, are not able to test the postulated mechanism (property rights – consent to taxation – tax revenue), mainly due to the lack of suitable data capturing consent at the cross-country level and over time. Furthermore, we recognize that cadastre may increase tax revenue not only by bringing individuals into direct beneficial exchange with the state (fiscal contract framework), but also by allowing the state to better estimate individual tax obligations and to enforce compliance [state capacity framework, see Nistotskaya and D'Arcy (2018)]. We acknowledge that our operationalization of the state-assigned individual property rights on land opens up the possibility of overlapping mechanisms. We also recognize that with observational cross-country data, it is impossible to completely rule out reverse causality between institutional variables and tax revenue, or the influence of potentially omitted variables that could affect both cadastral institutions and tax revenue. Our aim is to bring to the fore a previously overlooked factor that may affect tax revenue – the type of property rights assigning authority. While the results of our cross-country analysis support this link, and our individual-level analysis attests to the higher tax compliance mechanisms, further research is needed to ascertain the causal nature of these associations, and also to disentangle the fiscal contract from state capacity sources of higher tax compliance.

4. Conclusion

This paper brings property rights into the center of inquiry on the causes of tax compliance and tax revenues. We argue that – under a scope condition of at least two types of public authorities being able to assign property rights – the type of property rights assigning authority matters for the strength of the fiscal contract. State-assigned and upheld property rights bring citizens and the state into a direct relationship. This relationship is mutually beneficial because the state provides citizens with a private good that they could not produce themselves, and citizens are incentivized to respond to the state's tax demands as this supports the authority underpinning their property rights. Where an alternative authority assigns and adjudicates property rights, this may undermine individual incentives to pay tax to the state.

Applying this theoretical lens to property rights on land in SSA, we hypothesized that where the extent of state-led formalization of individual property rights on land is greater, citizens more readily assent to pay taxes to government. We tested this hypothesis using individual survey data and found a strong relationship between perceptions of the state as the principal authority in matters of land property rights and tax consent. We then examined the link between the state-led formalization of individual property rights on land, measured through state cadastral records, and tax revenue in a cross-country panel analysis. Cognizant of challenges regarding causal inference, we limit our claims to a robust positive association between the extent of cadastrification and the share of revenue from taxes on individuals. However, the magnitude of our estimates suggests that state-led formalization of property rights on land is not the most potent solution to SSA's weak tax state, as even a complete cadastrification would not allow the median SSA country to address the need for additional resources amounting to 19% of GDP to finance the Sustainable Development Goals by 2030 (Gaspar *et al.*, 2019).

Beyond our contribution to the fiscal contract literature, this paper speaks to broader debates on property rights and development, particularly in Africa. Our argument supports the idea of complementarity between fiscal and legal capacities (Besley and Persson, 2009). However, unlike Besley and Persson, who focused on public-order enforcement institutions (property rights protection), we highlighted the importance of property-rights-assigning institutions. Our work resonates with the literature that identifies the hybrid nature of African states, where informal/traditional institutions are layered onto formal/modern ones, as the core of development challenges (Van de Walle, 2001). We also contribute to the ongoing debate on the pros and cons of the formalization of land rights for the poor in SSA (Boone, 2019) by showing that state-led formalization may contribute – via higher tax revenues – to better provision of public goods and services.

While this paper constitutes an important step in unpacking the relationship between property rights and taxation, much additional work is needed. A better understanding of the relationship between property-rights-assigning authorities and taxation should take into account different types of traditional authorities and state authorities at different levels, and their interaction. A more fruitful examination of the relationship would be afforded by the addition of questions about respondents' property ownership situation to standard surveys such as Afrobarometer. Finally, alternative explanations beyond the fiscal contract framework should be investigated and the contribution of these causal mechanisms should be accounted for. This work would enable us to more fully understand the relationship we have begun to explore here between the variables at the heart of the political economy of households and individuals (property rights) and the state (taxation).

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S1744137422000406.

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Cite this article: Nistotskaya M, D'Arcy M (2023). No taxation without state-assigned property rights: formalization of individual property rights on land and taxation in sub-Saharan Africa. *Journal of Institutional Economics* **19**, 444–457. https://doi.org/10.1017/S1744137422000406