# Historical Path Dependence in Intergovernmental Tax Arrangements[*]

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## Abstract

This paper investigates the role of deep historical elements in shaping intergovernmental tax arrangements as an alternative to the various modern-day features suggested by economic theories. We connect historical elements and key explanatory factors embedded in ethno-cultural diversity and geography to new indicators measuring the taxing rights of sub-national governments in many countries. We estimate the effects of economically relevant and historical-institutional variables on the current design of the multi-layer tax structure across more than 70 countries in Africa, the Middle East, and Asia. The results confirm the relevance of the historical variables. Sub-national governments in countries with a higher degree of pre-colonial state centralization tend to have greater discretionary power over tax matters today. The path out of colonization also matters: countries that have experienced a violent independence movement tend to have a more centralized tax structure. Contrary to the conventional view, ethno-cultural diversity falls short in explaining multi-layer tax arrangements. However, the standard economic theories are not all irrelevant: country size and terrain ruggedness tend to imply greater decentralization of tax-related decisions. The results are robust to an extensive set of control variables and a range of IV-GMM estimations using ecological diversity, the Tsetse suitability index, and Neolithic transition timing as instrumental variables for pre-colonial centralization.

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# 1 Introduction

In this paper, we evaluate the relevance of institutional and historical variables relative to standard economics variables in explaining the shape of intergovernmental tax arrangements. While economic theories predominantly suggest that fiscal institutions are (or should be) determined by geographical characteristics and ethno-cultural diversity, a growing body of empirical research shows that modern-day institutions (more generally) carry within them both pre-colonial structures and the legacy of colonial experiences.

We show that these historical and institutional features are also important for understanding the multi-layer structure of tax institutions in modern times. Specifically, we find that subnational governments in countries with a higher level of pre-colonial state centralization tend to have greater discretionary power over tax matters today. We also show that colonial experiences and the path out of colonization shape modern-day arrangements: countries that have experienced a violent independence movement tend to have a more centralized tax structure. Some, but not all, explanatory features suggested by standard economic theories do matter as well: country size and terrain ruggedness tend to foster greater decentralization of tax-related decisions. Yet, other parameters such as ethno-cultural diversity appear to be less relevant.

Intergovernmental tax arrangements have long been a central topic in the fiscal federalism literature and in economics more broadly. The conventional approach to the governance of tax systems is that tax bases suitable for economic redistribution or stabilization are (or should be) assigned to central-level governments, whereas those with low inter-jurisdictional mobility should be assigned to lower-tier authorities. While public finance economists do not unanimously share this view (Bird, 1999; Liberati, 2011), a near-consensus over these principles, grounded in theoretical insights that emphasize the challenges associated with decentralizing the tax system (Prud'Homme, 1995; Rodden, 2002, 2006; Ambrosanio and Bordignon, 2015), have guided the design of tax institutions.

While theory might give (seemingly) clear-cut suggestions, intergovernmental tax arrangements have so far received less empirical considerations. Research that touches upon the driving factors of intergovernmental tax institutions often analyses the subject through the broader lens of fiscal decentralization (Patsouratis, 1990; Panizza, 1999; Arzaghi and Henderson, 2005; Letelier, 2005; Bodman and Hodge, 2010). Some of the most cited explanatory factors in this literature strand include countries' income level (Patsouratis, 1990; Panizza, 1999; Arzaghi and Henderson, 2005; Letelier, 2005; Bodman and Hodge, 2010), geographical characteristics such as land area or country size (Panizza, 1999; Arzaghi and Henderson, 2005), geographical fragmentation (Canavire-Bacarreza et al., 2017), ethnic fractionalization (Panizza, 1999), urbanization and population concentration (Letelier, 2005; Arzaghi and Henderson, 2005), and the level of democracy (Panizza, 1999; Arzaghi and Henderson, 2005). However, there remains limited empirical evidence on the explanatory factors of cross-country variation in intergovernmental tax-decision arrange-

ments. This paper addresses the existing gap in two ways.

First, we focus on the determinants of sub-national governments' taxing rights instead of the broader concept of fiscal decentralization. Existing data and information point to significant cross-country variations in how the tax system is governed across government layers (UCLG and OECD, 2016; OECD and UCLG, 2019; Vincent, 2020). The evidence also suggests that much of the variation cannot be explained by standard economic theories, and that cross-country differences are not well captured by the conventional classification of countries into federal and unitary states. For instance, Malaysia, a federal country, has a much more centralized tax system than Colombia, which itself is a unitary state. According to Chambas and Audras (2012), sub-national governments in Ghana and Kenya are similar in their financial autonomy, whereas the geographical proximity of Ghana and Burkina Faso does not appear to have induced a spillover in the design of intergovernmental tax institutions. In Tanzania, the local finance systems have developed without much interference from the central level (Fjeldstad, 2001), while in Benin a large part of what is defined as own-revenues of local governments is administratively collected by the central treasury administration (*Direction Générale des Impôts*) and redistributed to respective jurisdictions (Caldeira and Rota-Grasiozi, 2014; Dafflon and Madiès, 2012; OECD and UCLG, 2019). Therefore, any conventional indicator of tax decentralization from national accounts statistics – such as the ratio of sub-national in consolidated general government revenues – is likely to over- or under-estimate the extent of sub-national or central governments' discretion over the tax system.

Second, this paper investigates the role of deep-historical elements in shaping intergovernmental tax arrangements. While (most) existing economic theories suggest that the level of fiscal decentralization is (or should be) primarily shaped by heterogeneous demands embedded in geographical and ethno-cultural diversity, a growing body of evidence, predominantly in political economy and economic history, suggests that institutions are long-lasting, and those modern-day establishments carry within them features of early and pre-modern institutions and colonial legacy (see for e.g. Miles, 1993; Bockstette et al., 2002; Gennaioli and Rainer, 2007; Acemoglu and Robinson, 2008a,b; Ali et al., 2018, 2020; Michalopoulos and Papaioannou, 2020). With this in mind, we postulate that intergovernmental tax arrangements and the multi-layer design of tax institutions may have emerged and persisted throughout the years, despite a non-compliance with economic theories. The empirical analysis thus looks into deep-rooted determinants of modern-day intergovernmental arrangements in tax matters, and explores the extent to which countries' historical trajectory and pre-modern characteristics play a role in shaping fiscal institutions.

The relevance of a historical perspective in analyzing the intergovernmental tax arrangements has been hinted at by McLure (2001) and Bird (1999) who argue that the current level of tax and revenue assignment may have resulted from the historical trajectories of countries and the process of bargaining power among political and societal groups. Contrarily to the conventional top-down perspective on tax assignment, countries like the United States, Switzerland and Canada, among others, appear to have taken another avenue that is rooted in their historical path. As these

countries were formed out of independent colonies, the governance of the fiscal space began from the perspective of sub-national governments which agreed to transfer legitimacy and power to upper-tier authorities (ibid.). To date, sub-federal governments in the above-cited countries retain great discretionary power over tax and revenue matters. This suggests that countries' trajectories might partly explain variations in intergovernmental relations in tax matters today. Exploring cross-country tax assignment through a historical lens also aligns with a growing body of research on the role of pre-colonial and colonial features in shaping modern-day economic and political development (Sokoloff and Engerman, 2000; Acemoglu et al., 2001b; Gennaioli and Rainer, 2007; Nunn and Wantchekon, 2011; Michalopoulos and Papaioannou, 2013a,b, 2020; Broich et al., 2015; Ali et al., 2018, 2020).

The empirical framework in this paper is based on new indicators of sub-national governments' taxing rights put forward by a novel cross-country dataset on multi-layer tax arrangements (Vincent, 2020). The dataset was built upon extensive reviews of legal and policy documents, scientific and grey literature, and archives from the international bureau of fiscal documentation (IBFD) that define the governance of the tax system across tiers of government. The dataset is coded to reflect the extent to which all government tiers can decide over specific tax instruments (such as income, consumption and property taxes) and the type of decision involved (such as the setting of tax rates or tax administration). The primary variable of interest that is therefrom derived is the *"Tax Assignment Index (TAI)"* which reflects the discretionary power over the tax system granted to sub-national governments in the country sample.

Building on the discussion above, we adjoin two groups of explanatory factors to the new indicators of sub-national governments' taxing rights. The first draws on the existing literature on the determinants of decentralization based on costs and benefits – which we denote the economic approach. The variables in this group include ethno-linguistic fragmentation and geographical characteristics (e.g. country size and population density; terrain ruggedness), and factors that are likely to impose a transaction cost on the public sector or trigger fiscal erosion (e.g. bargaining power of minority groups, risk of conflicts over natural resources). With the second group of explanatory factors, we take on a more comprehensive approach and consider pre-modern and pre-colonial characteristics of countries, as well as colonial legacy and other related features. We denote this as the historical approach.

The baseline model in this paper is estimated using ordinary least squares regressions where the results serve to illustrate rather than demonstrate the conjectures of this paper. The coefficient estimates from the baseline model point to the existence of historical path dependence in intergovernmental tax arrangements. The results suggest that sub-national governments in countries with a higher degree of pre-colonial state centralization tend to have greater discretionary power over tax matters in modern-time. The path out of colonization is also relevant as countries that have experienced violent independence tend to have a more centralized tax structure. On the economic arguments, geographical characteristics such as the country size and the mean ruggedness of ter-

rain – which can be regarded as proxies for spatial decay and access to infrastructure – trump all other variables. Ethno-linguistic, ethno-political and religious fragmentations fall short in explaining sub-national governments' discretion over tax matters. However, the salience of territorial conflicts and the number of politically relevant ethnic groups with regional autonomy between 1946 and 1970 have, respectively, a positive and negative influence on sub-national government taxing rights in a sub-sample of African and Middle-Eastern countries.

The results are robust to a range of sensitivity checks. First, as the results on the influence of pre-colonial state centralization are steady in various specifications using OLS, we consider new estimations using instrumental variables techniques with general methods of moments (IV-GMM). While it is unclear whether concerns about endogeneity regarding pre-colonial state centralization are warranted, it has been argued that such historical variables might be correlated with unobserved characteristics omitted in OLS models. Hence, to alleviate such endogeneity concerns, we follow the existing literature and instrument pre-colonial state centralization with ecological diversity, the tsetse suitability index and the neolithic transition timing (as of 1500 C.E.). Previous research has established that these instruments account for much of the variation in pre-colonial and early institutions (Archibong, 2019; Fenske, 2014; Alsan, 2015). The estimations are conducted for a sub-sample of countries for which these instruments are available. The findings from the IV-GMM model corroborate the baseline results in that the historical trajectories of countries matter in explaining the current multi-layer governance structure of the tax system.

Second, we test whether the results are consistent when focusing only on sub-national discretion over tax administration and the setting of tax rates which are considered critical parameters of sub-national decision autonomy. The findings (both from OLS and IV-GMM estimations) suggest that pre-colonial state centralization explains a large part of the cross-country variation in the level of decision-making power over tax rates and tax administration granted to sub-national authorities in modern times. Third, sensitivity analyses also confirm the predominance of precolonial and early institutions' legacy – namely precolonial state centralization and the type of independence – over more recent historical trajectory – such as post-World War II institutional reforms under socialist regimes.

Overall, the empirical patterns in this paper point to a significantly greater role of historical and institutional factors in determining the degree to which sub-national governments are involved in tax matters and tax (de-)centralization than it has previously been recognized. In what follows, Section 2 presents the analytical framework and lays out the main conjectures that are empirically tested in this paper. In line with the conjectures, Section 3 describes the various data sources and the construction of the outcome variable or the new proxy of sub-national taxing rights. Section 4 outlines the empirical strategy and estimation techniques. The results are presented and discussed in Section 5, whereas concluding remarks are highlighted in Section 6.

# 2   Analytical Framework

This paper bridges two strands of the existing literature. The first one, which has been the most influential intellectual framework when it comes to shaping scholarly thinking on federalism and (de)centralization, relates to the determinants of decentralization and the cost-benefit of decentralized institutions. We denote it as the economic approach. The second strand takes a more comprehensive route and analyses the development of political and fiscal institutions. Most importantly, it explores the influence of historical trajectories and legacies on the design of fiscal arrangements. We will refer to it as the historical approach in this paper. The two approaches are not mutually exclusive; both economic and historical forces likely shape modern-day (tax) institutions. That said, there is, of course, an element of competition between these strands of thinking, as the historical approach opposes the notion that tax arrangements primarily (or at least largely) are determined by economic arguments about costs and benefits.

## 2.1   The Economic Approach

The literature on the drivers of decentralization reforms revolves around two main branches. The first and dominant intellectual framework focuses on the conditions under which it might be more efficient for local governments to provide public goods and services within their jurisdictions, instead of having such a task undertaken by central authorities (Oates, 1972; Wallis and Oates, 1988; Oates, 2005). The early works in this literature refer to this as the "decentralization theorem". It highlights the relevance of the informational advantage of local governments in reaching public allocation efficiency (Musgrave, 1959; Oates, 1972, 1977). By bringing political decision-making closer to the citizens, decentralization, it is argued, reduces information asymmetries and improves the adequacy of public policies under the assumption that local authorities have a more holistic understanding of the needs and preferences of the citizens. It is thereby derived that the benefits of decentralization are enhanced when there is heterogeneous demand for public goods, such as ethno-cultural diversity, linguistic and regional disparities and spatial decay.

### Ethno-cultural Diversity

Existing research supports the idea that ethnic polarization contributes to shaping institutions in a general sense. According to Alesina et al. (2003), for instance, polarized societies are prone to competitive rent-seeking by groups with different tastes and preferences. Easterly and Levine (1997) further suggests that the high level of ethnic diversity in African countries is strongly linked to high black-market premiums, poor financial development, inadequate provision of infrastructure, and low levels of education. Wantchekon (2003) and Wantchekon and Vermeersch (2011) also corroborate the influence of ethnic affinity in public goods preference in Benin.

We also find similar ideas in the more specific decentralization literature. It is postulated

and empirically corroborated that ethno-cultural diversity, ethnic groups, and hinterlands' prefer-ences for greater autonomy tend to foster decentralization (Watts, 1999; Panizza, 1999; Arzaghi and Henderson, 2005). Given that assigning taxing powers to lower-tier governments is an important step of such reform, one might predict that ethno-linguistic diversity is a key explanatory factor. In fact, Campbell (2003) previously indicated that ethnically fragmented countries tend to have a preference for decentralized tax institutions. The following conjecture will thus be tested using various indicators that reflect the ethno-cultural diversity and polarization within countries in the sample.

***Conjecture 1.a:*** *Sub-national governments' taxing rights increase with the level of ethno-cultural diversity.*

**Spatial Decay**

Geography has been a recurring theme in institutional economics. Many scholars have argued that geographical and environmental features – including climate, soil suitability and geology – impact the quality of institutions and countries' economic performance (Gallup et al., 1999; Sokoloff and Engerman, 2000; Acemoglu et al., 2002; Alsan, 2015). There is also some evidence that the level of decentralization is driven by geographical features (Panizza, 1999; Arzaghi and Henderson, 2005; Canavire-Bacarreza et al., 2017).

One might expect country size, population density and high transportation cost to increase the pressure to decentralize as hinterlands tend to be poorly served by the central government. Low population density, combined with abundant arable land, may also weaken central governments' control over sparsely settled territories (Herbst, 2000). According to Alesina and Spolaore (1997), transportation cost could be viewed as a dis-utility endured by individuals when they are located far away from the public good: the further away are the inhabitants from the centralized provision of a public good, the less they value the consumption of that good. Thus, decentralized institutions contribute to minimizing the spatial decay in public provision.

With this in mind, we argue that the spatial decay that drives the demand for local public pro-vision could also drive the demand for decentralized fiscal institutions.[1] We, therefore, conjecture that the spatial decay would increase the demands for fiscal autonomy by hinterlands and remote regions and thereby increase the lower-tier government discretion over tax matters.

***Conjecture 1.b:*** *Sub-national governments' taxing rights increase with spatial decay.*

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[1]Numerous publications in the fiscal federalism literature have argued that matching revenue and expenditure powers is necessary to foster optimal local spending decisions and bring about the accountability of local authorities (Oates, 1972; Rodden et al., 2003; Guo, 2008; Eyraud and Lusinyan, 2011). Rodden et al. (2003), for instance, have highlighted that the alignment of revenue and expenditure foster a hard budget constraint that limit inefficient spending decisions by lower-tier authorities.

In the empirical analysis, we proxy the spatial decay through an array of geographical variables such as country size, mean elevation, the ruggedness of terrain, the distance to coastline or sea- navigable river. Besides measuring the remoteness of regions within and across borders, these variables convey the differences in transportation costs and the likelihood of some regions being more or less favourable to trade and integration – which might ultimately shape the development of state and fiscal institutions.

**Bargaining Power of Societal Groups and Resources Endowments**

Another component of the economics-oriented fiscal federalism literature points to the transaction and administrative costs imposed by decentralized institutions. Besides the public efficiency argument, decentralization of power is often argued to be a valid strategy by central authorities to preserve territorial wholeness, appease secessionist movements or ethnic or regional conflicts (Panizza, 1999; Walter, 2006). Nonetheless, through this process, central authorities may also be forced to concede control over resources if the bargaining power of ethnic and regional actors dominate (North and Weingast, 1989; North, 1990). Severe problems of coordination of the fiscal space may therefore arise, especially if ethno-linguistic and regional disparities trigger conflicts over lucrative tax bases.

In recent decades, the body research on the linkages between decentralization, violence and secessionist movements has grown significantly. The emerged empirical evidence leans towards complex interactions between central authorities and ethno-regional autonomous entities in decentralized governance systems. Ethno-federalism and ethnic control of regional governments have also been identified as triggers for secessionist movements and a destabilizing force (Hale, 2004), with strong evidence regarding Nigeria (Suberu, 2001; Christin and Hug, 2012) and ex-Soviet Union countries (Cornell, 2002). Sambanis and Milanovic (2014), using data collected at the level of second-tier administrative divisions in 48 decentralized countries, found that approximately 21% of regions that enjoy some degree of autonomy experienced violent relations with central authorities. Christin and Hug (2012) also found that countries with substantial ethno-federal subdivisions such as Brazil and Nigeria are the most prone to ethnic conflicts. Decentralization, alongside severe ethnic and regional disparities, can further exacerbate the threats to central governance, especially when wealthier regions are net contributors to fiscal equalization schemes (Madiès et al., 2018).

Therefore, while the transfer of tax-related decisions to lower-tier authorities could facilitate government response to complex and heterogeneous demands of different regions – as postulated in Conjectures $(1.a)$ and $(1.b)$, such arrangements can also grant secessionist regions access to vast resources at the expenses of central authorities. It is thus expected that the threats of fiscal erosion and the need for central authorities to control and tap onto revenues from potentially conflict-ridden regions with resources endowments (such as oil, gas and arable land) would induce tighter regulatory control by central agencies, and therefore a lesser discretion of lower-tier authorities

over tax matters. Watts (1999) also points out that it might deem desirable for central authorities to have sufficient powers to resist territorial fragmentation, including financial power. Furthermore, while the country size is evidenced to be a driving factor of decentralization (also alluded in Conjecture (1.*b*)), it can also be a hindering element, especially when it comes down to the tax and revenue mobilization system. As countries grow, inter-regional distribution might become the primary objective of central governments, resulting thereby in a centralized revenue mobilization system and policy decision-making. Contrarily to the United States or Switzerland, rich countries like France tend to have a more generous redistributive system and centrally determined tax policies (McLure, 1994, 2001).

Research results from Panizza (1999) and Arzaghi and Henderson (2005) have so far suggested that democratization and federalism go hand-in-hand as democratically elected regional governments tend to align their policy agenda with citizens demands, which might induce greater autonomy from central authorities. Nevertheless, if the electoral process overly intensifies inter-jurisdictional competition, a centralized tax and revenue system might result as a precautionary measure to prevent fiscal erosion. The conventional approach dictates that central authorities must ensure control over resources bases to prevent fiscal erosion (Prud'Homme, 1995; Rodden, 2006; Martinez-Vazquez, 2015).

We therefore postulate that the level of tax-related decisions carried by lower-tier government units would be lower the higher the risk of fiscal erosion, the bargaining power of heterogeneous groups in society, the likelihood of secessionist movements or regional conflicts, and the greater the need of central authorities to tap unto revenues from natural resources endowments.

*Conjecture 1.c:* *Sub-national governments' taxing rights decrease with the bargaining power of heterogeneous groups, the salience of political and regional conflicts, and the size of natural resources endowments.*

In the empirical analysis, we proxy the bargaining power of heterogeneous groups, the salience of regional conflicts and autonomy through time-lagged parameters from the Ethnic Power Relations Database family (EPR) (Vogt et al., 2015; Girardin et al., 2015) (see subsection 3.2). The EPR databases provide information on ethnic and regional groups' access to executive governments, their involvement in civil wars and administrative units. To the EPR, we adjoin indicators on natural resources endowments, such as the share of arable land and soil fertility, which, as argued above, may give way to more centralized regulatory tax systems. In addition, we also consider the total average of natural resources rents as a share of GDP between 1970 and 1975 as an alternative proxy for resources endowment in sensitivity analyses.

Joining the different economic arguments, one could assume that intergovernmental tax institutions are designed to minimize the costs imposed by sub-national authorities' involvement in tax matters. This, by and large, constitutes the bulk of existing research and thinking on fiscal federalism and decentralization processes. However, beyond the economic rationales, there are

reasons to believe that countries' historical trajectories also play a role in shaping intergovernmental arrangements and fiscal institutions more broadly. In recent years, economic historians and political scientists have, in other settings, demonstrated that institutions (can) persist even when they deem inefficient (Acemoglu, 2006; Greif, 2006; Acemoglu and Robinson, 2008a,b). Thus, we might assume that (possibly inefficient) intergovernmental tax arrangements may have persisted despite the above economic arguments and rationales. In the following sub-section, we make a case for considering historical elements in the quest to understand the cross-country variations in the multi-layer tax structure.

## 2.2 The Historical Approach

For many years, social scientists have attempted to bring about explanations to cross-country differences in institutions. LaPorta et al. (1999) provide a seminal overview of the most influential theories on why institutions look the way they do. The economic theories dictate that institutions are created whenever the social benefits exceed the costs. The rationales provided by the branches of the fiscal federalism literature (discussed above) align with the economic theories whereby the level of sub-national government taxing rights result from an optimal balance between the cost and the benefits. The cultural theories, on the other hand, imply that institutions are anchored in societal values and preferences, whereas the political theories suggest that policies and institutions are shaped by those in power with the objective of amassing resources. Unlike the above conjectures, the cultural and political theories suggest that existing intergovernmental institutions are shaped by forces embedded in power structure or societal values.

Institutions are defined by North (1990) as the humanly devised constraints that shape social interactions. Hence, they persist through inter-generational legacy which ensures the survival of cultural, political, hierarchical structures in society. As with any other form of institutions, tax arrangements across tiers of government may have emerged and persisted through time despite non-compliance to the above conjectures and economic rationales. The relevance of a historical perspective in analysing intergovernmental tax arrangements has also been outlined in previous literature where it is argued that the current level of tax and revenue assignment may have resulted from countries' historical trajectories and the process of bargaining among political and societal groups (see for e.g. Bird, 1999; McLure, 2001). However, to the best of our knowledge, no prior empirical research has attempted to confirm or invalidate these claims..

Recent findings, primarily in economic history, have highlighted the relevance of pre-colonial characteristics in explaining variations in modern-day economic performance, public goods provision and state capacity, especially in Sub-Saharan Africa (Gennaioli and Rainer, 2007; Michalopoulos and Papaioannou, 2013a,b; Osafo-Kwaako and Robinson, 2013; Dippel, 2014; Alsan, 2015; Michalopoulos and Papaioannou, 2020). According to Gennaioli and Rainer (2007), the observed variation in the quality of institutions in the modern era may be due to the accountability of local chiefs in a hierarchical and centralized structure in pre-colonial time. The authors argue that in

10

less hierarchical settings – inhabited by politically fragmented groups – the presence of too many stakeholders may have rendered bargaining very costly, leading to less coordinated policies and disorder. Hence, pre-colonial state centralization, which can be regarded as a measure of state integration, appears to have fostered organized state institutions that persisted through time.

Some of these contributions have also argued that pre-colonial institutions were not only crucial during the colonial period but also after the independence of most African countries. On the one hand, colonial institutions were built upon (or influenced by) the ones that colonizers found upon their arrival (LaPorta et al., 1999; Acemoglu et al., 2002; Cappelli and Baten, 2017; Ali et al., 2018). By collaborating with senior traditional leaders, the colonialists were able to control local chiefs and induce them to rule in the interest of their communities. Traditional institutions have thus contributed to maintaining the hierarchical structure of governance, which persist until today. On the other, traditional patterns of politics also appear to have influenced the nature of post-colonial leaders, especially at the local level where post-colonial regimes could not reach their objectives without the cooperation of traditional leaders. Unable to create entirely new institutions, both colonial and post-colonial leaders had to rely on and exploit the existence of pre-colonial leadership structure.

Existing evidence suggests that many pre-colonial institutions were deeply entrenched in local communities. de Juan (2017) argues that pre-colonial institutions are likely to remain salient in the historical strongholds of the pre-colonial political and cultural systems where certain traditions have been internalized in cultural paradigms over many centuries. Therefore, it can be assumed that the pre-colonial institutional structure and the level of state integration in pre-modern time, which, according to the empirical evidence, explains modern-day variation in institutions, can also explain the cross-country variation in the hierarchical structure of tax institutions. I summarize the above arguments in the following conjecture:

***Conjecture 2.a:*** *Sub-central governments' taxing rights are historically path-dependent, and state structures that were in place before colonial times shape modern day tax arrangements.*

Most countries in the sample covered in this paper have been colonized at some point in their history. The political economy and economic history literature highlights the lasting impact of colonizers' conquests and ruling on modern-day economic development and institutions (Sokoloff and Engerman, 2000; Acemoglu et al., 2001a; Huillery, 2009; Jones, 2013; Frankema and van Waijenburg, 2014; Ali et al., 2018, 2020). Official languages, legal and regulatory system, religion and culture constitute some of the most observable characteristics of the colonial legacy. Numerous publications also point to key differences in colonization styles of Great Britain and France (Crowder, 1964; Sokoloff and Engerman, 2000; Acemoglu et al., 2001a). Crowder (1964), for instance, suggests that the British colonizers were more likely to use traditional boundaries and authorities than the French or the Spanish. Under the British ruling, local authorities remain largely autonomous, although they carried the obligation of collecting taxes for the administration

according to the rules set by the colonizers. This strategy is known as the indirect rule, or the "divide and rule" (Ali et al., 2018). The French style, on the other hand, was prone to the breaking-up of traditional governance units and the own-selection of native rulers rather than through traditional means, although historical evidence suggests some exceptions such as in Senegal where history suggests that traditional leaders played an intermediary role between their followers and the French colonial administration (Diouf, 2013). Yet, across the board, it is argued that the French generally minimized local decision-making and instead adopted the principles of centralized planning with little regards for pre-existing institutions (Mamdani, 2018).

Based on these findings, it could be expected that the preservation of local and traditional ruling under the British rules will have maintained some local level of discretion and involvement in governance matters, including on taxes, which persisted till today. Nevertheless, that assumption remains very strong. In most contexts, the interplay between the pre-colonial features and colonial legacy makes the prediction on the effects of historical variables very ambiguous. Although some researchers have attributed the success of African countries to both pre-colonial and the limited impact of British colonialism – such as in Botswana (Acemoglu et al., 2001a; Hjort, 2010) – research by Blanton et al. (2001), for instance, suggests that the indirect, decentralized rule of the British fostered an unranked system of ethnic stratification which triggered competition between ethnic groups and ultimately ethnic conflicts. Their findings also indicate that, unlike the French colonies that were left with a centralized bureaucratic power structure that impeded ethnic mobilization, British colonial legacy is positively associated with both the frequency and intensity of ethnic conflicts. Ali et al. (2020) also point to lower level of trust and higher perception of corruption in former British colonies. Hence, following the arguments that led to conjecture (1.$c$) on the bargaining power of ethnic groups and the salience of territorial conflicts, the British colonial experience, could have also led more centralized tax systems as a preventive measure of fiscal erosion and resources-ridden ethnic or regional conflicts.

Either way, and based on the existing literature, we argue that the colonial experience would shape current fiscal institutions. The path out of colonization is also expected to matter. For instance, violent independence movements in some countries and the re-construction of state bureaucracy that followed may have fostered centralized state institutions, in comparison to countries with a peaceful independence process where the bureaucratic apparel may have remained intact. Given that most countries in the sample have been colonized. This leads to a second history-linked conjecture:

*Conjecture 2.b: Sub-central governments' taxing rights are anchored in countries' colonial trajectory and the path out of colonization.*

To wrap up, the literature clearly points to the fact that institutions can persist over time, even if they are not efficient in standard economic ways, and that the explanations to differences in societal and political organizations are anchored in decades of historical development (see for

e.g. Huillery, 2009; Jones, 2013; Frankema and van Waijenburg, 2014). In line with these findings, we postulate that intergovernmental tax arrangements are rooted in historical and societal features that date back to pre-colonial and colonial periods, and that the current level of sub-national government taxing rights is historically path dependent, even when such arrangements would be considered inefficient by standard economic rationales.

In the empirical analysis, Conjectures $(2.a)$ and $(2.b)$ are tested using a wide range of ethnographic and historical variables that capture the characteristics of pre-industrial economies, the traditional system in pre-modern time and the colonial legacy of countries in the sample. The empirical strategy is developed to account for deep-rooted exogenous and time-lagged variables to limit the bias associated with omitted variables.

# 3 Data Description and Sources

## 3.1 Dependent Variables

In this paper, the key explanatory variable is a measure of sub-national governments' taxing rights. This measure was developed through a new dataset that provides comprehensive information on the vertical decision structure over tax system across governments tiers in a large number of countries (Vincent, 2020). The dataset was completed through desk research involving an in-depth review of tax codes, laws and decrees, scientific and grey literature in public finance and local taxation, policy documents and archives from the International Bureau of Fiscal Documentation (IBFD, 2017).[2]

As illustrated in Table C.2 in Appendix C, the decision-making power of each government tier is coded for each tax instrument and according to four decision parameters: instrument, base, rate and administration. *Instrument* refers to the ability of each government tier to establish or alter an existing tax revenue instrument.[3] *Base* indicates which layer of government is involved in defining the taxable base or granting tax relief. *Rate* refers to the discretionary power over the setting of tax rates. *Administration* refers to the involvement of sub-national authorities in tax and revenue administration.

For each tax instrument, it is coded the tiers of government in charge of deciding over the four

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[2]Legal documents include, for instance, the Constitutions, Tax Codes, Local Governments Acts, Decrees and laws on local taxation. Academic and grey publications were gathered from major literature databases such as Google Scholar, Scopus, Web of Science, EconLit, using, on the one hand, the *country names*, and on the other keywords related to public finance structure such as *"tax code"*, *"taxing powers"*, *"local taxation"*, *"local tax"*, *"local revenue"*, *"tax decentralization"*, *"fiscal decentralization"*. The gathered information is triangulated with archives of the International Bureau of Fiscal Documentation (IBFD, 2017) which records fiscal reforms and changes in more than one hundred countries. The archives of IBFD provide very detailed information on fiscal changes in the structure of tax institutions in a timely manner, and have previously been used in the construction of other tax-related databases such as in Amaglobeli et al. (2018). See Vincent (2020) and Appendix C for further details.

[3]In most countries, tax instruments are introduced by central authorities or are adopted through parliamentary procedures. There are, however a few exceptions: in the United States, for instance, seven states – namely Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming – do not carry state income tax.

parameters above, with $C$, $I$, and $L$ respectively referring to central, intermediate and local levels of government. Using an aggregation methodology, such that $(L) = (I, L) = 1$ for a single-handed decision by sub-central authorities and $(C, L) = (C, I, L) = 1/2$ for a joint decision with the central authority, it is derived a score for each decision component over the range of tax instruments. An overall index – the *"Tax Assignment Index (TAI)"* – is calculated by taking the averages of the four scores.[4]

The *"Tax Assignment Index (TAI)"* is an overall measure of the extent to which sub-national authorities can decide over existing tax instruments and across the decision parameters listed above. This measure provides a more comprehensive understanding of intergovernmental tax arrangements compared to previously existing measures. Unlike other indicators on tax decentralization, it essentially reflects the decision powers of sub-central authorities over the tax system. A higher score means that authorities below the central level have greater authority over the tax system.

In many countries, however, the intermediate level of governments carries discretionary power over the tax system – even in unitary countries. Intermediate level of governments can single-handedly decide over specific dimensions or join central and (or) local-level authorities in taking such decisions. Bundling the intermediate and local levels and assigning a single weight to *"sub-national"* authorities as a whole might undermine the relevance of regional and local governments relatively to the central. Therefore, an alternative scoring approach is adopted whereby we assign a specific weight to regional authorities such that in joint decisions, $(C, I, L) = 2/3$ instead of $1/2$. Indicators from the alternative scoring procedure are also used as outcome variables to test the robustness of our empirical estimates.

Furthermore, the empirical framework goes beyond the broad discretion over the tax system to also explore the role of key variables in explaining sub-national governments' discretion over tax administration and the setting of the tax rates. The setting of tax rates and tax administration are important regulatory dimensions that shape the interactions between state authorities, business and residents. The scores on the setting of tax rates and tax administration – hereafter labelled as the *"Tax Rate Assignment (TRA)"* and *"Tax Administration Assignment (TAA)"* – reflect the level of discretionary power granted to sub-national authorities over these parameters of the governance of the tax system.

## 3.2 Explanatory Variables

The conjectures in section 2 infer that intergovernmental tax arrangements are driven by two sets of factors, drawn respectively from the economic approach – so far predominant in the existing literature – and the new historical approach that this paper wants to put forward. In this sub-section, we first describe the variables intended to operationalize the economic approach, namely ethno-

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[4]It is noted that some countries may have a more complex multi-tiered system. However, central, intermediate and local government tiers are the most common across most nominally federal and unitary countries. See the coding matrix in Appendix C.

cultural diversity, spatial decay and the bargaining power of societal groups intertwined with natural resources endowments. We then describe the variables intended to capture the alternative (competing) explanatory framework with a focus on the historical trajectory of each country. This second set will contain variables that can be traced back to pre-colonial and colonial times.

**Ethno-cultural diversity**

Ethno-cultural diversity is captured through indicators of ethno-linguistic and cultural fragmentation and polarization by Desmet et al. (2012) and Alesina et al. (2003). The ethnic, linguistic and religious fractionalization indicators of Alesina et al. (2003)indicate the probability that two randomly selected individuals will differ by their ethnic and religious groups. Desmet et al. (2012), on the other hand, propose alternative measures of fractionalization and polarization at different levels of linguistic aggregations. The resulting indicators reveal deep cleavages within countries (Desmet et al., 2012). The indicators from Desmet et al. (2012) and Alesina et al. (2003) are used interchangeably in the empirical estimations. Based on the existing literature, described in the analytical framework above, one would expect sub-national governments' taxing rights to be higher when there is more extensive ethno-cultural diversity.

**Spatial Decay**

Spatial decay is captured through geographical characteristics that have the potential to increase the pressure to decentralize the tax system, should one use an efficiency-based approach to the determination of the appropriate level of decentralization. These include the country size and the population density, which point to the sparseness of the territory and the likelihood of hinterlands being less adequately served by the central government (Panizza, 1999; Arzaghi and Henderson, 2005; Canavire-Bacarreza et al., 2017).

We also include countries' mean elevation, terrain ruggedness and the average distance to the nearest coastline or sea-navigable river. These variables convey the differences in transportation costs and the likelihood of some areas being more favourable to trade and integration (see for e.g. Michalopoulos and Papaioannou, 2013b; Gennaioli and Rainer, 2007; Nunn and Puga, 2010; Nunn and Wantchekon, 2011). Among others, Nunn and Puga (2010) suggest that mean elevation and ruggedness of terrain reflect the cost of accessing public infrastructure, which has been empirically shown to affect countries' development. The geographic characteristics of countries have also contributed to shaping colonial institutions and ethnic relations (see for e.g. Acemoglu et al., 2001b). Land area, elevation, mean distance to coast and rivers, distance from country centroids to coast and rivers, and population in tropical zones are accounted for with information compiled by the Center for International Development of Harvard University (CID Harvard University, 2001). Geographical features are generally assumed to be exogenous proxies of the spatial decay (Panizza, 1999; Arzaghi and Henderson, 2005; Canavire-Bacarreza et al., 2017).

**Bargaining Power of Societal Groups and Resources Endowments**

In section 2, we argued that the interactions among societal, minority and ethnic groups would influence the structure of the tax system in each given country. Such interactions are captured through variables from the Ethnic Power Relations Databases (EPR) which so far stand as the most comprehensive information sources on ethnic relations and power structure within societies in recent decades. The dataset family was introduced by Vogt et al. (2015) and updated in 2018 to include a series of data on ethnicity, civil wars and conflicts that occurred in the past decades. The EPR databases have been widely used in research across political science and political economy. From the EPR, we draw several proxies that account for the bargaining power of ethnic and minority groups. These include, among others, the number of ethnic groups of political relevance, the population share of ethnic relevant groups with regional autonomy, and the incidence of territorial conflicts. Politically relevant ethnic groups refer to those that either have representatives making political claims on their behalf or are singled out by the state through discrimination (Girardin et al., 2015). Given that interactions among societal groups are likely to evolve with changes in institutions, we limit the variables selected to the time period of 1946 to 1970 and consider the average of the variables across that period.

Besides having 1946 as the first data point for countries in the EPR databases, the selection of this time period (1946-1970) is based on two other rationales. First, the indicators of sub-national governments' taxing rights are cross-sectional and constructed with information from 2010 to 2017. A time lag helps to reduce the bias (reverse causality) in the empirical estimates. Second, most countries in the sample are located in Sub-Saharan African and Asia, where it has been demonstrated that the prominent waves of decentralization reforms began in the late 1990s, hence a two-decade gap (see for e.g. Dafflon and Madiès, 2012; Caldeira, 2011; Chatry and Vincent, 2019). Therefore, it is expected that the ethnic-power relations during and in the aftermath of the independence of most African countries have contributed to shaping decentralization discourse in the 1990s and, by extension, the tax structure across government layers. Notwithstanding, some countries may have embarked on the decentralization wagon much earlier. Therefore, to test the sensitivity of the results, a different time-lag (1946-1960) is also considered for the empirical estimations.

We have argued above that natural resources endowments alongside the salience of conflicts and the bargaining power of regional and ethnic groups may trigger tighter regulatory control by central authorities. The need to collect rents from resources extraction, be it for redistributive purpose or to limit fiscal erosion, might incentivize central authorities to adopt a centralized tax system. Thus, in addition to the above, we include soil fertility and the percentage of arable land as proxies for resources endowment that might lead to tension and increase the benefits of centralized regulatory control. Moreover, to test the monetary relevance of resources extraction, we include the total average of natural resources rents as a percentage of GDP between 1970 and 1975 as an alternative proxy.

**Historical Variables**

The variables used to operationalize the pre-colonial and colonial aspects from the history-focused part of the analytical framework are drawn from the Atlas of Pre-Colonial Societies (Müller, 1999; University of Zurich, 2017) and from the ICOW Colonial History dataset (Hensel, 2014). These two datasets are considered prime sources of information on pre-colonial and colonial societies.

The Atlas of Pre-Colonial Societies was assembled and made available by researchers of the University of Zurich and the Swiss Science Research Foundation. For the most part, the definitions of the variables are identical to those of the Ethnographic Atlas by G.P. Murdock (Murdock, 1967). As inferred from its description, the Atlas presents a compendium of the cultural heritage of the non-western world and covering 95 African, Asian and Melanesian countries. It describes the pre-industrial economies, the traditional systems of kinship and pre-colonial modes of political organization intending to facilitate the understanding of the cultural diversity of contemporary nation-states. In the original dataset, an ethnic group is regarded as centralized if it has more than two jurisdictional levels above the local community and fragmented otherwise.

As most ethnic societies are split across countries based on modern-day boundaries, the aggregation method of the index is done using a systematic methodology based on the population of each recorded ethnic unit. The indicators for pre-colonial institutions are thus constructed in a way that is reflective of modern-day state boundaries (see University of Zurich (2017) for methodological details). This allows us to use country-level indicators on pre-colonial state centralization, pre-colonial agro-technical level and pre-colonial asymmetric work distribution. These latter two capture, respectively, the level of economic development and the labour market structure between men and women in the pre-colonial era.

The ICOW colonial history dataset provides detailed information on the colonial trajectory of many countries, including the identity of the primary colonizers, the legacy of the colonial period in terms of the legal and institutional framework, and indicators capturing how countries obtained their independence. Following the work on the consequences of British versus French colonial ruling (Miles, 1993; Crowder, 1964; Sokoloff and Engerman, 2000; Acemoglu et al., 2001a; Ali et al., 2018, 2020), a binary variable capturing British legal origin is added to differentiate between countries that were primarily governed through the indirect ruling of the British and that have eventually maintained their traditional and pre-modern structure.

In addition, we also consider a binary indicator for whether a country obtained its independence through violence. As argued above, the reconstruction process in the aftermath of a violent independence process, as opposed to a peaceful transition, might have pressured a country to develop a centralized governance system as a mean of fostering integration and national cohesion. Such early centralized state institutions (including tax institutions) may have persisted across the years, independently of whether there is an efficiency-based (economic) reason for their existence today. Sensitivity analyses also integrate a binary indicator for countries that have experienced

a socialist regime between 1946 and 1990 as those may have developed a more centralized fiscal regime. In line with the historical path dependency arguments, institutions in countries with a socialist regime before or at the time of the decentralization wave in the early 1990s may have persisted. The most recent historical trajectory of these countries could, to some extent, invalidate the hypothesis on the persistence of pre-colonial and colonial institutions. The data on socialist states are compiled from various sources (Ottaway, 1987; Schmid, 1992; Kornai, 1992; Kornai et al., 2001; Guo, 2006).

**Additional Control Variables**

In addition to the main variables of interest, most econometric specifications include additional socio-economic, cultural and geographical controls. Among others, we consider the predicted genetic homogeneity by Ashraf and Galor (2013) which incorporates the pairwise genetic distances between these ancestral populations and expected heterozygosity of the pre-colonial ancestral populations of contemporary sub-national groups. The predicted genetic homogeneity accounts for deep-rooted pre-historic factors that may have affected countries' development and institutions since the emergence of human civilization and the persistence of ethno-cultural diversity. We also consider the percentage of Catholics in the 1980s to further account for colonial legacy and cultural heritage as in LaPorta et al. (1999), and other deep-rooted geographical variables such as the percentage of lands in the tropics, the percentage of the population in temperate zones, and the distance to regional frontiers in 1000 C.E. We also include regional fixed effects in most empirical estimations to account for the potential spatial spillovers in the design of fiscal institutions.

## 4 Empirical Framework

As this paper is (primarily) focused on the (possible) effects of deep-rooted determinants, the empirical analysis begins with ordinary least squares regressions (OLS). This approach has some obvious limitations in terms of econometric identification and causal inference. However, these limitations are unavoidable, as several variables of primary interest do not (by definition) change during modern times. The empirical estimations are performed on a sample of 76 countries located in Africa, Asia and the Middle East. The baseline model is specified as follows, where $Y_i$ refers to the level of taxing rights of sub-national governments of countries in the sample, $\alpha$ a constant, and $\varepsilon_i$ the error term.

$$Y_i = \alpha + \mathbf{C}_{1a}\beta' + \mathbf{C}_{1b}\vartheta' + \mathbf{C}_{1c}\theta' + \mathbf{C}_{2a}\lambda' + \mathbf{C}_{2b}\xi' + \mathbf{X}\delta' + \epsilon_i \tag{1}$$

$\mathbf{C}_{1a}$ is a vector of covariates that capture the ethno-cultural diversity and polarization within a country. $\mathbf{C}_{1b}$ is a set of variables accounting for the spatial decay and other factors that may impede access to the centralized provision of public services – and thereby foster the decentralization

of public services delivery and the tax system. $\mathbf{C}_{1c}$ is a vector of variables that account for the bargaining power of politically relevant ethnic groups between 1946 and 1970, and natural resource endowments, whereas $\mathbf{C}_{2.a}$ and $\mathbf{C}_{2.b}$ are the vectors of historical parameters, including those that account for pre-colonial characteristics and colonial legacy.

To recap the analytical framework, note that the conjectures $(1.a)$, $(1.b)$ and $(1.c)$ are capturing the economic arguments that have previously been emphasized in the literature on fiscal federalism and decentralization (Panizza, 1999; Arzaghi and Henderson, 2005; Bodman and Hodge, 2010; Suberu, 2001; Canavire-Bacarreza et al., 2017), although primarily theoretically and with older and less detailed measures of decentralization. Hence, the inclusion of the variables in $\mathbf{C}_{2a}$ and $\mathbf{C}_{2b}$, and the combined focus on both economic and historical variables, and the competition between these two types of explanations, is novel to this paper and therefore of primary interest. $\mathbf{X}$ is a vector of additional control variables, including the regional dummies.[5]

**Estimations with Instrumental Variables (IV-GMM)**

One of the primary threats to the validity of OLS estimates is the endogeneity of the regressors. The strategy to counter this limitation is to restrain the model to likely exogenous characteristics and variables that are lagged in time by at least twenty years. The residuals are likely to be unbiased if it is argued that the included variables are exogenous and that the empirical model has controlled for all relevant parameters.

While this paper focuses on the deep-rooted and historical determinants of intergovernmental tax arrangements, it has been argued that historical variables such as pre-colonial centralization and pre-independence conditions could be correlated with unobservable characteristics that are omitted in ordinary least-squares specifications (Archibong, 2019). We thus recur to an instrumental variables estimation technique with a general methods of moment estimator (IV-GMM), in which we instrument the indicator of pre-colonial state centralization with the Tsetse suitability index first used by Alsan (2015), the ecological diversity index provided by Fenske (2014), and the predicted Neolithic transition timing (as of 1500 CE) introduced by Ashraf and Galor (2013).

Thus, the estimation of the impact of pre-colonial state centralization on modern-day subnational governments' taxing rights is done in two stages, where $Precol_i$ is the indicator of pre-colonial state centralization, and $\widehat{Precol_i}$ its predicted value from the first-stage equation. $\mathbf{C}_{2a_i}$ refers to all remaining historically-linked variables except for the pre-colonial state centralization.

*First stage:*

$$Precol_i = \rho + \mathbf{C}_{1a}\tau' + \mathbf{C}_{1b}\sigma' + \mathbf{C}_2\varpi' + \mathbf{C}_{2a_i}\kappa' + \mathbf{C}_{2b}\omega' + \mathbf{X}\eta' + \mu_i \tag{2}$$

*Second stage:*

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[5]Given the time-invariant structure of the data, regional fixed-effects are used instead of country-level fixed effects.

$$Y_i = \alpha + \mathbf{C}_{1a}\beta' + \mathbf{C}_{1b}\vartheta' + \mathbf{C}_{1c}\theta' + \mathbf{C}_{2a_i}\lambda' + \psi\widehat{Precol}_i + \mathbf{C}_{2b}\xi' + \mathbf{X}\delta' + \epsilon_i \tag{3}$$

As described by Baum et al. (2003, p. 1) and Hayashi (2000), the IV-GMM holds the advantage of producing more accurate statistical inferences than the traditional 2SLS-IV approach if the error term is heteroskedastic. While the consistency of the 2SLS coefficients is not affected by the heteroskedastic error, the standard errors would be inconsistent in such case and thereby leading to biased inferences. The GMM approach described here overcomes this issue by using the orthogonality conditions to allow for asymptotically more efficient estimations in the presence of heteroskedasticity of unknown form.

The instrumental variables are selected with insights from the existing literature. The first is the *TseTse suitability index* by Alsan (2015). According to the author, a lower burden of the *Tsetse* is associated with intense cultivation and political centralization in pre-modern time. The findings of Alsan (2015) are consistent with archaeological evidence of more advanced civilizations which are supported by intensive agricultural systems and in places where the fly could not survive, such as Great Zimbabwe. In addition to the Tsetse suitability index, we follow Archibong (2019) and adopt the *ecological diversity index* from Fenske (2014) as the second instrument.[6] The *ecological diversity* accounts for the probability that two or more different ecological zones are contained within a particular ethnic state area. According to Bates (1983) and Fenske (2014), states on ecological boundaries were able to benefit from gains from trade, which then fuelled higher levels of pre-colonial centralization.

The third instrument is the Neolithic transition timing provided by Ashraf and Galor (2013) with data issued from Putterman (2008). The variable is defined as the number of years elapsed since the onset of sedentary agriculture as of the year 1500 C.E., thus before the wave of colonization of most countries in the sample. Diamond (2002) has suggested this timing since the Neolithic revolution as a proximate determinant of economic development. Considering that the level of centralization and organization of the state in the pre-modern era is an indicator of state integration, it is expected that the Neolithic transition timing, with 1500 C.E. as the reference year, would be a significant driver of pre-colonial state institutions.

As these instrumental variables, especially the *TseTse suitability index*, are limited for a smaller sample of countries, the IV-GMM estimations are conducted only with countries located in Sub-Saharan Africa and the Middle-East and North Africa. Given the reduced sample size, the results are tested for robustness using alternative specifications and the sub-sample of countries in the IV-GMM estimations.

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[6]It is worth noting that the first-stage results were weak in Archibong (2019) and thus not reported in the paper.

# 5  Results and Discussion

Figure 1 explores the correlation between the measurement of sub-national taxing rights and key explanatory variables of interest. As it is shown, there is a positive correlation between the outcome variable and pre-colonial state centralization. Country size and mean ruggedness of terrain also display a positive correlation while the variable capturing ethno-linguistic fragmentation by Desmet et al. (2012) does not hold any significant linkages with sub-national governments' broad discretion over the tax system. The correlation between the average share of politically relevant ethnic groups between 1946 and 1970, and the Tax Assignment Index also does not stand out. However, the lower-right quadrant of Figure 1 suggests that the total average of natural resource rents between 1970-1975 is negatively correlated with modern-day taxing rights of lower-tier authorities, which corroborates the argument that natural resource endowments may be linked to more centralized tax institutions.

Figure 1:  Crossplot of key variables of interest
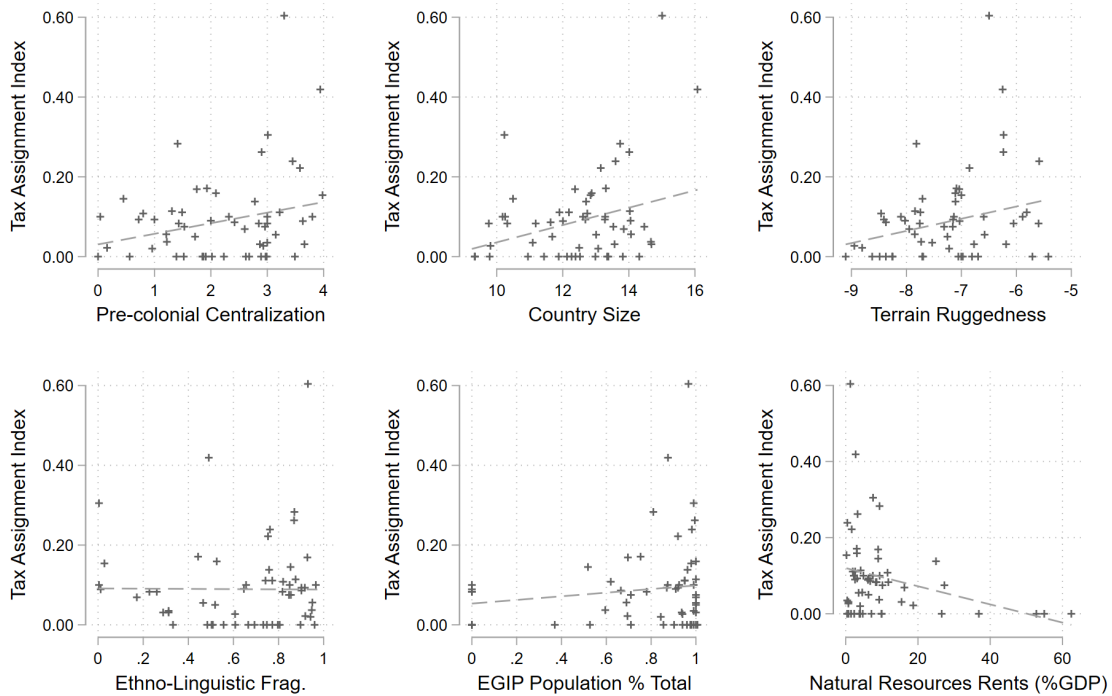


*Notes:* This figure shows the correlation between key explanatory variables of interest and the proxy for sub-national taxing rights (i.e. *Tax Assignment Index*). *Ethno-Linguistic Fragmentation* is at the first aggregation level – thus implying a higher level of diversity (see Desmet et al. (2012) for further details). Natural resources rents are averaged over the period of 1970 to 1975. *EGIP Population % Total* refers to the share of ethnic groups of political relevance in the total population (see Girardin et al. (2015) for conceptual definition).

## 5.1  Baseline Model

Table 1 reports the baseline cross-sectional OLS estimates. The sets of variables that capture ethno-linguistic diversity and polarization, spatial decay (country size, typical population density, terrain ruggedness, elevation, distance to the coast or sea-navigable river), ethnic bargaining power and territorial conflicts (averaged between 1946 and 1970), and natural resources' endowment (arable land and soil fertility) are included, alongside the historical variables – namely a binary indicator the British colonial legacy, the characteristics of independence movement (violent or not) and pre-colonial state centralization. As discussed in subsection 3.1, the dependent variable measures the broad discretionary power of sub-national government authorities over the tax system. In specific-ations (5*) and (6*), we estimate the baseline model with a version of this indicator which results from an alternative scoring procedure in which we account for the relevance for the relevance of intermediate level of governments in joint decisions with central authorities (see Table C.3).

The results, in all specifications, indicate a positive correlation between the pre-colonial state centralization and modern-day sub-national decision-making power in tax matters. It is also noted that larger countries and those with a higher mean of terrain ruggedness tend to have more decent-ralized tax institutions. In contrast, countries that have experienced violent independence grant less discretion on tax matters to their sub-national governments. The variables on ethnic diversity, territorial conflicts and the salience of ethnic relations fall short in explaining the multi-layer tax structure in the country sample. Hence, Table 1 conveys a mixed picture: some of the factors from the *'economic'* approach, which have been emphasized in previous research on fiscal federalism and decentralization, come out as relevant, but not all of these hold up. In contrast, however, the historical features emphasized in this paper come out as highly relevant in explaining the level of sub-national taxing rights.

**Baseline with additional covariates**

The baseline specifications in Table 1 are refined with the addition of an array of other control variables that capture the level of pre-colonial development and cultural features. We also include additional proxies for deep-rooted geographic and demographic characteristics of the countries, including the distance to the regional frontier in 1000 C.E., the population density in 1000 C.E., the percentage of lands in the tropics, the percentage of the population living in temperate zones, the percentage of Catholic in the 1980s further to capture the legacy and cultural traits of colonizers, and the predicted genetic homogeneity (adjusted for ancestry) from Ashraf and Galor (2013) as an alternative proxy for diversity. Regional fixed effects are also accounted for as a mean of capturing the likelihood of spatial spillovers in the design of fiscal institutions. Given that many neighbour-ing countries share the same primary colonizer and ethnic ties, public institutions which originate from colonial times or which are built upon ethnic and cultural preferences could have been set according to similar patterns.

Table 1: Historical Path Dependence in Intergovernmental Tax Arrangements:
Baseline Model - OLS Estimates

| | (1) | (2) | (3) | (4) | (5*) | (6*) |
|---|---|---|---|---|---|---|
| *Dependent Variable:* Sub-national taxing rights (*Tax Assignment Index*) | | | | | | |
| Pre-colonial Centralization | 0.030** | 0.035** | 0.039*** | 0.043*** | 0.039*** | 0.043*** |
| | (0.015) | (0.015) | (0.014) | (0.014) | (0.014) | (0.014) |
| British Legal Origin | 0.062 | 0.053 | 0.037 | 0.033 | 0.037 | 0.032 |
| | (0.038) | (0.037) | (0.038) | (0.030) | (0.038) | (0.030) |
| Violent independence | -0.067** | -0.066** | -0.071** | -0.076** | -0.071** | -0.075** |
| | (0.031) | (0.030) | (0.030) | (0.034) | (0.030) | (0.034) |
| Country Size | 0.058*** | 0.055*** | 0.054*** | 0.039*** | 0.054*** | 0.039*** |
| | (0.015) | (0.014) | (0.014) | (0.011) | (0.014) | (0.011) |
| Typical Population Density | 0.031*** | 0.033*** | 0.022 | 0.013 | 0.022 | 0.013 |
| | (0.011) | (0.012) | (0.015) | (0.013) | (0.015) | (0.013) |
| Terrain ruggedness within 100km | 0.087*** | 0.087*** | 0.079*** | 0.081*** | 0.079*** | 0.080*** |
| | (0.027) | (0.027) | (0.028) | (0.030) | (0.028) | (0.030) |
| Elevation | -0.057** | -0.062** | -0.067** | -0.066** | -0.067** | -0.066** |
| | (0.028) | (0.029) | (0.033) | (0.027) | (0.033) | (0.027) |
| Distance (km) to coast or navigable river | 0.016 | 0.020 | 0.022 | 0.028 | 0.022 | 0.028 |
| | (0.018) | (0.019) | (0.028) | (0.026) | (0.028) | (0.026) |
| Ethno-linguistic Fragmentation | | 0.049 | 0.073 | 0.047 | 0.072 | 0.046 |
| | | (0.077) | (0.083) | (0.083) | (0.083) | (0.083) |
| Polarization | | -0.039 | -0.060 | -0.037 | -0.059 | -0.036 |
| | | (0.074) | (0.081) | (0.080) | (0.081) | (0.080) |
| Arable land | | | 0.000 | -0.000 | 0.000 | -0.000 |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| Soil fertility | | | 0.163 | 0.112 | 0.164 | 0.114 |
| | | | (0.101) | (0.082) | (0.101) | (0.083) |
| EGIP Count | | | | 0.008 | | 0.008 |
| | | | | (0.008) | | (0.008) |
| Territorial Conflicts | | | | 0.180 | | 0.180 |
| | | | | (0.220) | | (0.221) |
| EGIP population with regional autonomy | | | | -0.021 | | -0.011 |
| | | | | (0.451) | | (0.451) |
| Constant | -0.151 | -0.094 | -0.161 | -0.063 | -0.170 | -0.071 |
| | (0.214) | (0.213) | (0.255) | (0.249) | (0.256) | (0.251) |
| Additional Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N Countries | 76 | 76 | 76 | 74 | 76 | 74 |
| $R^2$ | 0.49 | 0.50 | 0.52 | 0.59 | 0.52 | 0.59 |
| Adj-$R^2$ | 0.40 | 0.39 | 0.40 | 0.45 | 0.40 | 0.45 |
| AIC | -114.09 | -111.60 | -111.75 | -111.69 | -111.19 | -111.19 |

*Notes:* Robust standard errors in parentheses. Significance level: *p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns 5 and 6; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables include pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence. Pre-colonial agro-technical level is negative and statistically significant, which somewhat echoes previous research on the reversal fortune of some countries, especially in Sub-Saharan Africa (Acemoglu et al., 2002; Huillery, 2009). Ethno-linguistic fragmentation and polarization are at the first level of aggregation (Desmet et al., 2012). EGIP: ethnic groups of political relevance (see Girardin et al. (2015) for conceptual definitions). EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970 (see section 3).

Table 2: Historical Path Dependence in Intergovernmental Tax Arrangements:
Baseline Model with additional covariates – OLS Estimates

| | (1) | (2*) | (3) | (4*) | (5) | (6*) |
|---|---|---|---|---|---|---|
| *Dependent Variable:* Sub-national taxing rights (*Tax Assignment Index*) | | | | | | |
| Pre-colonial Centralization | 0.059** | 0.059** | 0.066** | 0.065** | 0.059** | 0.059** |
| | (0.025) | (0.025) | (0.029) | (0.029) | (0.025) | (0.025) |
| British Legal Origin | 0.025 | 0.025 | 0.023 | 0.022 | 0.025 | 0.025 |
| | (0.035) | (0.035) | (0.032) | (0.032) | (0.035) | (0.035) |
| Violent independence | -0.090** | -0.090** | -0.111*** | -0.111*** | -0.090** | -0.090** |
| | (0.039) | (0.039) | (0.041) | (0.041) | (0.039) | (0.039) |
| Country Size | 0.046*** | 0.046*** | 0.055*** | 0.055*** | 0.046*** | 0.046*** |
| | (0.017) | (0.017) | (0.017) | (0.017) | (0.017) | (0.017) |
| Terrain ruggedness within 100km | 0.091*** | 0.091*** | 0.106*** | 0.105*** | 0.091*** | 0.091*** |
| | (0.034) | (0.034) | (0.038) | (0.038) | (0.034) | (0.034) |
| Ethno-linguistic Fragmentation | 0.069 | 0.065 | | | 0.069 | 0.065 |
| | (0.124) | (0.124) | | | (0.124) | (0.124) |
| Polarization | -0.060 | -0.057 | | | -0.060 | -0.057 |
| | (0.119) | (0.119) | | | (0.119) | (0.119) |
| Ethnic Fractionalization | | | 0.015 | 0.013 | | |
| | | | (0.031) | (0.031) | | |
| Religious Fractionalization | | | -0.003 | -0.002 | | |
| | | | (0.016) | (0.016) | | |
| Arable land | -0.000 | -0.000 | 0.000 | 0.000 | -0.000 | -0.000 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Soil fertility | 0.091 | 0.085 | 0.002 | -0.002 | 0.091 | 0.085 |
| | (0.110) | (0.109) | (0.102) | (0.102) | (0.110) | (0.109) |
| EGIP Count | 0.008 | 0.008 | 0.007 | 0.007 | | |
| | (0.007) | (0.007) | (0.008) | (0.008) | | |
| Territorial Conflicts | 0.193 | 0.194 | 0.198 | 0.197 | | |
| | (0.214) | (0.214) | (0.211) | (0.211) | | |
| EGIP population with regional autonomy | -0.086 | -0.077 | -0.145 | -0.135 | | |
| | (0.454) | (0.454) | (0.453) | (0.454) | | |
| EGIP Count$^{\pm}$ | | | | | 0.008 | 0.008 |
| | | | | | (0.007) | (0.007) |
| Territorial Conflicts$^{\pm}$ | | | | | 0.193 | 0.194 |
| | | | | | (0.214) | (0.214) |
| EGIP population with regional autonomy$^{\pm}$ | | | | | -0.086 | -0.077 |
| | | | | | (0.454) | (0.454) |
| Constant | 0.538 | 0.535 | 0.856 | 0.851 | 0.538 | 0.535 |
| | (0.615) | (0.617) | (0.631) | (0.632) | (0.615) | (0.617) |
| Regional FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Additional Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N Countries | 72 | 72 | 71 | 71 | 72 | 72 |
| $R^2$ | 0.63 | 0.64 | 0.65 | 0.65 | 0.63 | 0.64 |
| Adj-$R^2$ | 0.42 | 0.42 | 0.45 | 0.45 | 0.42 | 0.42 |
| AIC | -99.05 | -98.81 | -99.97 | -99.72 | -99.05 | -98.81 |

*Notes:* Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns 2, 4, and 6; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river (km), percentage of catholic in 1980s, genetic homogeneity(ancestry adjusted), % land in the tropics, % population in temperate zones, population density in 1000 C.E. , distance to regional frontier in 1000 C.E. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other). Ethno-linguistic fragmentation and polarization are at the first level of aggregation (Desmet et al., 2012). Columns (3) and (4) include the Alesina et al. (2003)'s measures of ethnic and religious fractionalization. EGIP: ethnic groups of political relevance (see Girardin et al. (2015) for conceptual definitions). EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970 (see section 3), except in columns (5) and (6) in which they are averaged over the period of 1946 to 1960 (identified by the symbol $^{\pm}$).

The new results are reported in Table 2. The specifications explain close to 60% of the variation in the outcome variable. The coefficient estimates on pre-colonial state centralization, area, terrain ruggedness, and violence independence corroborate the results of the baseline model in Table 1. In particular, the coefficient estimates on pre-colonial state centralization are positive and increase both in magnitude and significance. Ethno-cultural diversity, the potential bargaining power of ethnic groups and natural resource endowments remain insignificant as in previous settings. In specifications (3) and (4), the ethno-linguistic fragmentation and polarization by Desmet et al. (2012) are substituted by the ones proposed by Alesina et al. (2003) on ethnic and religious fractionalization. The estimates do not vary much, nor the relevance of other key variables.

## 5.2 Estimations with Instrumental Variables (IV-GMM)

Table 3 reports the estimates from the IV-GMM specifications. Given the robust results regarding the influence of pre-colonial centralization in previous estimates (Table 1, Table 2), the indicator of pre-colonial state centralization is instrumented with the *ecological diversity* from Fenske (2014), the *Neolithic transition timing* from Ashraf and Galor (2013) and the *TseTse suitability index* from Alsan (2015). The sample is however reduced to 42 countries due to the limited availability of observations for these instruments. Of the 42 countries, 5 are located in the Middle-East and North Africa, and 37 in Sub-Saharan Africa. Based on the two standard criteria for a valid instrument (Greene, 2017), the first-stage results and the *p-value* of the LM test for under-identification point to the joint relevance of the instruments. The *p-value* of the Hansen-J test also implies that the instruments have jointly met the over-identification criteria.

The coefficient estimates on main variables of interest are consistent with previous findings in Table 1 and Table 2. The results confirm a positive and statistically significant impact of pre-colonial state centralization on the current level of sub-national discretion in tax matters. They also corroborate that sub-national authorities in countries with experienced violent independence movements tend to have less taxing powers. In contrast, the mean ruggedness of terrain and country size lead to a much higher discretion. Unlike in Table 2, estimations with this sub-sample of countries, which are primarily located in Africa, suggest that the average number of groups with regional autonomy between 1946-1970 is associated with a lower level of sub-national governments' discretion over tax matters in modern days, whereas the average number of territorial conflicts in 1946-1970 appears to have positively shaped the distribution of power between the upper and lower level of governments.

Due to the change in sample size and to test the sensitivity of the IV-GMM results, specifications (4) and (6) of Table 2 are re-estimated using the sub-sample of countries in the IV-GMM model. The findings, reported in Table B.1, are in line with the results of Table 3, implying that for the sub-group of African and Middle-Eastern countries, there is a robust positive linkage between pre-colonial state centralization, type of independence, area, terrain ruggedness, and the current level of taxing powers at the sub-national level. For this sub-sample of countries, it is also consist-

Table 3: Historical Path Dependence in Intergovernmental Tax Arrangements:
IV-GMM Estimates

| | (1) | (2*) |
|---|---|---|
| *Dependent Variables:* Sub-national taxing rights (*Tax Assignment Index*) | | |
| Pre-colonial Centralization | 0.142*** | 0.142*** |
| | (0.038) | (0.038) |
| Violent independence | -0.152*** | -0.152*** |
| | (0.026) | (0.026) |
| Country Size | 0.074*** | 0.074*** |
| | (0.019) | (0.020) |
| Terrain ruggedness index within 100km | 0.164*** | 0.165*** |
| | (0.031) | (0.031) |
| Territorial Conflicts | 0.517*** | 0.514*** |
| | (0.104) | (0.105) |
| EGIP population with regional autonomy | -1.101*** | -1.106*** |
| | (0.197) | (0.200) |
| Constant | 2.061*** | 2.073*** |
| | (0.471) | (0.475) |
| Regional FE | Yes | Yes |
| Additional Controls | Yes | Yes |
| | | |
| ***First-Stage*** | | |
| | | |
| Ecological Diversity | 2.167** | 2.167** |
| | (1.007) | (1.007) |
| TseTse Suitability Index | 0.086 | 0.086 |
| | (0.238) | (0.238) |
| Neolithic Transition Timing | -0.914 | -0.914 |
| | (1.038) | (1.038) |
| N Countries | 42 | 42 |
| $R^2$ *(second-stage)* | 0.90 | 0.90 |
| Adj-$R^2$ *(second-stage)* | 0.74 | 0.73 |
| AIC | -92.50 | -91.95 |
| Hansen J (*p-value*) | 0.36 | 0.36 |
| Under-identification (*p-value*) | 0.03 | 0.03 |

*Notes:* Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns 2 and 4; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, number of ethnic groups of political relevance (EGIP Count), percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E.. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other).

ent that the average number of groups with regional autonomy between 1946-1970 and the number of territorial conflicts throughout the same period do have, respectively, a positive and a negative effect on lower-tier governments' discretion on taxing issues.

## 5.3   Sub-national Discretion over Tax administration and Tax Rates

As an alternative to the overall *Tax Assignment Index*, we explore, using the larger sample of countries, the effect of the key explanatory variables on different decision dimensions – namely the sub-national governments' discretion over tax administration and the settings of tax rates. Columns (1.1) to (1.4) of Table 4 report the estimates using OLS regressions on the larger sample of countries. Columns (1.1) to (1.2) of Table 5.6 report the estimates using OLS regressions on the larger sample of countries. Pre-colonial state centralization remains statistically significant in all models and trumps all other parameters. Hence, sub-national governments in countries with higher pre-colonial state centralization appear to have greater discretionary power over tax administration and the settings of tax rates. The mean ruggedness of terrain, as in previous estimates, also yields a positive correlation with the ability of lower-tier authorities to be involved in tax administration and the setting of tax rates. While the type of independence and the country size appear to be less relevant for sub-national discretion on tax administration, they remain highly relevant for sub-national discretion over the setting of tax rates – which is considered an important component of the conceptual definition of '*tax autonomy*' (see for e.g. OECD, 1999, 2000; Stegarescu, 2005).

Columns (2.1) to (2.4) report the estimates from IV-GMM specifications with the reduced sample of 42 countries. The instrumental variables remain unchanged. In line with previous results, it is shown that the level of pre-colonial state centralization, country size, terrain ruggedness and the violence of independence movement all significantly impact the current level of subnational governments' discretion over tax administration and tax rates. The instrumental variables satisfy the criteria of relevance and over-identification on a 95% confidence interval. The LM test statistic for under-identification also corroborates the relevance of the instruments. In addition to the above, we also test the sensitivity of the IV-GMM results by estimating IV-2SLS models, with the outcome variables being the broad discretion of sub-national authorities over the tax system, on the one hand, and their discretion over tax rates and tax administration, on the other. The coefficient estimates are reported in Table B.2 and are in line with the above.

## 5.4   Further Sensitivity Analyses

*The Relevance of Socialist Regimes and Institutions between 1946 and 1990*

As argued in section 3.2, the aftermath of World Word II and the more recent history of countries could have contributed to change the structure of institutions. More specifically, institutions that devised or reformed under socialist regimes between 1946 and 1990 could have not only altered

Table 4: Historical Path Dependence in Intergovernmental Tax Arrangements: Sub-national Discretion over Tax Administration and Tax Rates

| | OLS | | | | IV-GMM | | | |
|---|---|---|---|---|---|---|---|---|
| | (1.1) | (1.2*) | (1.3) | (1.4*) | (2.1) | (2.2*) | (2.3) | (2.4*) |
| Dependent Variables: Tax [...] Assignment | Administration | | Rates | | Administration | | Rates | |
| Pre-colonial Centralization | 0.083** | 0.083** | 0.084** | 0.084** | 0.313*** | 0.314*** | 0.162** | 0.162** |
| | (0.037) | (0.038) | (0.036) | (0.036) | (0.110) | (0.111) | (0.066) | (0.066) |
| Violent independence | -0.041 | -0.039 | -0.116** | -0.115** | -0.175** | -0.174** | -0.235*** | -0.237*** |
| | (0.059) | (0.060) | (0.049) | (0.049) | (0.074) | (0.075) | (0.045) | (0.045) |
| Country Size | 0.043 | 0.044 | 0.045** | 0.045** | 0.156*** | 0.159*** | 0.051** | 0.051** |
| | (0.028) | (0.028) | (0.021) | (0.021) | (0.050) | (0.051) | (0.025) | (0.025) |
| Terrain ruggedness within 100km | 0.082* | 0.081* | 0.112** | 0.111** | 0.348*** | 0.351*** | 0.126*** | 0.127*** |
| | (0.048) | (0.049) | (0.042) | (0.043) | (0.075) | (0.076) | (0.047) | (0.048) |
| Constant | 0.061 | 0.056 | 0.679 | 0.674 | 4.685*** | 4.700*** | 1.724** | 1.755** |
| | (0.953) | (0.954) | (0.738) | (0.739) | (1.259) | (1.276) | (0.798) | (0.801) |
| Regional FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Additional Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *First-Stage* | | | | | | | | |
| Ecological Diversity | | | | | 2.167** | 2.167** | 2.167** | 2.167** |
| | | | | | (1.007) | (1.007) | (1.007) | (1.007) |
| TseTse Suitability Index | | | | | 0.086 | 0.086 | 0.086 | 0.086 |
| | | | | | (0.238) | (0.238) | (0.238) | (0.238) |
| Neolithic Transition Timing | | | | | -0.914 | -0.914 | -0.914 | -0.914 |
| | | | | | (1.038) | (1.038) | (1.038) | (1.038) |
| N Countries | 72 | 72 | 72 | 72 | 42 | 42 | 42 | 42 |
| $R^2$ (second-stage) | 0.56 | 0.57 | 0.61 | 0.61 | 0.60 | 0.60 | 0.88 | 0.88 |
| Adj-$R^2$ (second-stage) | 0.31 | 0.32 | 0.38 | 0.38 | -0.03 | -0.04 | 0.69 | 0.68 |
| AIC | -31.89 | -31.49 | -61.75 | -61.22 | -11.57 | -10.87 | -60.63 | -60.03 |
| Hansen J (p-value) | | | | | 0.07 | 0.07 | 0.97 | 0.96 |
| Under-identification(p-value) | | | | | 0.03 | 0.03 | 0.03 | 0.03 |

*Notes:* Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns (1.2), (1.4), (2.2), and (2.4); see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, the number of ethnic groups of political relevance (EGIP Count), percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other).

the legacy of pre-colonial and post-independence institutions but also shaped inter-governmental relations which emerged in the 1990s and persisted until today. In other words, the existence of socialist institutions in recent history could invalidate the hypotheses on the persistence of colonial and post-colonial institutions.

Table 5: Historical Path-Dependence in Intergovernmental Tax Arrangements
OLS Estimates, with Dummy for Former Socialist States

| | (1) | (2*) |
|---|---|---|
| *Dependent Variables:* Sub-national taxing rights (*Tax Assignment Index*) | | |
| Pre-colonial Centralization | 0.060** | 0.060** |
| | (0.026) | (0.026) |
| British Legal Origin | 0.025 | 0.024 |
| | (0.036) | (0.036) |
| Violent independence | -0.091** | -0.090** |
| | (0.039) | (0.039) |
| Country Size | 0.046*** | 0.046*** |
| | (0.016) | (0.016) |
| Terrain ruggedness within 100km | 0.093*** | 0.092*** |
| | (0.034) | (0.034) |
| Socialist State between 1946-1990 | -0.013 | -0.013 |
| | (0.035) | (0.035) |
| Constant | 0.553 | 0.550 |
| | (0.615) | (0.617) |
| Regional FE | Yes | Yes |
| Additional Controls | Yes | Yes |
| N Countries | 72 | 72 |
| $R^2$ | 0.64 | 0.64 |
| Adj-$R^2$ | 0.41 | 0.41 |
| AIC | -97.29 | -97.04 |

*Notes:* Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns 2 and 4; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, the number of ethnic groups of political relevance (EGIP Count), the percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Social State is a binary indicator for countries that had a socialist regime between 1946 and 1990. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other).

Hence, in further sensitivity analyses, we test whether countries that have experienced a socialist regime throughout 1946 and 1990 have a more centralized tax regime in current days. As previously stated, the data on socialist states are compiled from various sources (Ottaway, 1987; Schmid, 1992; Kornai, 1992; Kornai et al., 2001; Guo, 2006). The results are reported in Table 5 and are consistent with previous findings. The existence of a socialist regime in recent history falls short in explaining current inter-governmental tax arrangements. In contrast, the persistence of pre-colonial state centralization, country size, terrain ruggedness and the type of independence remains statistically significant drivers of the level of sub-national governments taxing rights in

modern time.

*The Relevance of Natural Resources Rents (as % of GDP between 1970 and 1975)*

The explanatory power of soil fertility and arable land as a percentage of total land remained un-noticed and not statistically significant in the previous results tables. As an alternative to those variables, we re-estimate the specifications of columns (4) and (6) of Table 2 while considering the total average of natural resources rents as a percentage of GDP across the time period of 1970-1975 as an additional variable. While this variable might trigger some spurious correlations, it is noted that the coefficient estimates of key variables of interest, namely pre-colonial state central-ization and violent independence have retained their direction and significance for their linkages to the level of sub-national governments' taxing rights. These findings further corroborates the predominance of these historical variables over those previously highlighted in the literature (see Table B.3). Table 2 suggests a negative correlation between national resources rents and the level of subnational discretion in tax matters. Figure 1 also hints at such negative relationship and sug-gests a certain validity to our postulate that the need for central authorities to tap onto revenues from resources endowment might foster a more centralized tax system.

## 5.5 Potential Explanations of the Path Dependence

The empirical results of this paper point to a robust and consistent effect of historical variables on modern-day intergovernmental tax arrangements. These findings align closely with the existing literature on the path-dependency of institutions, most notably of pre-colonial and pre-modern institutions. We hereby demonstrate that, like any other forms of institution, the multi-layer gov-ernance of the tax system in the present time is also embedded in countries' deep historical traject-ories and early institutional features.

Our reasoning for the robust effects of pre-colonial state centralization in shaping intergov-ernmental fiscal institutions today is grounded in two strands of research. The first strand has empirical established the patterns linking pre-colonial state centralization to modern-day quality of institutions and bureaucratic capacity of state officials (see for e.g. Gennaioli and Rainer, 2007; Broich et al., 2015). Authors in that strand often argue that the hierarchical features of centralized units in pre-colonial times may have fostered coordinated policies which persisted through times.

Drawing from that literature, we examine the linkages between sub-national taxing rights, bureaucratic capacity in modern time, and pre-colonial centralization. Figure 2 suggests, on the one hand, a positive correlation between pre-colonial state centralization and sub-national taxing rights as measured by the *Tax Assignment Index*. On the other, it points also points to a positive cor-relation between pre-colonial state centralization and the mean bureaucratic capacity of countries between 1984 and 2014. In other terms, pre-colonial state centralization concurrently holds a pos-itive association with these two key variables. In addition, Figure 3 also shows that sub-national

## Figure 2: Pre-colonial Centralization, Tax Assignment and Bureaucratic Quality
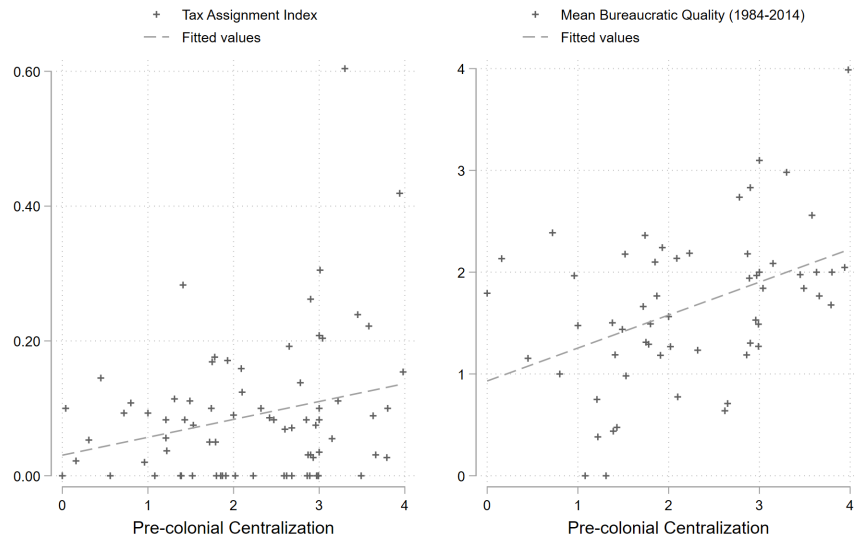


*Notes:* This figure shows the correlation between pre-colonial centralization and the *Tax Assignment Index* on the one hand, and pre-colonial centralization and the average bureaucratic quality of countries in the sample on the other. The measurement for bureaucratic quality is issued from the International Country Risk Guide dataset.

## Figure 3: Bureaucratic Quality and Tax Assignment
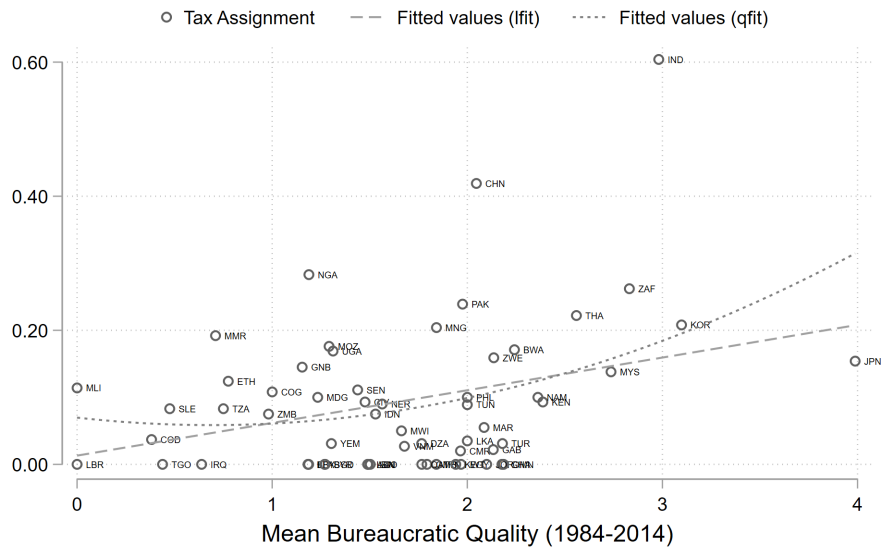


*Notes:* This figure shows the correlation between the average bureaucratic quality of state institutions in countries in the sample and across the period of 1984 to 2014 and the level of sub-national taxing rights measured by the *Tax Assignment Index*. The measurement for bureaucratic quality is issued from the International Country Risk Guide dataset.

taxing rights and bureaucratic capacity are positively linked. Therefore, while investigating the empirical relationship between sub-national taxing rights and bureaucratic capacity is beyond the scope of this research, it appears that pre-colonial centralization might be a confounding factor of such a relationship.

Notwithstanding, if we consider the document pattern on the reluctance of central authorities in devolving taxing powers to sub-national governments (see for e.g. Vincent, 2020; OECD and UCLG, 2019), and if we assume that sub-national taxing rights are a reflection of the bureaucratic capacity of sub-national authorities in raising revenues and deciding on tax matters, the positive correlation of these three variables might suggest that the empirical relevance of pre-colonial state centralization and bureaucratic capacity highlighted in the literature goes much deeper than the national level, and may well carry within it the linkages between pre-colonial centralization and sub-national state capacity. This opens a new avenue for future research, specifically on the interplay between pre-colonial centralization, sub-national bureaucratic capacity and taxing rights.

Our reasoning draws on a second strand of literature. Authors of this strand studies the interplay between pre-colonial and colonial institutional arrangements and the effects of such interplay on the preservation of traditional institutions throughout colonial times and in the post-independence era. As argued in subsection 2.2, economic history emphasizes the differences in governance styles between British colonies and others (see for e.g. Acemoglu et al., 2001b; Lange et al., 2006). It is often argued that the 'native administration' strategy by the British granted local chiefs significant powers and allowed them to retain part of the taxes they collected (Crowder, 1968) – features which may still have persisted today. Among others, Miles (1993) suggest that local chiefs under British colonial rules emerged at independence with greater power and authority vis-à-vis the national government than did their counterparts in former French territories. In such former colonies, it is shown that local chiefs continue to engage in several governance tasks, including the collection of taxes and revenues from mining, provision of public services and local political process (Acemoglu et al., 2014; Glennerster et al., 2013; Dupuy, 2017; Williams, 2004).

Yet, our results did not reveal any strong relevance of British colonial legacy on the current design of inter-governmental tax arrangements. They instead convey the predominance of pre-colonial state centralization over the legacy of the British colonial apparatus. Thus, it is fair to argue that the key determining factor is not the existence of the British colonial system per se, but whether or not the pre-colonial state structure has been preserved throughout the colonial period.

Kjaer (2009) provides an illustration to our arguments by highlighting the interplay between pre-colonial institutions and colonization style in the context of Uganda. The author attributes the variation in the extractive capacity of local authorities to variation in trust, which differed across districts belonging to different kingdoms in the pre-colonial. The Ankole kingdom, a centralized administrative unit with a tradition of organized tax collection, has a high extractive capacity today. In pre-colonial times, Ankole was a well-established centralized monarchy with unity and social cohesion, which have persisted even after the kingship was abolished. The British col-

onizers thus relied on the pre-existing administrative unit of the Ankole kingdom in their ruling.

In comparison to Ankole, the administrative unit of Busoga experienced a different trajectory. The district of Busoga had no prior history of centralized institutions nor organized tax collection in pre-colonial times. As such, the British had to impose a new system that was more closely administered and animated stronger resistance against the central government, resulting in less trust and thus less capacity of local authorities in modern times.

This illustration aligns with our findings. It questions the relevance of the colonizers' origins but rather emphasizes the interplay between colonial and pre-colonial institutions. As demonstrated by our results, the nature of the colonizer becomes irrelevant once we account for pre-colonial state features and other deep-institutional features.

# 6   Conclusion

This paper brings evidence on the deep-rooted economic, cultural and historical factors to the research on the determinants of intergovernmental taxation across countries. More specifically, we set up an econometric structure aimed at explaining the current level of sub-national governments' discretion over tax matters in a sample of broadly 76 countries located in Africa, the Middle-East, Central and East-Asia.The analytical framework is built around two main strands of the literature. The first one relates to the cost-benefit analysis of decentralization and decentralized institutions. The second strand of literature takes on a more comprehensive approach and explores the multi-layer design of tax institutions through the lens of countries' historical trajectories. Based on previous research findings, we argue that inter-governmental tax arrangements – like any other form of institutions – may have been shaped by countries' historical trajectories, and that the level of sub-national taxing rights is historically path-dependent even when such arrangements would be considered inefficient in view of economic rationales.

Sub-national governments' taxing rights are proxied by a novel index from newly built dataset on multi-layer government tax arrangements(Vincent, 2020). The index is computed with information from from legal and policy sources (e.g. tax codes) that define the governance structure of the tax system in each given country. It captures the extent to which lower-tier authorities (intermediate and local) are involved in tax-related decisions. In addition to the broad sub-national discretion, the empirical analysis also zooms at lower-tier discretion over the setting of tax rates and tax administration.

The empirical findings point to a historical path dependence in the intergovernmental tax arrangements. Using both OLS and IV-GMM models, we find a significant effect of pre-colonial state centralization on modern-day sub-national control over the tax system. These results are robust to an array of control variables, including regional dummies that capture the potential spillovers in the design of fiscal institutions. In addition, we find that the path out of colonization also matters: countries that have experienced a violent independence movement tend to have a more central-

ized tax structure. This result also points to the relevance of historical experiences. Furthermore, sensitivity analyses confirm the predominance of pre-colonial institutions and the type of independence over post-World War II institutional reforms under socialist regimes. The legal origin of the colonizer, proxied by a binary variable for former British colonies, also yields no significant impact on the current design of the intergovernmental tax structure.

Regarding the conventional determinants of the level of decentralization, as suggested by the existing literature and which we describe as *'economic'* in the analytical framework, the results reveal that larger countries and those with higher mean of terrain ruggedness tend to have a more decentralized tax system. In a sub-sample of African and Middle-East countries, estimates with IV-GMM corroborate these findings. However, unlike the predominant view, variables that account for ethno-cultural diversity fall short as determinants of intergovernmental tax arrangements. Ethnic bargaining power and interactions also fall short with the full sample of countries. Notwithstanding, in a sub-sample of 42 African and Middle-Eastern countries where the number of ethnic groups with regional autonomy and the salience of territorial conflicts throughout 1946-70 appear to have influenced the current level of taxing rights granted to sub-national authorities.

The most striking finding of this paper is perhaps that pre-colonial centralization, consistently throughout all specifications, has strong explanatory power when it comes to present-day fiscal arrangements. Unlike the existing literature on the British, our results suggest that this might only be valid in cases where the pre-colonial state integration structure had remained intact during the colonial period. Graphical analysis suggests that bureaucratic quality of countries between 1984 and 2014, and the level of sub-national taxing rights, go hand in hand, and that both indicators appear to be driven by the level of pre-colonial state centralization. This could suggest that the previously established positive relationship between precolonial centralization and bureaucratic capacity goes much deeper by also including at the subnational level. This paper therefore points to interesting avenues for research on the interplay between sub-national taxing rights, bureaucratic capacity and pre-colonial institutions, and how such interplay influences the capacity of modern-day local governments to enforce fiscal rules and effectively raise revenues.

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# APPENDIX

## A   Data Description and Summary Statistics

Table A.1: Variables and Data Sources

| VARIABLES | DESCRIPTION & DATA SOURCES |
|---|---|
| Tax Assignment Index | Proxy for Sub-national Taxing Rights. *Data Source:* Vincent (2020) |
| Tax Assignment Index (*) | Proxy for Sub-national Taxing Rights. *Data Source:* Vincent (2020) |
| Tax Administration Assignment | Proxy for Sub-national Discretion over Tax Administration. *Data Source:* Vincent (2020) |
| Tax Administration Assignment (*) | Proxy for Sub-national Discretion over Tax Administration. *Data Source:* Vincent (2020) |
| Tax Rate Assignment | Proxy for Sub-national Discretion over Tax Rates. *Data Source:* Vincent (2020) |
| Tax Rate Assignment (*) | Proxy for Sub-national Discretion over Tax Rates. *Data Source:* Vincent (2020) |
| Pre-colonial Centralization | Measurement of Pre-colonial State Centralization. *Data Source:* Atlas of pre-colonial Societies (University of Zurich, 2017; Müller, 1999) |
| Pre-colonial Agro-technical level | Measurement of Pre-colonial Agro-technical level. *Data Source:* Atlas of precolonial Societies (University of Zurich, 2017; Müller, 1999) |
| Pre-colonial Asymmetric Work Distribution | Measurement of gender differences in work distribution. *Data Source:* Atlas of precolonial Societies (University of Zurich, 2017; Müller, 1999) |
| British Legal Origin | Legal Origin of countries (British=1; Otherwise=0) *Data Source:* ICOW Dataset (Hensel, 2014) |
| Violent independence | Binary indicator for whether a country had experienced a violent independence (Yes=1, otherwise=0). *Data Source:* ICOW Dataset (Hensel, 2014) |
| Socialist State between 1946-1990 | Binary indicator for whether a country had a socialist regime between 1946 and 1990 (Yes=1, otherwise=0). *Data Source:* Author's with data from various sources (Ottaway, 1987; Schmid, 1992; Kornai, 1992; Kornai et al., 2001; Guo, 2006). |
| Years of independence | Number of years since a country gained its independence (ln). *Data Source:* ICOW Dataset (Hensel, 2014) |
| Country Size | Country size (ln) *Data Source:* Physical Factors (CID Harvard University, 2001) |
| Typical Population Density | Typical population density (ln). *Data Source:* Physical Factors (CID Harvard University, 2001) |
| Terrain ruggedness index within 100km | Mean terrain ruggedness within 100 km (ln). *Data Source:* Physical Factors (CID Harvard University, 2001) |
| Elevation | Mean elevation at the country level (ln). *Data Source:* Physical Factors (CID Harvard University, 2001) |
| Distance (km)to coast or navigable river | Average distance in km to coast or navigable river (ln). *Data Source:* Physical Factors (CID Harvard University, 2001) |
| Ethno-linguistic Fragmentation | Ethno-linguistic fragmentation at the $1^{st}$ level of aggregation (ln). *Data Source:* Desmet et al. (2012) |
| Polarization | Ethno-linguistic Polarization at the $1^{st}$ aggregation level (ln). *Data Source:* Desmet et al. (2012) |
| Ethnic Fractionalization | Ethnic Fractionalization (ln). *Data Source:* Alesina et al. (2003) |
| Religious Fractionalization | Religious Fractionalization (ln). *Data Source:* Alesina et al. (2003) |

*Continued on the next page*

| Variables | Description & Data Sources |
|---|---|
| Arable land % | Arable land as a percentage of total land. *Data Source:* Ashraf and Galor (2013) |
| Soil fertility | Fertility of soil. *Data Source:* Ashraf and Galor (2013) |
| Natural Resources Rents (% GDP, 1970-1975) | Average of natural resources rents as a share of GDP between 1970 and 1975. *Data Source:* World Bank Development Indicators |
| EGIP Count (1946-1970) | Average number of ethnic groups of political relevance between 1946 and 1970. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| Territorial Conflicts (1946-1970) | Average number of Territorial Conflicts between 1946 and 1970. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| EGIP population with regional autonomy (1946-1970) | Average share of ethnically relevant population with regional autonomy between 1946 and 1960. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| EGIP Count (1946-1960) | Average number of ethnic groups of political relevance between 1946 and 1960. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| Territorial Conflicts (1946-1960) | Average number of Territorial Conflicts between 1946 and 1960. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| EGIP population with regional autonomy (1946-1960) | Average share of ethnically relevant population with regional autonomy between 1946 and 1960. *Data Source:* Authors with EPR data (Vogt et al., 2015; Girardin et al., 2015) |
| % Catholic in 1980s | Average share of Catholics in the total population in the 1980s. *Data Source:* Quality of Government Dataset (Teorell et al., 2018) |
| Genetic homogeneity (ancestry adjusted) | Predicted genetic homogeneity/diversity adjusted for ancestry given the modern country borders. *Data Source:* Ashraf and Galor (2013) |
| % Land in the tropics | Percentage of land in the tropics. *Data Source:* Ashraf and Galor (2013) |
| % Population in temperate zones | Percentage of population living in temperate zones. *Data Source:* Ashraf and Galor (2013) |
| Population density in 1000 C.E. | Population density in the 11th century (ln). *Data Source:* Ashraf and Galor (2013) |
| Distance to regional frontier in 1000 C.E. | Distance to regional frontier in the 11th century (ln). *Data Source:* Ashraf and Galor (2013) |
| Mean Bureaucratic Quality (1984-2014) | Average bureaucratic quality between 1984 and 2014. *Data Source:* Authors' with data from ICRG Country Risk |
| Regions | Regions: Sub-Saharan Africa, Middle-East and North-Africa, Others. *Data Source:* World Development Indicators |

### *Instrumental Variables*

| | |
|---|---|
| TseTse Suitability Index | TseTse Suitability Index. *Data Source:* Alsan (2015) |
| Neolithic Transition Timing (ln) | Number of years elapsed since the onset of sedentary agriculture as of 1500 C.E. . *Data Source:* Ashraf and Galor (2013) |
| Ecological Diversity | Probability that two or more different ecological zones are contained within a particular ethnic state area. *Data Source:* Fenske (2014) |

*Notes:* (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities. (ln) refers to values in natural logarithm.

## Table A.2: Summary Statistics

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Tax Assignment Index | 76 | 0.108 | 0.137 | 0.000 | 0.612 |
| Tax Assignment Index (*) | 76 | 0.108 | 0.137 | 0.000 | 0.612 |
| Tax Administration Assignment | 76 | 0.220 | 0.203 | 0.000 | 0.892 |
| Tax Administration Assignment (*) | 76 | 0.221 | 0.205 | 0.000 | 0.892 |
| Tax Rate Assignment | 76 | 0.111 | 0.172 | 0.000 | 0.800 |
| Tax Rate Assignment (*) | 76 | 0.112 | 0.172 | 0.000 | 0.800 |
| Precolonial Centralization | 76 | 2.215 | 0.985 | 0.000 | 3.980 |
| Precolonial Agro-technical level | 76 | 64.000 | 26.683 | 0.000 | 100.000 |
| Precolonial Assymetric Work Distribution | 76 | 66.965 | 21.619 | 19.330 | 100.000 |
| British Legal Origin | 76 | 0.355 | 0.482 | 0 | 1 |
| Violent independence | 76 | 0.342 | 0.478 | 0 | 1 |
| Socialist State between 1946-1990 | 76 | 0.316 | 0.468 | 0 | 1 |
| Years of independence (ln) | 76 | 4.326 | 0.693 | 3.219 | 6.477 |
| Country Size | 76 | 12.650 | 1.505 | 9.250 | 16.077 |
| Typical Population Density | 76 | 3.871 | 1.340 | 0.593 | 6.931 |
| Terrain ruggedness index within 100km | 76 | -7.122 | 0.856 | -9.104 | -5.417 |
| Elevation(ln) | 76 | -0.761 | 0.880 | -3.369 | 0.886 |
| Distance (km) to coast or navigable river | 76 | 5.509 | 1.144 | 2.652 | 7.424 |
| Ethnolinguistic Fragmentation | 76 | -2.830 | 1.935 | -6.908 | -0.572 |
| Polirization | 76 | -2.254 | 2.027 | -6.908 | -0.037 |
| Ethnic Fractionalization | 75 | -0.777 | 0.979 | -5.810 | -0.071 |
| Religious Fractionalization | 76 | -1.250 | 1.343 | -6.038 | -0.150 |
| Arable land % | 76 | 12.530 | 12.756 | 0.000 | 62.110 |
| Soil fertility | 76 | 0.496 | 0.165 | 0.175 | 0.871 |
| Natural Resources Rents (% GDP) | 59 | 1.340 | 1.961 | -6.598 | 4.135 |
| EGIP Count (1946-1970) | 74 | 2.090 | 2.192 | 0.000 | 14.000 |
| Territorial Conflicts (1946-1970) | 74 | 0.079 | 0.194 | 0.000 | 1.000 |
| EGIP population with regional autonomy (1946-1970) | 74 | 0.018 | 0.075 | 0.000 | 0.469 |
| EGIP Count (1946-1960) | 74 | 2.090 | 2.192 | 0.000 | 14.000 |
| Territorial Conflicts (1946-1960) | 74 | 0.079 | 0.194 | 0.000 | 1.000 |
| EGIP population with regional autonomy (1946-1960) | 74 | 0.018 | 0.075 | 0.000 | 0.469 |
| % Catholic in the 1980s | 76 | 14.686 | 20.518 | 0.000 | 84.100 |
| Genetic homogeneity (ancestry adjusted) | 75 | 0.265 | 0.024 | 0.226 | 0.343 |
| % Land in the tropics | 76 | 0.660 | 0.447 | 0.000 | 1.000 |
| % Population in temperate zones | 76 | 0.087 | 0.233 | 0.000 | 1.000 |
| Population density in 1000 C.E. | 75 | 0.488 | 1.328 | -2.632 | 2.989 |
| Distance to regional frontier in 1000 C.E. | 76 | 7.572 | 1.484 | 0.000 | 8.799 |
| Region = Sub-Saharan Africa | 76 | 0.539 | 0.502 | 0 | 1 |
| Region = Middle-East and North-Africa | 76 | 0.197 | 0.401 | 0 | 1 |
| Region = Other | 76 | 0.263 | 0.443 | 0 | 1 |
| Mean Bureaucratic Quality (1984-2014) | 62 | 1.635 | 0.761 | 0.000 | 3.988 |

### *Instrumental Variables*

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Ecological Diversity | 43 | 0.246 | 0.159 | 0.000 | 0.637 |
| TseTse Suitability Index | 43 | -0.119 | 0.915 | -1.735 | 1.371 |
| Neolithic Transition Timing(ln) | 74 | 8.313 | 0.536 | 7.213 | 9.250 |
| N Countries | 76 | | | | |

*Notes:* (*) indicates that the indicators are constructed based on the alternative scoring method such that $(C, I, L) = 2/3$ instead of $1/2$. See Table C.2 and Table C.3 for illustrations. EGIP refers to the ethnic groups of political relevance. See Girardin et al. (2015) for conceptual and methodological details.

# B Empirical Results

Table B.1: Historical Path-Dependence in Intergovernmental Tax Arrangements:
OLS estimates using sub-sample from IV-GMM estimations (Table 3)

| | (1) | (2*) |
|---|---|---|
| *Dependent Variables:* Sub-national taxing rights (*Tax Assignment Index*) | | |
| Pre-colonial Centralization | 0.076** | 0.077** |
| | (0.036) | (0.036) |
| Violent independence | -0.130*** | -0.130*** |
| | (0.038) | (0.038) |
| Country Size | 0.053* | 0.054* |
| | (0.029) | (0.029) |
| Terrain ruggedness index within 100km | 0.172*** | 0.172*** |
| | (0.044) | (0.044) |
| Territorial Conflicts | 0.571*** | 0.569*** |
| | (0.159) | (0.161) |
| EGIP population with regional autonomy | -1.031*** | -1.033*** |
| | (0.317) | (0.321) |
| Constant | 1.920*** | 1.933*** |
| | (0.706) | (0.713) |
| Regional FE | Yes | Yes |
| Additional Controls | Yes | Yes |
| N Countries | 42 | 42 |
| $R^2$ | 0.92 | 0.92 |
| Adj-$R^2$ | 0.79 | 0.79 |
| AIC | -102.65 | -101.82 |

*Notes:* Robust standard errors in parentheses. Significance level: * $p<0.10$, **$p<0.05$, ***$p<0.01$. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (column 2; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, the number of ethnic groups of political relevance (EGIP Count; see Girardin et al. (2015) for conceptual definition), the percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Regional FE is a dummy variable referring to countries not located in Sub-Saharan Africa (approximately 11% of the sub-sample).

Table B.2: Historical Path Dependence in Intergovernmental Tax Arrangements:
Sub-national Discretion over the Tax System Overall, over Tax Administration and Tax Rates
2SLS-IV Estimates

| Dependent Variables: Tax Assignment Index | (1.1) Overall | (1.2*) Overall | (2.1) Administration | (2.2*) Administration | (3.1) Rates | (3.2*) Rates |
|---|---|---|---|---|---|---|
| Pre-colonial Centralization | 0.124*** | 0.125*** | 0.295*** | 0.296*** | 0.160** | 0.159** |
| | (0.041) | (0.042) | (0.113) | (0.114) | (0.072) | (0.073) |
| Violent independence | -0.148*** | -0.148*** | -0.170** | -0.169** | -0.233*** | -0.235*** |
| | (0.026) | (0.026) | (0.075) | (0.075) | (0.046) | (0.046) |
| Country Size | 0.066*** | 0.066*** | 0.132*** | 0.135*** | 0.048* | 0.048* |
| | (0.020) | (0.021) | (0.051) | (0.052) | (0.028) | (0.028) |
| Terrain ruggedness within 100km | 0.165*** | 0.166*** | 0.346*** | 0.349*** | 0.126** | 0.127** |
| | (0.031) | (0.031) | (0.078) | (0.079) | (0.049) | (0.050) |
| Constant | 1.956*** | 1.969*** | 4.537*** | 4.571*** | 1.669** | 1.690** |
| | (0.477) | (0.481) | (1.266) | (1.283) | (0.838) | (0.841) |
| Regional FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Additional Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| *First-Stage* | | | | | | |
| Ecological Diversity | 2.167** | 2.167** | 2.167** | 2.167** | 2.167** | 2.167** |
| | (1.007) | (1.007) | (1.007) | (1.007) | (1.007) | (1.007) |
| TseTse Suitability Index | 0.086 | 0.086 | 0.086 | 0.086 | 0.086 | 0.086 |
| | (0.238) | (0.238) | (0.238) | (0.238) | (0.238) | (0.238) |
| Neolithic Transition Timing | -0.914 | -0.914 | -0.914 | -0.914 | -0.914 | -0.914 |
| | (1.038) | (1.038) | (1.038) | (1.038) | (1.038) | (1.038) |
| N Countries | 42 | 42 | 42 | 42 | 42 | 42 |
| $R^2$ | 0.91 | 0.91 | 0.64 | 0.64 | 0.88 | 0.88 |
| Adj-$R^2$ | 0.77 | 0.76 | 0.07 | 0.07 | 0.69 | 0.69 |
| AIC | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| Hansen J (*p-value*) | 0.36 | 0.36 | 0.07 | 0.07 | 0.97 | 0.96 |
| Under-identification(*p-value*) | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |

*Notes*: Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns (1.2), (2.2), and (3.2)); see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, the number of ethnic groups of political relevance (EGIP Count), the percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other).

Table B.3: Historical Path-Dependence in Intergovernmental Tax Arrangements: OLS Estimates, with Natural Resources Rents (%GDP, 1970-1975)

| | (1) | (2*) |
|---|---|---|
| *Dependent Variables:* Sub-national taxing rights (*Tax Assignment Index*) | | |
| Pre-colonial Centralization | 0.075** | 0.076** |
| | (0.031) | (0.031) |
| British Legal Origin | -0.002 | -0.002 |
| | (0.046) | (0.046) |
| Violent independence | -0.152*** | -0.153*** |
| | (0.057) | (0.057) |
| Country Size | 0.034* | 0.034* |
| | (0.020) | (0.020) |
| Terrain ruggedness within 100km | 0.082* | 0.081* |
| | (0.041) | (0.041) |
| Natural Resources Rents (%GDP) | -0.004* | -0.004* |
| | (0.002) | (0.002) |
| Constant | 0.741 | 0.732 |
| | (0.906) | (0.903) |
| Regional FE | Yes | Yes |
| Additional Controls | Yes | Yes |
| N Countries | 58 | 58 |
| $R^2$ | 0.71 | 0.71 |
| Adj-$R^2$ | 0.45 | 0.45 |
| AIC | - 72.39 | -72.33 |

*Notes:* Robust standard errors in parentheses. Significance level: * p<0.10, **p<0.05, ***p<0.01. (*) implies that the indicator has been revised to account for the relevance of intermediate level of governments in joint decisions with central authorities (columns 2 and 4; see Appendix C and Table C.3 for methodological explanations and illustrations). Control variables (also included in the first-stage regressions) include: pre-colonial agro-technical level, pre-colonial asymmetric work distribution, and total years of independence, typical population density, mean elevation, mean distance to coast or navigable river(km), arable land, soil fertility, the number of ethnic groups of political relevance (EGIP Count), percentage of catholic in the 1980s, genetic homogeneity (ancestry adjusted), ethno-linguistic fragmentation and polarization at the first level of aggregation from Desmet et al. (2012), % land in the tropics, % population in temperate zones, population density in 1000 C.E., distance to regional frontier in 1000 C.E. EGIP Count, Territorial Conflicts, and EGIP Population with regional autonomy are averaged over the period of 1946 to 1970. Regional FE account for the regional location of countries (Sub-Saharan Africa, Middle East and North Africa, base=Other).

# C   Measurement of Sub-national Taxing Rights

The proxies for sub-national taxing rights, and sub-national discretion over tax administration and the setting of tax rates were developed as part of a doctoral research project. The construction of the dataset is documented in Vincent (2020).[7] It informs on the discretionary power of sub-national and central governments over the tax system more broadly, over specific tax instruments and specific decision dimensions such as the setting of tax rates and tax administration. The dataset was built through thorough reviews of legal and policy documents that inform on the vertical attribution of power over the tax system across tiers of government in each given countries. The sources of information are summarized as follows.

Table C.1: Primary Sources of Information

| | |
|---|---|
| Legal Provisions | Tax Codes, Local Government Acts, Laws and Decrees on Local Public Finances and Taxation, Constitutions |
| Policy Documents | Decentralization Policy document, Territorial and Public Administration reforms documents, Development Strategies, Public Finance Reports, Regional and Local Councils Reports |
| Archives | International Bureau of Fiscal Documentation - Tax Research Platform |
| Scientific and Grey Publications | Peer-reviewed publications, edited volumes, working papers, multilateral organizations reports(IMF, World Bank, OECD, UCLG, UN, etc.) |
| Existing Databases | OECD Tax Autonomy, Regional Authority Index, etc.; Local Public Finance Datasets (when available); IMF GFS |

The coding procedure of the new dataset is illustrated in Table C.2. The tier of government in charge of deciding over the parameters for each tax instrument is labelled as such, with $C$ referring to central government authorities, $I$ the intermediate level authorities and $L$ for local governments. Let $T$ be the number of identified tax instruments (e.g. corporate income tax, business tax, personal income tax), $D_s$ a binary indicator for the involvement of lower-tier governments in the decision-making process, $S$ the number of instruments upon which sub-central governments have a certain degree of decision-making power ($S \leqq T$), and $\alpha$ a scoring weight which is equivalent to $1/2$ for a joint decision and $1$ for a single-handed decision, $A_d$ with $d \in \{1, 2, 3, 4\}$ the score related to each decision-component (e.g. $A_2$: the discretionary power over the settings of tax rate), then $A_d$ is derived as follows:

$$A_d = \frac{\sum_{s=1}^{S} \alpha D_s}{\sum_{i=1}^{I} T_i} \tag{4}$$

$$\text{with} \quad \alpha = \begin{cases} 1/2 & \text{if decided by central AND sub-national authorities (e.g. "C,L")} \\ 1 & \text{if decided by central OR sub-national authorities (e.g. "C" or "L")} \end{cases}$$

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[7]Additional information can also be accessed from this website.

The resulting indicators ($A_d$) on these four dimensions facilitate in-depth analysis into different aspects of the multi-layer tax structure across countries. They allow for comparison of the management of specific tax instruments – such as the personal income tax or property tax – whose base, rate and administration may not be uniformly defined by the same government layer across countries. In this paper, the score on *Tax Rate* and *Tax Administration* are used as alternative outcome variables to test whether our framework also explains modern-day variation in sub-national governments' discretion over tax administration and the setting of the tax rates. These scores on the types of decision are by extension referred to the *"Tax Rate Assignment (TRA)"* and *"Tax Administration Assignment (TAA)"*.

The overall *"Tax Assignment Index (TAI)"* is obtained by taking the averages of the scores on the four decision dimensions. It reflects the legal taxing powers granted to lower-tier authorities both across existing instruments and decision dimensions. The scoring procedure is illustrated in Table C.2. Figure C.1 displays the *Tax Assignment Index* across countries.

$$TAI = \frac{\sum_{d=1}^{4} A_d}{4} \tag{5}$$

In many countries, intermediate-level governments hold some discretion over tax matters. Whenever the legal provisions allow for it, regional governments can, single-handedly or jointly with central and local authorities, take policy decisions regarding specific tax instruments. Thus, combining intermediate and local levels into one (as sub-national authorities) might undermine the relevance of regional or local governments compared to the central. As a result, an alternative scoring approach is adopted whereby we assign a specific weight to regional authorities such that, in joint decisions that involve the central, intermediate and local governments (C, I, L), $\alpha = \frac{2}{3}$ instead of $\frac{1}{2}$. the alternative scoring procedure induces a minor deviation in the overall *"Tax Assignment Index"* and the deviation only applies to a few countries. Table C.3 illustrates the changes in the indicators.

Table C.2: Main Coding and Scoring Procedures

| C: Central I: Intermediate L: Local | Income | | | | Property | | Consumption | | | Others | | | | | Scoring | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Corporate Income Tax | Business Tax | Personal Income Tax | Payroll/Withholding | Property | Transfers of Property | Sales/VAT/Turnover | Excise | Fuel | Industry and Trade | Vehicles | Gambling | Stamps | Natural Resources | Assignment Score | Tax Assignment Index |
| *Country Name* | | | | | | | | | | | | | | | | *0.22* |
| Instrument | C | C | C | C | C | C | C | C | C | C,I | C | C | C | C | 0.04 | |
| Base | C | C | C | C | C,I | C,L | C | C | C | C,I | C | C | C | C | 0.11 | |
| Rate | C | C | C | C | I,L | I,L | C | C | C | C,I,L | C,I | I,L | C | C | 0.29 | |
| Administration | C | L | C | C,I | I,L | L | C | C | C | C,I,L | I,L | L | C,L | C | 0.46 | |

*Source:* Author's. Matrix originally from the World Bank Qualitative Decentralization Indicators

Table C.3: Alternative Scoring Procedures

| C: Central I: Intermediate L: Local | Income | | | | Property | | Consumption | | | Others | | | | | Scoring | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Corporate Income Tax | Business Tax | Personal Income Tax | Payroll/Withholding | Property | Transfers of Property | Sales/VAT/Turnover | Excise | Fuel | Industry and Trade | Vehicles | Gambling | Stamps | Natural Resources | Assignment Score | Tax Assignment Index |
| *Country Name* | | | | | | | | | | | | | | | | *0.23* |
| Instrument | C | C | C | C | C | C | C | C | C | C,I | C | C | C | C | 0.04 | |
| Base | C | C | C | C | C,I | C,L | C | C | C | C,I | C | C | C | C | 0.11 | |
| Rate | C | C | C | C | I,L | I,L | C | C | C | C,I,L | C,I | I,L | C | C | 0.30 | |
| Administration | C | L | C | C,I | I,L | L | C | C | C | C,I,L | I,L | L | C,L | C | 0.48 | |

*Source:* Author's. Matrix originally from the World Bank Qualitative Decentralization Indicators

Figure C.1: Discretionary Power of Sub-Central Governments over the Tax System:
The Tax Assignment Index

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**Tax Assignment Index**

0.00                    0.79