


Vertical taxing rights and tax compliance norms

Journal Article**Author(s):**

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Publication date:

2023-01

Permanent link:

<https://doi.org/10.3929/ethz-b-000587256>

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Originally published in:

Journal of Economic Behavior & Organization 205, <https://doi.org/10.1016/j.jebo.2022.11.003>

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jeboVertical taxing rights and tax compliance norms[☆]

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ARTICLE INFO

Article history:

Received 16 March 2022
 Revised 31 October 2022
 Accepted 3 November 2022
 Available online 5 December 2022

JEL classification:

H77
 H26
 O1

Keywords:

Tax compliance norms
 Tax institutions
 Tax structure
 Fiscal federalism
 Developing countries

ABSTRACT

This paper investigates the effects of multi-layer tax arrangements on tax compliance norms and behaviours of individuals in 49 Latin American and African countries. To date, the literature on tax compliance predominantly portrays the government-taxpayer relationship as bilateral. In practice, however, taxpayers have multiple payment obligations and often towards more than one tier of government. This paper argues for the consideration of multi-level tax arrangements in cross-country empirical enquiries on tax compliance norms and behaviours. It draws from the existing literature to posit that the vertical decision structure on tax matters by different government layers could influence tax compliance through, for instance, altering enforcement parameters, affecting compliance costs or shaping the fiscal exchange between citizens and the State through elements of trust, perception of public accountability and redistribution, and public utility. The empirical findings suggest that assigning taxing rights and discretionary powers on tax administration to subnational governments lower tendencies of compliance. The paper confirms the overruling hypothesis that inter-governmental tax arrangements matter for understanding tax compliance norms. The results are robust to multiple specifications, including the use of instrumental variables to address endogeneity concerns.

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1. Introduction

The ability of a state to raise revenues from citizens in exchange for public goods and services is fundamental for economic progress. As such, scholars have long invested in understanding the drivers of tax compliance and finding the optimal design for tax institutions. Still, to date, tax non-compliance remains one of the most pressing public policy challenges. Non-compliance, especially in developing and emerging economies, undermines the ability of state authorities to provide goods and services in poverty-sensitive areas such as education and healthcare. In 2019, the IMF estimated that in order to reach the Sustainable Development Goals by 2030, low-income countries need to gather revenues and fiscal resources approximating 15.4% of their GDP (see for e.g. [Gaspar et al., 2019](#)). Yet, the tax-to-GDP ratio for low and middle-income countries stood at 10.7% in 2020 ([World Bank, 2020](#)) compared to 33.51% for OECD countries ([OECD, 2021](#)). Weak institutions, lack of en-

[☆] The author is grateful to anonymous reviewers, the editors, Arno Riedl, Kaj Thomsson, Gregoire Rota-Graziosi, Thierry Madiès, Simone Bertoli, Franziska Gassman, Pui-Hang Wong, Bob Rijkers and Stephan Dietrich, Marko Köthenbürger for valuable comments, suggestions and support. Many thanks also to participants at the 2018 Oxford University (CSAE) Workshop on Public Finance and Public Management in Africa, the 2nd UNU-MERIT Annual Conference, and the OECD Fiscal Network Brown Bag Seminar series for in-depth discussions and comments on an earlier draft.

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forcement capacity, profit shifting of corporations, and low accountability in the provision of public services are cited among other rationales for the low collection rate in developing economies (Fuest and Riedel, 2010; Besley and Persson, 2014; Ali et al., 2014; Janský and Palanský, 2019). The erosion of tax bases also triggers the dependency of developing countries on external donors, which further undermines the “*governance dividend of taxation*” (Moore, 2004, p.310) and disincentivizes citizens to comply with their due payments, thus perpetuating a vicious cycle.

In attempts to understand the drivers of tax compliance, early theoretical works drew insights from the economics of crime and portfolio choice literature (see for e.g. Allingham and Sandmo, 1972; Yitzhaki, 1974). Taxpayers are depicted as money-maximizing individuals who gamble on whether to pay their full liability or under-report their gross income, given a set of parameters such as tax rates and audit probability. In recent years, the focus of the literature has shifted to non-expected utility models as researchers argue that taxpayers make their decisions under ambiguity rather than risk (see for e.g. Dhimi and al Nowaihi, 2007). Recent publications also predominantly fall at the cross-section of economics and psychology as researchers dig into the intrinsic, neurological and social factors that influence citizens’ willingness to pay (Cummings et al., 2001; Alm and Torgler, 2006; Traxler, 2010; Hokamp, 2014; Chetty et al., 2014; Besley et al., 2019).

Empirical evidence within both strands of literature abounds. Notwithstanding, an overview of existing works suggests that they are mostly built upon frameworks that consider the taxpayer-government relationship as a bilateral one. In practice, however, governments consist of many layers, and taxpayers often have payment obligations towards more than one layer. As argued by Hindriks and Myles (2013, p. 585), the setting of tax instruments, including the probability of being caught and the fines associated with each instrument, may not be set by the same layer or tax agencies, and even less in a cohesive manner. In many countries, regional and local governments are permitted to have their own tax enforcement institutions or procedures, independently of central or federal ones. Yet, despite a wide range of publications on fiscal federalism, on the one hand, and tax compliance, on the other, empirical evidence linking the multi-layer structure of taxation to tax compliance is exceptionally scarce. There is also a conspicuous lack of theoretical frameworks on how multi-layered tax institutions could influence the tax behaviours of firms and residents.

This paper argues for the consideration of vertical tax arrangements in attempts to understand tax compliance norms. It provides evidence of how the level of subnational taxing rights and discretion over specific tax-related decisions influence compliance norms and behaviours of citizens in a sample of 49 Latin-American and African countries. The paper draws from public opinion survey data – namely, the Afrobarometer Survey and the LatinoBarómetro (Afrobarometer, 2016; Latínóbarómetro, 2015) – that report on individual attitudes towards tax payments. It also relies on a new dataset that captures intergovernmental tax arrangements and measures the level of taxing rights granted to subnational authorities. For each country, the new dataset identifies the vertical decision structure on tax matters, more broadly, and on specific decision dimension such as the setting of tax rates and tax administration.

The contributions of the paper are threefold. First, it discusses the mechanisms through which the multi-tier structure of taxation could influence individual tax compliance norms, drawing from existing works within the public finance and political economy literature. Considering tax compliance as the ultimate goal for the State, the analytical framework builds upon the pro and con arguments for having decentralized tax institutions or sub-national governments’ involvement in tax matters. Second, it is among the first to assess how various features of vertical tax arrangements could influence compliance. The new dataset on multi-layer tax structure suggests that countries differ quite significantly in the types of decisions assigned to different government tiers. It is, therefore, worth investigating whether governments’ discretion over different dimensions of the tax system might yield different effects on tax compliance norms and attitudes of individuals. Third, it provides heterogeneous analyses by zooming into factors that might play a mitigating role in shaping the nexus of multi-layer taxation and tax compliance.

The empirical results confirm that the vertical assignment of taxing rights matter in our understanding of tax compliance norms and attitudes. The findings suggest that the higher the level of taxing rights of sub-national authorities, the lower the tendencies of compliance. Zooming into decision parameters, it is revealed that sub-national discretion over tax administration is of great concern as it tends to lower compliance. The results also suggest that the scarcity of tax knowledge tends to exacerbate the negative effects of sub-national taxing rights and discretion over tax administration on tax compliance. Furthermore, the paper questions whether these findings are due to the core design of multi-level tax institutions or due to higher compliance costs in respective country contexts. It thereby investigates whether indicators that capture compliance costs at the country level – such as the number of tax payments or hours to fill taxes – might trump the relevance of indicators that proxy sub-national taxing rights and discretion over tax administration. The results suggest that neither of these variables trumps the relevance of the design of tax institutions across tiers. The negative linkages between subnational taxing rights and tax compliance norms remain highly significant and thus seem to be embedded in parameters such as the scarcity of tax knowledge or others that are yet to be explored by the literature. Overall, this paper contributes to the scholarly discussion on how complex tax structure affects revenue mobilization in developing and emerging economies. By exploring the different channels and using novel indicators, it adds to the literature on how incentives embedded in intergovernmental fiscal institutions could extend to and drive taxpayers’ behaviours.

In what follows, Section 2 provides an overview of the background literature. Section 3 presents the analytical framework and reasoning for considering vertical taxing rights in the search to understand the drivers of compliance. Section 4 details the empirical framework, including the description of key variables, data sources and primary estimation strategy. Section 5 discusses and tests the robustness of the results. Concluding remarks are provided in Section 6.

2. Brief overview of the literature

Understanding why people pay taxes has long been both a scholarly and a policy concern. Early theoretical contributions drew insights from the economics of crime and portfolio choice literature. [Allingham and Sandmo \(1972\)](#) and [Yitzhaki \(1974\)](#) count among some of the initial attempts to model a taxpayer's decision to evade. In their frameworks, taxpayers are assumed to be homogeneous, money maximizing and gamble on whether to pay their full liability or under-report their gross income, given a set of parameters – namely, tax rates, fines, and the likelihood of being caught. Predictions from these models are relatively straightforward: tax evasion decreases with tax rates, fines, and audit probabilities. Publications that followed questioned the simplicity of the latter. Critics argued that such models abstract from the complex reality in which taxpayers operate. [Snow and Warren \(2005\)](#) and [Hashimzade et al. \(2012\)](#), for instance, argue that the probability of audit is not common knowledge; therefore, ambiguity-adverse taxpayers would comply in any case and independently of such probability. Contributions by [Slemrod \(2002\)](#) and [Blackwell \(2007\)](#) further point out that higher tax rates might induce less compliance. Refinements of the pioneer theoretical models also depart from the sole private utility assumption to include the returns to tax payments, in the form of tax-financed public goods and services, as potential drivers of tax compliance ([Cowell and Gordon, 1988](#); [Bordignon, 1993](#); [Dell'Anno, 2009](#); [Blackwell, 2007](#); [Bodea and LeBas, 2016](#)).

The more recent literature on tax compliance predominantly falls at the cross-section of economics and psychology, as scholars dig into the intrinsic, neurological and social factors that influence the willingness to pay ([Cummings et al., 2001](#); [Alm and Torgler, 2006](#); [Traxler, 2010](#); [Hokamp, 2014](#); [Chetty et al., 2014](#); [Besley et al., 2019](#)).¹ The ever-growing literature puts a greater emphasis on experimental methodologies, either as a means to circumvent the unavailability of administrative tax data for many countries or to reach causal estimates and thereby limit biased conclusions.² As surveyed by [Mascagni \(2018\)](#), this strand has also expanded to developing economies, such as in Sub-Saharan Africa, where a growing number of tax experiments are taking place. To date, empirical evidence within both the classical and new literature strands abounds. While the added value of each contribution differs, the findings point to fairness ([Bordignon, 1993](#); [Falkinger, 1995](#); [Fortin et al., 2007](#)), trust in (tax) authorities ([Feld and Frey, 2002](#); [Kogler et al., 2013](#); [Batrancea et al., 2019](#)), prestige and social norms ([Cowell, 1990](#); [Bobek et al., 2007](#); [Fortin et al., 2007](#); [Traxler, 2010](#); [Hokamp, 2014](#); [Chetty et al., 2014](#); [Besley et al., 2019](#)), culture ([Cummings et al., 2001](#); [Alm and Torgler, 2006](#)), higher institutional quality and the perception of government and its accountability ([Alm et al., 1992](#); [Frey and Torgler, 2007](#); [Cummings et al., 2009](#); [Cullen et al., 2018](#)), as key explanatory factors of tax compliance norms and behaviours.³

Nevertheless, a review of the literature suggests that the existing empirical and experimental findings rely on frameworks that consider the taxpayer-government relationship as a bilateral one. Tax authorities are depicted as a single unit in charge of monitoring and collecting tax payments. In practice, however, governments consist of many layers; and in many countries (both nominally federal and unitary), taxpayers have multiple payment obligations, and often, towards more than one tier of government. Subnational authorities may be legally entitled to decision-making on various tax matters, such as the setting of tax rates or granting tax reliefs. In such cases, and as suggested by [Hindriks and Myles \(2013, p. 585\)](#), the setting of tax instruments, including the probability of being caught and the fines associated with each revenue instrument, may not be set by the same layer and even less in a cohesive manner. In Argentina, for instance, the provincial authorities may have their independent tax agencies, and the procedures regarding audit and collection may operate under different modalities from one jurisdiction or province to another (see for e.g. [Besfamille et al., 2017](#)).

Despite a wide range of publications on fiscal federalism and decentralization, on the one hand, and tax compliance, on the other, contributions linking the multi-layer structure of tax institutions to tax compliance norms and behaviours are exceptionally scarce. Moreover, there is a notable paucity of theoretical models on the subject, albeit many rationales for investigating this further. Enforcement agencies across tiers of government might differ in their audit schedule, monitoring and detection capabilities. Limited vertical coordination in tax matters could induce unwanted consequences such as higher tax rates in a non-cooperative equilibrium or higher compliance costs for taxpayers who undertake different transactions across jurisdictions.⁴ Reversely, the geographical proximity of local tax offices to the taxpayers might increase observability and facilitate the tracking down of non-compliant residents and firms. Proximity could also bring more visibility and, thus, accountability of local officials. While this paper is unable to examine all the possible channels, the following section argues for considering inter-governmental tax arrangements in attempts to understand tax compliance norms and behaviours.

3. Analytical framework

While the fiscal federalism literature provides in-depth theoretical discussions on the assignment of tax revenues and tax bases across tiers of government, there remains minimal empirical evidence on the ramifications of multi-layer tax arrange-

¹ It is also predominantly centred around non-expected utility modelling. Contributors to that new strand argue that taxpayers make their choices under ambiguity (uncertainty with unknown probability) rather than risk (uncertainty with known probability) (see for e.g. [Dhami and al Nowaihi, 2007](#)). Non-expected utility theories can thus offer better predictions for those who overweight the audit and detection probabilities ([Hashimzade et al., 2012](#)).

² For more extensive discussions, see for instance [Andreoni et al. \(1998\)](#); [Weber et al. \(2014\)](#); [Alm \(2012\)](#); [Weber et al. \(2014\)](#); [Mascagni \(2018\)](#); [Slemrod \(2019\)](#)

³ Findings on government accountability as a driver of compliance sustain the inclusion of public utility in theoretical models (see for e.g. [Bordignon, 1993](#); [Cowell and Gordon, 1988](#)).

⁴ For discussions on the common pool problem, see, for instance, [Keen and Kotsogiannis \(2003, 2004\)](#).

ments for various socio-economic and behavioural outcomes. Most notably, research on the potential influence of taxing rights of different government tiers on tax compliance is highly scarce. Until recently, the academic and policy discourse on tax revenue mobilization was mostly centred on national tax institutions. However, with the prominence of decentralization reforms since the 1990s and the rapid urbanization rate, many countries have granted (or are granting) responsibilities in tax and revenue matters to local and regional authorities. Such discretion comes in different shapes and varies significantly across countries. In some contexts, sub-national governments may be assigned revenues from a tax instrument while having no discretion in defining the tax rates for said instruments. In others, provincial authorities may administer their own enforcement agencies and, sporadically, are in charge of collecting national taxes on behalf of the central government.⁵

It is of utmost relevance to understand how the structure of tax institutions across government layers influences taxpayers' attitudes (alongside other forms of behavioural and political outcomes). While recent developments in the fiscal federalism literature emphasize the behavioural responses of stakeholders to incentives embedded in inter-governmental political and fiscal institutions, there remain very few empirical insights into how taxpayers respond to such arrangements.⁶ Given the lack of theoretical frameworks and models on the subject, exploring the linkages between multi-layer tax arrangements and tax compliance requires in-depth discussions of the factors ingrained in such arrangements, and which, in view of the existing literature, might influence taxpayers' compliance norms and attitudes. This section regroups these factors into two strands, broadly reflecting the pro- and con-arguments of having both central and lower-tier authorities involved in tax matters.

Fiscal Exchange, Public Accountability and Enforcement

By bringing political decision-making closer to the citizens, decentralization is argued to reduce information asymmetry and improve the adequacy of public policies (Oates, 1972; 1977; 2005). If local public goods are closer to community-bound preferences, a taxpayer is expected to be more compliant, given that his social circles' interests might better align with local provisions. Evidence of such is provided by Güth et al. (2005) who show, through a lab experiment, that voluntary provision rates for locally provided public goods are usually higher than for global (or national) ones. If it is assumed that local tax institutions and the level of taxing rights granted to lower-tier governments are set according to residents' preferences and demands for such institutions, it can thus be expected that such a structure would enhance the fiscal exchange between local authorities and their constituencies, and by extension tax compliance. Empirical evidence from Torgler et al. (2010) points to a positive relationship between local autonomy and tax morale in the context of Switzerland, with local autonomy measured through a self-assessment by local authorities. Torgler and Werner (2005) also evidence that higher tax autonomy, measured by the ratio of sub-national own-tax in federal tax revenues, is associated with higher tax morale in Germany. Considering that tax morale is an essential driver of compliance, as discussed in Torgler (2011), it can be conjectured that the higher the discretionary power of subnational governments on tax matters, the higher the likelihood of tax compliance.

Aside from constituents' preferences, decentralization of the tax system can also bring more visibility and accountability to local officials. In a democratic electoral process, it is expected that local authorities would be incentivised to spend according to public demands, as they are closely monitored by their constituents.⁷ Existing evidence points to tax evasion being lower in regions with a higher degree of political control (see for e.g. Pommerehne and Weck-Hannemann, 1996). The literature on mental accounting also suggests that individuals' aversion that the government would waste their tax payments increases their tendency to monitor their authorities (see for e.g. Tversky and Kahneman, 1991) – a level of monitoring that is more feasible in a reduced-size environment such as a local community. The intensive interactions between taxpayers and local bureaucrats in a small structure could also promote trust – a factor that has been established as an essential determinant of tax compliance (Feld and Frey, 2002; Wahl et al., 2010a; Kouamé, 2015; Kogler et al., 2013; Batrancea et al., 2019). Notwithstanding, it is worth acknowledging that the ultimate effect of subnational taxing rights on tax compliance norms and attitudes is ambiguous. Whether an increase in tax compliance at the local level induces compliance across the board (i.e., with taxes collected by central authorities, for instance) has not been addressed by the existing theoretical and empirical literature. It is undeniable that such predictions would be complicated in cases where the tax climate, including trust and accountability, differs across government tiers.

Beyond the overall taxing rights of subnational authorities, this paper also zooms into discretion over tax administration and the setting of tax rates. First, the geographical proximity to taxpayers might enhance the ability of local enforcement agencies to effectively track down and punish evaders. Expanding tax administration beyond the central level might also be beneficial across the board if local agencies are efficient in sharing information with central authorities. As fraud detection – or the perception of such – becomes recurrent, it is expected that taxpayers would comply more with their due payments. Second, compared to the decentralization of tax administration, which requires extensive facilities and investment,

⁵ The legal frameworks in each country, often specified through tax codes, local government acts, or local taxation acts, describe the extent to which sub-national authorities are involved in or entitled to making fiscal and tax-related decisions. Insights on cross-country variations in vertical taxing rights can be found in the OECD and UCLG World Observatory on Subnational Finance and Investment OECD and UCLG (2019, 2022) and in Vincent (2020, Chapter 2).

⁶ For insights on the incentives and behavioural responses to intergovernmental institutions, see contributions to the second-generation theory of fiscal federalism, such as Oates (2005); Weingast (2009, 2014)

⁷ The fiscal federalism literature has also long argued for tying local expenditure to revenue generation as a means of restraining local authorities from confiscatory demands and bringing about public accountability (see for e.g. Rodden, 2002; Rodden, 2006; Lockwood, 2005).

discretionary powers of lower-tier authorities in the setting of tax rates are common across countries, especially regarding property and other local taxes, although central authorities might impose a ceiling on final rates. Subnational discretion on tax rates can further enhance the fiscal exchange or the implicit contract between authorities and residents. On the one hand, tax rates have a direct implication for revenue mobilization by the authorities; on the other, it provides a transparent framework for households and businesses in choosing their preferred jurisdictions. As a result, residents are able to assess the rates they pay *vis-à-vis* the packages of tax-financed public services that they receive.⁸ It can thus be expected that the ability of lower-tier authorities to set tax rates would increase compliance by fostering the fiscal exchange or implicit contract between the authorities and the taxpayers. This latter and the above postulates on how subnational taxing rights and discretion over tax administration and tax rates might shape tax compliance norms are empirically tested in this paper.

Transaction Costs and Externalities

The fiscal federalism literature has long pointed to the threats of decentralizing the tax system, including disintegrated economic space and fiscal erosion.⁹ Considerations for such risks appear to have guided the design of intergovernmental tax relations in many countries, given the limited discretionary power granted to intermediate and local authorities, especially in developing and emerging economies.¹⁰ The negative externalities of a multi-layer tax structure can be explored from different angles.

First, one of the most unwanted consequences of a complex tax system is the rise in compliance costs for taxpayers who may have payment obligations in several jurisdictions or are bound to interact with several tax authorities. Such hurdles might lead an individual to underestimate his returns to tax payments (or his received share of tax-financed public goods), which could further dampen his willingness to pay. If such transaction costs are a result of a multi-layer tax system, countries might be motivated to have more centralized fiscal institutions: fewer offices to visit, less information to process, and fewer regulatory procedures. It is also undeniable that tax knowledge is crucial to tax compliance and even more so in a system with multiple enforcement stakeholders (Eriksen and Fallon, 1996; Saad, 2014). Tax laws are often criticized for being too complicated. In a multi-layered tax structure, the scarcity of tax knowledge and the multiplicity of regulatory procedures can further curtail the willingness to pay.

Second, the assumed benefits of a centralized tax structure include economies of scale in enforcement capacities and more efficient use of tax-related capital and technology. Although the literature on the optimal size of tax administration is limited, Mayshar (1991) and Keen and Slemrod (2017), among others, suggest that it might still be undesirable to expand tax administration even when there is a positive correlation between the expansion and tax revenues collected at the margin.¹¹ In low-income countries, more particularly, a multi-layered tax administration does not only imply a new organizational structure but also a partition of already scarce public resources into multiple units. Such a split could result in an expansion of corrupt behaviours, or else, in one or more enforcement agencies being less efficient in detecting fraudulent behaviours, conducting frequent and thorough audits and punishing the evaders, all the while forsaking the benefits of economies of scale.¹² Any disparities in administrative capacities could also alter the perception of coercive powers of tax officials, which is argued to be an essential driver of compliance (Wahl et al., 2010a; Hartl et al., 2015). As resources are scarce, excessive monitoring by local (or the closest) authorities could erode trust and create a hostile tax climate, and thus crowds-out the incentives to pay. As argued by Feld and Frey (2002) and Ferrin et al. (2007), excessive monitoring can also be seen as a sign of distrust, and excessive regulations crowd-out intrinsic motivation in relevant circumstances. A few case studies on developing economies suggest that higher tax discretion to lower-tier authorities results in inefficient forms of taxation and a greater tax burden (Rodden, 2006; Bird, 2015; Carnahan, 2015; Coolidge, 2012; Ali et al., 2014).

Hence, contrary to previous arguments, it can also be expected that the complexity resulting from a multi-level tax institution might roll back any positive effect of subnational taxing rights on tax compliance. The following section details how the above arguments are operationalised for the empirical analysis.¹³

4. Empirical framework

The empirical analysis utilizes publicly available survey data on individuals' tax compliance norms, socio-demographic characteristics, and political attitudes. The survey data are paired with proxies measuring subnational taxing rights more

⁸ For pioneer and core literature on inter-jurisdictional mobility and competition, see for instance Tiebout (1956); Wilson (1999); Keen and Kotsogiannis (2004). It is also noted that existing measurements of tax autonomy, such as in the OECD tax autonomy database (OECD, 1999) and the Regional Authority Index (Marks et al., 2008; Hooghe et al., 2016), integrate the tax rate-setting ability as an essential component of sub-national fiscal autonomy.

⁹ For in-depth discussions on the potential threats of multi-level tax institutions, see, for instance, Prud'Homme (1995); Rodden (2002, 2006)

¹⁰ For discussions on limited decisions on tax matters at the subnational level, see Martínez-Vazquez (2015); OECD (2019b); OECD and UCLG (2022) and Vincent (2020, chapter 2).

¹¹ Given the cost of the expansion, it is generally not optimal to take enforcement up to the point at which tax revenue, net of administration costs, is maximized (unless the marginal social value of additional revenue is infinitely large) (Keen and Slemrod, 2017, p. 135).

¹² Bird (2015), among others, suggested that developing countries generally have inefficient tax administrations, often associated with corruption leading to higher compliance costs for the taxpayers.

¹³ It must be noted that several other channels through which multi-layer tax arrangements could influence taxpayers' behaviours are not explored in this paper, either due to unestablished theoretical frameworks or a lack of data. These can be regarded as pathways for future research.

broadly and discretion over the setting of tax rates and tax administration, more specifically. The merged data are then complemented by other covariates that capture the heterogeneity of countries and contexts in which the respondents operate.

4.1. Measuring tax compliance norms

A persistent challenge in cross-country empirical research on tax compliance is the absence of large-scale administrative tax data on individuals and firms. As a result, both pioneer and recent empirical investigations have resorted to survey data to measure attitudes towards tax payments in cross-sectional (see for e.g. Torgler, 2004; Torgler, 2005a; Alm and Torgler, 2006; Torgler and Schneider, 2007; Cummings et al., 2009) and time-series studies (see for e.g. Torgler, 2005a; Martínez-Vázquez and Timofeev, 2009). While it may be argued that respondents are not truthful in their answers, the use of survey data remains widespread. Reinikka and Svensson (2006), among others, have also argued that appropriate survey methods can significantly reduce the issues of biased and misleading responses in surveys. Tripp (1997) further suggests that there is a high degree of truthfulness in survey responses on tax payments, as the refusal to pay taxes can be seen as a form of opposition towards the State, contrarily to the predominant view that non-compliance should bring a sentiment of shame.

This paper follows a similar strategy and compensates for the lack of cross-country data at the individual level with survey data on tax compliance norms and attitudes from the Afrobarometer and Latinobarómetro (Afrobarometer, 2016; Latinobarómetro, 2015). Tax compliance is operationalised as a respondent's self-reported deliberate refusal or failure to pay taxes and fees to the government. The two survey data sources, covering a total of 49 countries, are chosen to enhance cross-country variation and increase the reliability of coefficient estimates. The operationalization of compliance and the selection of covariates are made with careful assessment of the survey questionnaires to ensure the comparability of information across data sources.

Afrobarometer Round 6. *Tax Compliance* is operationalised through question Q27D formulated as follows:

Question: Here is a list of actions that people sometimes take as citizens when they are dissatisfied with government performance. For each of these, please tell me whether you, personally, have done any of these things during the past year. If not, would you do this if you had the chance: **Refused to pay a tax or fee to the government.**

Answers: 0=No, would never do this; 1=No, but would do if had the chance; 2=Yes, once or twice; 3=Yes, several times; 4=Yes, often; 9=Don't know; 98=Refused to answer; -1=Missing

A binary indicator is derived from answers to this question. It refers to the fully compliant individuals or those that stated to have never refused to pay taxes and fees to their respective governments; hence: 1="No, would never do this", "0=Yes, have done (2, 3, 4)". To avoid any ambiguity, observations from the second category "No, but would do if I had the chance" are discarded from the empirical estimations: it is unclear whether the answer conveys full compliance or whether that was used as a subterfuge to avoid the question. All remaining categories (e.g. "Refused to answer") are coded as missing values.

Latinobarómetro 2015. *Tax Compliance* is derived from question Q21STGBS.F on each respondent's refusal to pay taxes.

Question: Q21STM. Now I want you to look at this card. I am going to read out a variety of political activities that people can undertake, and I would like you to tell me if you have ever done any of them (1), if you would ever do any of them (2), or if you would never do any of them (3). Q21STGBS.F: **Refused to pay taxes or fees to the government.**

Answers: 1 = Have done; 2=Could do; 3 = Never, under any circumstances

Similar to the Afrobarometer survey, a binary indicator is derived to identify the fully compliant individuals – those that stated to have never refused to pay taxes and fees to the governments (1=Never, under any circumstances; 0=Have done). Observations with "could do" as an answer are discarded from the estimations. It must be noted that the empirical analysis is limited to Round 6 of the Afrobarometer and Round 5 of the Latinobarómetro due to differences across survey questionnaires for other survey rounds, most notably regarding how tax compliance is operationalised in this paper. The similarity in the statement "Refused to pay taxes or fees to the government" and in other characteristics facilitates cross-country comparisons.

4.2. Vertical taxing rights and measurements

To date, the most notable proxy variable for tax decentralization remains the ratio of subnational to total general government tax revenues. Such an indicator does, however, not suit the empirical analysis of this paper as it fails to inform on the vertical decision structure or the involvement of different governments tiers in the governance of the tax system, which, as argued above, is crucial towards understanding how such arrangements may shape taxpayers' compliance.¹⁴

This paper overcomes the data limitation by relying on a new dataset on multi-layer tax arrangements that identifies the vertical decision structure on tax matters and, more specifically, on different tax instruments (e.g. income, consumption and property tax) and decision dimensions (e.g. tax administration or the setting of tax rates) (see extended description in Vincent (2020, Chapter 2)). The database was built through in-depth reviews of legal and policy documents that inform on the legal assignment of tax responsibilities to different tiers of authority. These include, among others, the constitutions,

¹⁴ Beyond the conventional budgetary ratios, existing data on tax autonomy, such as from the OECD tax autonomy database or the Regional Authority Index (RAI), are often limited in scope or are not disaggregated enough on different dimensions of the tax system, especially for this group of countries.

Table 1
Explanatory variables of interest and correlation with tax compliance.

PROXIES	DESCRIPTION	CORRELATION
Tax Assignment Index	Sub-national government taxing rights (overall)	−0.122***
Tax Assignment Index (*)	Sub-national government taxing rights (overall)	−0.123***
Tax Assignment Index (I,C,P)	Sub-national government taxing rights (overall)	−0.130***
Tax Administration Assignment	Sub-national government discretion over tax administration	−0.114***
Tax Administration Assignment (*)	Sub-national government discretion over tax administration	−0.116***
Tax Administration Assignment (I,C,P)	Sub-national government discretion over tax administration	−0.108***
Tax Rate Assignment	Sub-national government discretion over the setting of tax rates	−0.076***
Tax Rate Assignment (*)	Sub-national government discretion over the setting of tax rates	−0.078***
Tax Rate Assignment (I,C,P)	Sub-national government discretion over the setting of tax rates	−0.097***

Notes: This table conveys the pairwise correlation coefficients between the various proxies measuring sub-national government taxing rights and the operationalised outcome variable on tax compliance. (*) implies that the indicator has been revised to account for the relevance of the intermediate level of governments in joint decisions with central and local authorities. (I,C,P) refers to the indicators that solely account for income, consumption and property taxes. Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

the tax codes, the local government acts, and policy reports on territorial and public finance reforms. The legal and policy documents are triangulated with archives from the international bureau of fiscal documentation (IBFD, Access: 2015–2017). An indicator from this database, denoted as the “*Tax Assignment Index*”, conveys, more broadly, the level of taxing rights of sub-national authorities over the tax system. Section 3 previously outlined the rationales for exploring the effects of vertical rights regarding tax rates and tax administration more specifically. Sub-national discretionary powers on these decision parameters are thus proxied by the so-called “*Tax Administration Assignment*” and the “*Tax Rate Assignment*”, also from the same data source. A higher value on these proxies indicates that sub-central authorities have, by law, a greater right of influence on tax matters, across the board or on specific decision parameters (see Appendix B).

In using these new indicators, this paper differentiates itself from previous empirical works. For instance, Güth et al. (2005)’s lab experiment indicates that the willingness to pay is higher in a decentralized structure compared to a centralized one; the paper does, however, not address the complexity of a tax system where upper and lower-tier authorities may both have some degrees of discretion. Torgler et al. (2010) operationalised local autonomy through a survey in which local administrators are asked to report their perception of local autonomy; yet, their empirical strategy does not refer to the structure of tax payments in the context of Switzerland – a country where sub-federal authorities hold considerable decision-making power over tax institutions. Lago-Peñas and Lago-Peñas (2010) considered a binary indicator for federal governments in their empirical estimations; however, as highlighted numerous in the literature, subnational authorities in federal countries do not necessarily hold significant taxing powers. Federal countries such as Malaysia and Austria stand as staggering examples (see for e.g. Vincent, 2022). This paper is also the first to provide subjective evidence of the potential effects of subnational discretion over tax rates and tax administration on tax compliance norms.

As described in Vincent (2020), intermediate or regional-level governments carry discretionary power over the tax system in many countries. Thus, bidding the taxing rights of local and regional governments into “sub-national governments” might undermine the relevance of regional authorities in the vertical decision-making process. Thus, as provided in the database, proxies that account for the involvement of intermediate-level governments in joint decision-making (with central and local authorities) on tax matters are considered for each measurement of taxing rights. Lastly, the empirical estimations also consider proxies for sub-national taxing rights that are solely constructed with respect to income, consumption and property taxes. As these are the most common instruments and important revenue sources, it is tested whether the results are sensitive to the choice of tax instruments in measuring vertical taxing rights.

Table 1 lists the main explanatory variables of interest. It also points to a statistically significant and negative correlation between the binary outcome variable on tax compliance and the indicators capturing sub-national taxing rights and their discretion over tax rates and tax administration. Proxies from the alternative measurement approach, which account for regional governments’ discretion, and those constructed solely with respect to income, consumption and property taxes, are identified as such and are used to further test the robustness of the results to variations in the measurement of subnational taxing rights.

4.3. Control variables

The empirical specifications control for an array of variables that capture demographic, political and social characteristics of each respondent and the country context. The set of individual-level covariates is provided respectively through the Afrobarometer (2016) and the Latinobarometro (2015) survey data, alongside the questions and answers on tax compliance, whereas the vector of country characteristics is provided through standardized databases on countries’ economic and political features (see for e.g. Teorell et al., 2017; Scartascini et al., 2018; World Bank, 2022), in addition to the indicators measuring multi-layer tax arrangements.

Individual-level covariates

At the individual level, the models first and foremost account for the socio-demographic characteristics of each respondent. The variables are selected based on insights from the existing literature. **Age** is a continuous variable indicating the age of the survey respondent (see for e.g. Alm and Torgler, 2006; Torgler and Schaltegger, 2006; Cummings et al., 2009). **Gender** is a binary variable indicating whether the respondent is a man (1) or a woman (0) (see for e.g. Torgler, 2005b; Torgler and Schaltegger, 2006; Alm and Torgler, 2006). **Education** is an ordinal variable taking the following values: 0=no formal education; 1=primary education; 2=secondary education; 3=post-secondary education (see for e.g. Torgler and Schaltegger, 2006). **Employment status** is a binary variable indicating whether the respondent was employed at the time of the survey (see for e.g. Torgler, 2004; Alm and Torgler, 2006).

In addition to the socio-demographic characteristics, the models also account for factors that capture the political and social attitudes of each respondent and which have been highlighted as key determinants in previous publications. **Trust in Institutions** is a composite indicator measuring a respondent's overall trust in public and political institutions, including the presidential office or the national government, the parliament or congress, the judiciary or the courts, and electoral institutions (see for e.g. Frey and Torgler, 2007; Torgler and Schneider, 2007; Torgler et al., 2010). It is constructed through factor analyses using polychoric correlations of ordinal variables related to trust in the above-listed institutions (see for e.g. Lee et al., 1995; Holgado-Tello et al., 2008). **Pro-democracy** refers to whether a respondent supports or has a favourable opinion of democracy (see for e.g. Torgler, 2005b; Torgler and Schneider, 2007). **Political Involvement** is a composite indicator pointing to a respondent's political endeavours (see for e.g. Wahl et al., 2010b; Kogler et al., 2013; Batrancea et al., 2019; Ma et al., 2020). Similar to the variable on *trust*, it is constructed through factor analyses using polychoric correlations of binary indicators that indicate whether a respondent is close to a political party, frequently discusses politics, participates in political protest, and attends or raises an issue at community meetings. **Religiosity** is a binary variable indicating a respondent's adherence to a particular religion or religious assembly; religious beliefs and commitments, and the virtues that stem from religious teachings are expected to provide an internal constraint on cheating (see for e.g. Torgler and Schaltegger, 2006; Benk et al., 2016). Lastly, **Perception of redistribution** indicates whether a respondent thinks that the current income redistribution is fair or that the narrowing of the income gap is appropriately handled by the government. This variable is intended to capture perceptions of government accountability and the strength of the fiscal exchange which are postulated to be key determinants of compliance (see for e.g. Bordignon, 1993; Falkinger, 1995; Verboon and Goslinga, 2009; Congdon et al., 2011).

Country-level covariates

At the country-level, the models first control for **Per capita GDP (ln)** – a proxy for countries' income level (see for e.g. Lago-Peñas and Lago-Peñas, 2010). For each country, per capita GDP is averaged over three years – the year of the survey data collection and two years preceding the survey. Such an approach helps to capture the broader level of development rather than a year-based estimate. Second, are included geographical characteristics of the countries, namely **Country Size** and **Population Density**. Geography has been a recurring theme in institutional economics; many argue that geography affects the quality of institutions (Gallup et al., 1999; Sokoloff and Engerman, 2000), and the level of decentralization (Panizza, 1999; Arzaghi and Henderson, 2005; Canavire-Bacarreza et al., 2017). Third, it is included a measurement of **Ethnic fractionalization**, defined as the probability that two randomly selected individuals will be from different ethnic groups, and provided by Alesina et al. (2003). It is argued that that trust and consensus over public policies and institutions might be lower in ethnically fragmented societies. This variable has also previously been used in Lago-Peñas and Lago-Peñas (2010). Fourth, the paper considers a measurement of institutional quality: the World Governance Indicator (WGI) on **Government Effectiveness**; it is a composite indicator that captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The WGI Government Effectiveness is also averaged over three years, although the data display minimal year-to-year variation for included countries. Lastly, it is considered a proxy measuring the potential tax burden on a micro-level in each given country (see for e.g. Alm et al., 1995). Given the unit of analysis (individual respondents) and the methodological constraints attached to measuring tax burden in relation to such unit, this paper recurs to **Labour Tax and Contributions as % of commercial profits**, to proxy, to the best extent possible, the burden felt by individual respondents, at least in the formal economy.

4.4. Estimation strategy

This paper adopts a generalized linear mixed model (GLMM) with probit estimation techniques (also known as mixed-effects probit model) as the primary identification strategy. This estimation technique nests individual data and responses in country contexts (Raudenbush and Bryk, 2002; Rabe-Hesketh and Skrondal, 2012), and has been previously used in empirical enquiries regarding tax compliance norms (see for e.g. Lago-Peñas and Lago-Peñas, 2010). Given that the outcome variable is binary, the likelihood of tax compliance of individual i in the country j is a function of the $1 \times q$ row vector \mathbf{x}_{ij} of individual characteristics, $1 \times p$ vector \mathbf{w}_j of institutional and socio-economic factors of the country in which (i) lives, and random effects \mathbf{u}_j . $\Phi(\cdot)$ is the standard normal cumulative distribution function. \mathbf{z}_{ij} is the $1 \times n$ vector of covariates corresponding to the random effects and can be used to represent both random intercepts and random coefficients, and which is the scalar

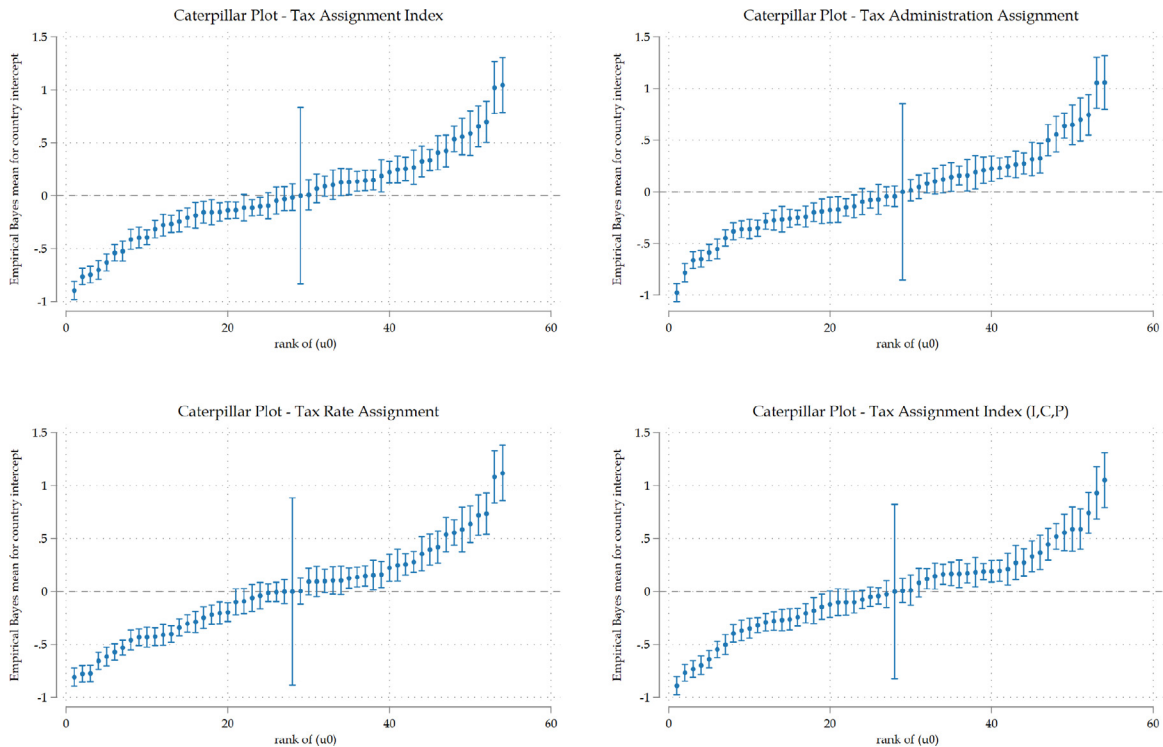


Fig. 1. Caterpillar Plots of country (random) effects. These figures are graphic representations of the countries' effects. The caterpillar plots are obtained by calculating the empirical Bayes predictions of the random effects in the null model with the main variables of interest on rank order with a 95% confidence interval. They indicate that for a large number of countries, the 95% confidence interval does not overlap zero, implying that the likelihood of compliance is significantly above or below the average in these countries.

1 in the random intercept model. The probability of falling into the group whose answer equals 1 is given as follows:

$$P(y_{ij} = 1 | \mathbf{x}_{ij}, \mathbf{w}_j, \mathbf{u}_j) = \Phi(\mathbf{x}_{ij}\beta + \mathbf{w}_j\delta + \mathbf{z}_{ij}\mathbf{u}_j) \tag{1}$$

Equation (1) can also be written in a latent linear form where the binary responses y_{ij} are determined by the latent continuous responses via the threshold model as in (3). The error terms ϵ_{ij} and \mathbf{u}_j follow the standard normal distribution with mean 0 and variance 1. ϵ_{ij} is also assumed to be independent across countries and individuals, and independent of \mathbf{u}_{ij} . The random effects are not directly estimated as model parameters but are instead summarized according to the variance components. The random intercept can be seen as the combined effects of omitted country covariates that induce some respondents to be more compliant than others. In all specifications, it is assumed that \mathbf{u}_{ij} are independent across individual respondents and independent of the covariates and thus do not affect the probability of observing the individual outcome variables given the random intercept – strict exogeneity conditional on the random intercept (Rabe-Hesketh and Skrondal, 2012, Chapter 10).

$$y_{ij}^* = \mathbf{x}_{ij}\beta + \mathbf{w}_j\delta + \mathbf{u}_j + \epsilon_{ij} \tag{2}$$

with $i = 1 \dots I, j = 1 \dots J$

$$\text{and } y_{ij} = \begin{cases} 1 & \text{if } y_{ij}^* > 0 \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

To assess the level of correlation within clusters or countries, it can be derived the intra-class correlation or the variance partition coefficient. ρ is understood as the proportion of the variation that is explained by the hierarchical structure or country context. σ^2 is the variance of the random component \mathbf{u}_j and θ^2 the variance of the individual error term, which equals 1 in standard probit models. The ICC, calculated as follows, is reported for each estimation where applicable.

$$ICC = \rho = \frac{\sigma^2}{\sigma^2 + \theta^2} \tag{4}$$

Fig. 1 is a graphical representation of the country (random) effects. It is obtained by calculating the empirical Bayes predictions of the random effects in the null model with the main variables of interest on rank order with a 95% confidence interval. The caterpillar plots show that for a large number of countries, the 95% confidence interval does not overlap zero, which indicates that the likelihood of tax compliance is significantly above or below the average in these countries. Therefore, a nested model with consideration to both individual and country-level parameters appears to be an adequate estimation technique.

5. Empirical results and discussion

Table 2 reports the coefficient estimates of the baseline model, testing whether a higher level of sub-national taxing rights influences tax compliance norms of respondents in respective countries. In columns (1–2), sub-national taxing rights are first proxied by the *Tax Assignment Index*. In columns (3–4) and (5–6), the relevance of sub-national discretions over tax administration and the settings of tax rates is explored, and respectively proxied by the variables *Tax Administration Assignment* and *Tax Rate Assignment*.¹⁵ Negative and statistically significant coefficient estimates for these indicators suggest that, on average, tax compliance is lower in countries with a higher level of sub-national taxing rights or discretionary powers on tax rates and tax administration. In other terms, and all else equal, these indicators associate with a lower probability of citizens responding that they have never refused to pay taxes or fees to their respective governments.

¹⁵ See Appendix B for further details.

Table 2
Vertical taxing rights and tax compliance norms: Baseline Estimates

	Generalized Linear Mixed Model (GLMM-Probit)					
	Dependent Variable: Tax Compliance (binary)					
	(1)	(2)	(3)	(4)	(5)	(6)
Country-level						
Tax Assignment Index	-1.368*** (0.267)	-1.275** (0.520)				
Tax Administration Assignment			-0.974*** (0.332)	-0.857** (0.381)		
Tax Rate Assignment					-0.734** (0.371)	-0.436 (0.534)
Per Capita GDP (ln)		-0.343*** (0.117)		-0.368*** (0.113)		-0.385*** (0.118)
Individual-level						
Trust in Institutions		0.079*** (0.013)		0.079*** (0.013)		0.078*** (0.014)
Pro-Democracy		0.209*** (0.025)		0.208*** (0.025)		0.209*** (0.025)
Political Involvement		-0.805*** (0.069)		-0.805*** (0.069)		-0.805*** (0.069)
Perception of Redistribution		-0.075* (0.040)		-0.075* (0.040)		-0.075* (0.040)
Constant	1.569*** (0.092)	3.651** (1.435)	1.656*** (0.132)	4.278*** (1.190)	1.473*** (0.093)	4.656*** (1.364)
σ_2^2	0.190*** (0.041)	0.174*** (0.034)	0.198*** (0.044)	0.177*** (0.037)	0.216*** (0.044)	0.189*** (0.033)
N Respondents	39,556	39,556	39,556	39,556	39,556	39,556
N Countries	49	49	49	49	49	49
ICC	0.159	0.148	0.165	0.150	0.178	0.159
Log-likelihood	-12,321.684	-11,845.876	-12,322.760	-11,846.321	-12,324.725	-11,847.775
Country-level Controls	No	Yes	No	Yes	No	Yes
Individual-level Controls	No	Yes	No	Yes	No	Yes

Notes: This table presents the coefficient estimates of the baseline model, which assesses the influence of sub-national taxing rights and discretionary powers on the setting of tax rates and tax administration on tax compliance norms of individuals in 49 countries in Latin America and Sub-Saharan Africa. ICC refers to the intra-class correlation or the proportion of the total variance that is due to between-country differences. σ_2^2 refers to the variance of the random components (country-level). Additional country-level control variables include the WGI government effectiveness, ethnic fractionalization, country size, population density, and the share of labour tax and contributions in total commercial profits (a proxy for the tax burden at the country level). These are not reported due to their lack of statistical significance in the reported estimations. At the individual level, additional covariates include age, gender (male), education level, employment status, and religiosity. The coefficient estimates on age and lower education are respectively positive and negative and statistically significant, implying that older respondents tend to be more compliant, whereas respondents with an education level lower than post-secondary tend to be less compliant. Standard errors are robust-clustered at the country level. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The estimation results in [Table 2](#) indicate a negative relationship between sub-national taxing rights and tax compliance. Columns (3–4) zoom into sub-national involvement and discretion over tax administration. The coefficient estimates also suggest that the higher the lower-tier involvement in tax administration, the lower the probability of citizens stating that they have always complied with their taxes and fees. It must be noted that no country has a fully decentralized tax administration, even nominally federal countries such as Argentina or Brazil. Thus, a high score on the *Tax Administration Assignment* index does not imply the non-existence of a central and federal tax administration, but rather greater legal rights of sub-national authorities to set parameters and oversee enforcement and collection of tax revenues, perhaps in coordination with central authorities. The negative and statistically significant coefficient thus hints that granting a greater discretionary power on tax administration to lower-tier authorities might be detrimental to tax revenue mobilization. Columns (4–6) report the empirical results assessing the relevance of sub-national governments' involvement in the setting of tax rates, thus measured by the *Tax Rate Assignment*. While the coefficient estimates point to a negative correlation (as in [Table 1](#)), there is no statistically significant evidence that local and regional authorities' involvement in the setting of tax rates lowers compliance norms once other factors are accounted for in column (6). This latter result is consistent throughout the paper, suggesting that subnational discretion over tax rates might be of lesser concern to individual taxpayers.

At the individual level, trust in institutions and support for democracy appear to be positive drivers of tax compliance, as in previous publications ([Frey and Torgler, 2007](#); [Torgler, 2005b](#); [Torgler and Schneider, 2007](#); [Torgler et al., 2010](#)). On the other hand, political involvement and awareness weaken compliance norms. Counter-intuitively, the more positive the citizens' appraisal of the re-distributive system, the lower the tendency towards compliance. This finding is consistent throughout all estimations in this paper and suggests that, contrarily to conventional beliefs, residents in Latin America and Sub-Saharan Africa are less prone to pay their taxes when they believe that the government is already doing enough to help the most impoverished strata of the population. At the country-level, it is indicated that tax compliance tendencies are much lower in wealthier countries, as indicated by the coefficient estimate on per capita GDP – a finding that is in line with [Lago-Peñas and Lago-Peñas \(2010\)](#). The intra-class coefficients (ICC) suggest that close to 15% or more of the variation in the outcome variables is due to cross-country differences.

Sensitivity checks: Measurement approaches of vertical taxing rights

To test the sensitivity of these results to the measurements of sub-national taxing rights, two approaches are adopted. First, it is tested whether the results are sensitive to the selection of tax instruments in the construction of the key explanatory variables. Therefore, sub-national authorities' rights over the tax system, more broadly, and discretionary powers over tax administration and tax rates, are measured solely with respect to income (I), consumption (C) and property taxes (P), given that these latter three are the most common tax revenue sources across countries. The empirical estimates using these indicators (I,C,P) are reported in columns (1–3) of [Table A.2](#). Although the magnitudes of the coefficients have changed, the direction and statistical significance are in line with previous results.

Second, the specifications of [Table 2](#) are re-estimated using the indicators of sub-national taxing rights that are derived from the alternative scoring procedure described in [Vincent \(2020, Chapter 2\)](#). As previously argued, bundling local and regional-level governments into *sub-national governments* in the coding system might undermine the relevance of intermediate-level authorities in joint decisions with central and local authorities. Indicators from an alternative scoring procedure (see Appendix B) thus replace the ones from [Table 2](#). The results are reported in columns (4–6) of [Table A.2](#) and are consistent with previous findings.

Sensitivity checks: Within-country variations

While the survey data are nationally representative, compliance might vary based on the regional location of individual respondents. Therefore, the paper adopts a three-level hierarchical mixed-effects model to account for regional disparities within countries. As such, individual respondents are nested within their respective regions, denoted as r and within respective countries j ([Rabe-Hesketh and Skrondal, 2012](#)). In addition, the variables on political and social attitudes at the individual level are averaged at the regional level. This approach helps reduce the likelihood of bi-directional causality between these variables and individual answers on tax compliance. The results of the three-tiered specifications are reported in [Table 3](#), in which it is corroborated that the higher the sub-national discretion over the tax system or matters of tax administration, the lower the likelihood of tax compliance. To further check the sensitivity of these results to the measurements of subnational taxing rights, the models are also estimated with the indicators constructed with data for income, consumption and property taxes. The coefficient estimates for these latter are in line with the main results of [Table 2](#). It is noted that the regional tendencies of trust in institutions and perception of redistribution are no longer relevant, while coefficient estimates on regional support for democracy and political involvement remain statistically significant with respectively positive and negative linkage with compliance. As suggested by ICC₂ (regions), a sizeable share of the variation in the outcome variable is due to regional differences within countries; yet, accounting for such differences does not invalidate the main results.

Table 3

Vertical taxing rights and tax compliance: 3-level hierarchical model (country-region-individual).

	Generalized Linear Mixed Model (GLMM-Probit)					
	Dependent Variable: Tax Compliance (binary)					
	(1)	(2)	(3)	(4)	(5)	(6)
Country-level						
Tax Assignment Index	-1.282** (0.537)					
Tax Administration Assignment		-0.769* (0.411)				
Tax Rate Assignment			-0.467 (0.506)			
Tax Assignment Index (I,C,P)				-1.653*** (0.551)		
Tax Administration Assignment (I,C,P)					-0.864** (0.367)	
Tax Rate Assignment (I,C,P)						-1.096 (0.654)
Per Capita GDP (ln)	-0.275** (0.113)	-0.304*** (0.112)	-0.314*** (0.116)	-0.287*** (0.107)	-0.314*** (0.111)	-0.308*** (0.112)
Individual-level						
Trust in Institutions [̄]	0.084 (0.079)	0.087 (0.081)	0.076 (0.081)	0.083 (0.078)	0.088 (0.081)	0.074 (0.081)
Pro-Democracy [̄]	0.952*** (0.155)	0.931*** (0.153)	0.945*** (0.154)	0.940*** (0.153)	0.923*** (0.152)	0.949*** (0.154)
Political Involvement [̄]	-0.941*** (0.218)	-0.948*** (0.218)	-0.946*** (0.219)	-0.923*** (0.216)	-0.940*** (0.219)	-0.931*** (0.217)
Perception of Redistribution [̄]	-0.177 (0.187)	-0.180 (0.185)	-0.176 (0.185)	-0.192 (0.185)	-0.189 (0.182)	-0.184 (0.185)
Constant	2.494* (1.474)	3.248*** (1.212)	3.495** (1.383)	2.507* (1.365)	3.385*** (1.071)	3.078** (1.396)
σ_3^2	0.155*** (0.042)	0.162*** (0.046)	0.168*** (0.044)	0.146*** (0.041)	0.158*** (0.043)	0.159*** (0.042)
σ_2^2	0.112*** (0.015)	0.112*** (0.015)	0.112*** (0.015)	0.112*** (0.015)	0.112*** (0.015)	0.112*** (0.015)
N Respondents	39,556	39,556	39,556	39,556	39,556	39,556
N Countries	49	49	49	49	49	49
ICC ₃	0.122	0.127	0.131	0.116	0.124	0.125
ICC ₂	0.210	0.215	0.219	0.205	0.212	0.213
Log-likelihood	-11,959.476	-11,960.344	-11,961.405	-11,958.280	-11,959.545	-11,960.362
Country-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents the results from a 3-level GLMM hierarchical model. These estimates account for within-country variations. ICC refers to the intra-class correlation at level 3 (country) and level 2 (regions), respectively. σ_3^2 and σ_2^2 refer to the variance of the random components at the country (3) and regional (2) levels. (I,C,P) refers to the indicators that account solely for income, consumption, and property taxes. (*) implies that the indicator has been revised to account for the relevance of intermediate levels of government in joint decisions with central and local authorities. [̄] implies that these variables are averaged at the regional level within each country. Country-level control variables include the WGI government effectiveness, ethnic fractionalization, country size, population density, and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status, and religiosity. Standard errors are robust-clustered at the country level. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01.

Estimations with instrumental variables

While bi-directional causality between the main explanatory variables of interest (measured at the country level) and tax compliance (measured at the individual level) is to many extents unwarranted, it is acknowledged that the hierarchical model might be limited in establishing causality as the salience of individual non-compliance may have fostered changes in the multi-layer design of tax institutions in respective countries in recent years. Upon that consideration, the generalized mixed-effects probit estimation strategy is substituted by extended ordered probit regressions with instrumental variables (see for e.g. [StataCorp, 2021](#)).

The paper thus addresses the concerns of endogeneity by using two instrumental variables: the number of taxing layers and the geographical fragmentation index by [Canavire-Bacarreza et al. \(2017\)](#). First, while it is more common that all three tiers of government (central, regional, and local) are involved in fiscal matters in federal nations, intermediate-level authorities also enjoy some discretionary powers on tax matters in selected unitary countries, such as joining decision-making in the setting of tax rates or tax administration. It is thus expected that the number of taxing tiers would affect compliance through the level of discretion that such tiers have over the tax system, more broadly, or specific decision dimensions.

Table 4
Vertical taxing rights and tax compliance: Estimations with instrumental variables.

	Extended Probit with IV					
	Dependent Variable: Tax Compliance (binary)					
	(1)	(2)	(3)	(4)	(5)	(6)
Country-level						
Tax Assignment Index	-0.720*** (0.130)					
Tax Assignment Index (*)		-0.703*** (0.127)				
Tax Assignment Index (I,C,P)			-1.036*** (0.170)			
Tax Administration Assignment				-0.456*** (0.100)		
Tax Administration Assignment (*)					-0.445*** (0.098)	
Tax Administration Assignment (I,C,P)						-0.522*** (0.122)
First stage						
Number of taxing layers	0.144*** (0.001)	0.147*** (0.001)	0.110*** (0.001)	0.190*** (0.001)	0.195*** (0.001)	0.150*** (0.001)
Geographical Fragmentation Index	0.022*** (0.001)	0.021*** (0.001)	0.018*** (0.001)	0.013*** (0.001)	0.011*** (0.001)	0.026*** (0.001)
Constant	-0.222*** (0.003)	-0.224*** (0.003)	-0.174*** (0.003)	-0.135*** (0.004)	-0.138*** (0.004)	-0.156*** (0.005)
$\sigma_{\varepsilon_{ijc}}^2$	0.012*** (0.000)	0.012*** (0.000)	0.011*** (0.000)	0.015*** (0.000)	0.015*** (0.000)	0.020*** (0.000)
$corr(\varepsilon_{ijc}, \varepsilon_{ij})$	-0.008 (0.015)	-0.012 (0.015)	-0.005 (0.017)	-0.051*** (0.014)	-0.058*** (0.013)	-0.023 (0.018)
N Respondents	39,556	39,556	39,556	39,556	39,556	39,556
N Countries	49	49	49	49	49	49
Log-likelihood	19,362.731	18,759.144	21,510.608	14,553.704	14,334.214	8,614.310
Country-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents the results from endogenous probit estimations with instrumental variables. First-stage estimates are reported in the lower part of the table.(I,C,P) refers to the indicators that account solely for income, consumption and property taxes. (*) implies that the indicator has been revised to account for the relevance of intermediate levels of government in joint decisions with central and local authorities. Country-level control variables include the WGI government effectiveness per capita GDP, ethnic fractionalization, country size, population density and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status and religiosity, and other controls for socio-political attitudes. Standard errors are robust-clustered at the country level. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The second instrument – geographical fragmentation index (GFI) – stands as a measurement of spatial decay. It has long been argued that spatial decay fosters decentralization and decentralized provision of public services (see for e.g. Panizza, 1999; Arzaghi and Henderson, 2005; Canavire-Bacarreza et al., 2017). The GFI considers two important aspects of spatial decay: elevation and country size. The GFI conveys the weighted probability that two randomly sampled individuals in a given country do not live in similar altitude zones, with the weight matrix calculated as the average distance between altitudes. The index goes from zero, corresponding to a case where all the population is settled in the same altitude zone, to one, corresponding to the case where none of the population lives in the same altitude. The GFI thus increases with the number of altitude-zones and equal weight for each group. As established by Canavire-Bacarreza et al. (2017, 2020), the GFI is a key determinant for the level of fiscal decentralization. Given that level of sub-national taxing rights is an alternative measurement of fiscal decentralization (albeit from a legal and policy standpoint), it is argued to be a valid instrument for this paper as well.

The coefficient estimates from the models with instrumental variables are reported in Table 4. They robustly suggest that sub-national discretionary powers on tax matters, more broadly, and tax administration, more specifically, reduce compliance norms, independently of minor alteration in the measurement approach of the main explanatory variables. The test results for the correlation of the error terms – $corr(\varepsilon_{ijc}, \varepsilon_{ij})$ suggest that endogeneity is unwarranted in most specifications, except in columns (4–5).

Heterogeneous analyses

Besides testing the relevance of sub-national taxing rights or discretion on decision parameters, it is worth examining how such structure might yield different outcomes in different settings. The paper explores the heterogeneity in two ways: through countries' income status and the scarcity of tax knowledge in the immediate environment of individual respondents.

Table 5

Vertical taxing rights and tax compliance: low-income context and the relevance of tax knowledge.

	Generalized Linear Mixed Model (GLMM-Probit)			
	Dependent Variable: Tax Compliance (binary)			
	(1)	(2)	(3)	(4)
Country-level				
Tax Assignment Index	-1.411** (0.549)		2.449 (1.504)	
Tax Administration Assignment		-1.290*** (0.409)		1.445** (0.594)
Low Income Country (LIC)	-0.522** (0.246)	-0.703** (0.284)		
Tax Assignment Index * LIC	1.836 (1.876)			
Tax Administration Assignment * LIC		1.023 (0.931)		
Scarcity of Tax Knowledge (STK)			0.410 (0.294)	0.520 (0.277)
Tax Assignment Index * STK			-3.328* (1.836)	
Tax Administration Assignment * STK				-1.807*** (0.630)
Constant	4.814*** (1.780)	5.545*** (1.501)	3.657** (1.555)	3.657** (1.491)
σ_2^2	0.162*** (0.031)	0.158*** (0.034)	0.100*** (0.027)	0.098*** (0.027)
N Respondents	39,556	39,556	25,996	25,996
N Countries	49	49	31	31
ICC ₂	0.139	0.136	0.091	0.089
Log-likelihood	-11844.241	-11843.727	-5639.589	-5636.733
Country-level Controls	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes

Notes: This table presents the results testing the relevance of tax knowledge and low-income country context. ICC refers to the intra-class correlation or the proportion of the total variance that is due to between-country differences. σ_2^2 refers to the variance of the random components (country-level). (I,C,P) refers to the indicators that account solely for income, consumption and property taxes. (*) implies that the indicator has been revised to account for the relevance of intermediate levels of government in joint decisions with central and local authorities. Country-level control variables include the WGI government effectiveness, ethnic fractionalization, country size, population density and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status and religiosity. Standard errors are robust-clustered at the country level. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

First, [Section 3](#) of this paper discusses some of the inconveniences of a multi-layer tax structure, which may incite countries to opt for centralized tax institutions. These include, among others, dis-economies of scale in enforcement capacities, mis-coordination across tiers of government, which might create loopholes to be exploited by dishonest taxpayers. A complex tax administration overseen by multiple stakeholders might result in tax officials being unable to detect fraudulent behaviours and punish evaders, alongside higher compliance costs for firms and residents that must pay taxes in different regions or jurisdictions. It is also argued that in low-income countries, a partition of already scarce public resources into multiple tax units might lead to less efficient tax institutions. Given that most countries in the sample are developing and emerging economies, the data allow to test whether the marginal effects of sub-national taxing rights on tax compliance are exacerbated in countries classified as *low-income* (see [Table A.4](#)). It is done by interacting the main explanatory variables with a binary indicator for whether a respondent lives in a low-income country at the time of the survey. The income status of countries is retrieved from the World Bank classification for respective years.

Second, the availability and access to tax knowledge are essential for residents' tax compliance ([Eriksen and Fallan, 1996](#); [Saad, 2014](#)) and even more so in a complex system with multiple stakeholders and enforcement agencies. In a multi-layered tax structure or tax administration, the scarcity of tax knowledge can significantly increase compliance costs and create hurdles that dampen the taxpayers' willingness to pay. It is therefore expected that the lack of tax knowledge would play a mitigating role in how sub-national taxing rights and involvement in tax administration affect compliance. This is investigated by interacting the indicators measuring subnational taxing rights with a proxy that captures the scarcity in tax knowledge. This latter is derived from the Afrobarometer's question **Q70a** on the respondents' difficulty in finding out what taxes and fees to pay. The proxy is constructed in two stages: first, a binary indicator takes the value of 1 if the respondent finds it difficult to know which taxes and fees to pay; second, the binary indicator is averaged at the primary sampling unit or the enumeration area (EA), thereby conveying, not the individual, but the broader scarcity of tax knowledge within the residential location of each respondent.

Table 6

Vertical taxing rights and tax compliance: Institutional designs vs. Compliance costs.

	Generalized Linear Mixed Model (GLMM-Probit)			
	Dependent Variable: Tax Compliance (binary)			
	(1)	(2)	(3)	(4)
Country-level				
Tax Assignment Index	-1.231** (0.493)	-1.089* (0.604)		
Tax Administration Assignment			-0.848** (0.359)	-0.661* (0.397)
Number of Tax Payments	0.006 (0.004)		0.007 (0.004)	
Hours to pay taxes		-0.155 (0.155)		-0.235* (0.134)
Constant	3.138** (1.442)	2.647* (1.456)	3.695*** (1.192)	3.454*** (1.081)
σ_2^2	0.165*** (0.034)	0.216*** (0.050)	0.167*** (0.037)	0.217*** (0.054)
N Respondents	39,556	39,556	39,556	39,556
N Countries	49	49	49	49
ICC ₂		0.177		0.179
Log-likelihood	-11,844.707	-11,851.063	-11,845.049	-11,851.263
Country-level Controls	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes

Notes: This table presents the results testing the relevance of country-level compliance costs, proxied by the number of tax payments and total hours per year that businesses dedicate to pay taxes. ICC refers to the intra-class correlation or the proportion of the total variance that is due to between-country differences. σ_2^2 refers to the variance of the random components (country-level). Country-level control variables include the WGI government effectiveness, per capita GDP (ln), ethnic fractionalization, country size, population density, and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status, and religiosity. Standard errors are robust-clustered at the country level. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01.

The coefficient estimates of these heterogeneous analyses are reported in Table 5, which conveys the reinforcing or moderating effects of residing in a low-income country or having limited access to tax knowledge. Columns (1–2) of Table 5 suggest that the tendency towards non-compliance is statistically significant in low-income countries; however, there is no reinforcing effect of such location on the probability of non-compliance, as indicated by the lack of statistical significance of the interaction terms for both the *Tax Assignment Index* and the *Tax Administration Assignment*. Columns (3–4) of Table 5 point to the reinforcing effects of the scarcity of tax knowledge which tends to exacerbate the negative effects of subnational taxing rights on tax compliance, especially with subnational discretion over tax administration (column 4). All else equal, scarcity of tax knowledge combined with a higher sub-national discretion over the tax system, more broadly, and tax administration, in particular, weakens the willingness to pay.

Institutional design versus compliance costs

As discussed in previous sections, one of the most unwanted consequences of a complex tax structure is the rise in compliance costs for taxpayers. The multiplicity of regulatory forms to be filled, the number of hours dedicated to abiding by the rules of different tax authorities could induce hurdles that undermine any taxpayer's voluntary compliance. Previous results consistently suggest a negative effect of subnational governments' taxing rights and subnational discretion on tax administration on compliance. It is worth investigating further if these adverse effects are, in fact, due to the institutional design of multi-level tax institutions, or whether indicators that capture compliance costs at the country level could trump the relevance of multi-level tax arrangements. This issue is investigated by relying on the World Bank Doing Business Index Surveys which provide country-level estimates on the total number of taxes paid by businesses including electronic filing, and the total number of hours it takes per year to prepare, file, and pay (or withhold) three major types of taxes (corporate income tax, value-added tax and the labour tax). Although these variables are operationalised with firm-level survey data, they convey the broader challenges towards paying taxes in respective countries. As for other country-level parameters, these proxies for country-level compliance costs are also averaged over three years – the year of the data collection and two years preceding the survey, thus allowing to capture the broader cross-country variation in compliance costs and not year-based estimates.

The results are reported in Table 6. The coefficient estimates suggest that the number of tax payments and the total hours spent in filling for taxes, although slightly relevant given the changes in the magnitude of coefficient estimates (comparison of Table 2 and Table 6), do not trump the relevance of the institutional design *per se*. Despite these proxies of compliance costs, sub-national taxing rights, more broadly, and discretion over tax administration, remain negative in their effects on

tax compliance. While this paper acknowledges the limitations of matching indicators from business surveys with individual data, and the fact that compliance costs might be inadequately operationalised, the findings of Table 6 suggest that besides compliance costs, there might be other factors embedded in the design of multi-level tax arrangements that contribute to lower compliance norms in selected countries. As previously discussed, there is, to date, a paucity of theoretical frameworks regarding tax compliance in multi-level tax institutions, which needs to be addressed by future research.

Further Sensitivity Analyses

An additional sensitivity check is performed by considering an alternative outcome variable. It is derived from Question Q26E of the Afrobarometer Survey, and Question P51ST.B of the LatinoBarómetro on whether a respondent believes that “Citizens should pay taxes in a democracy”. Using this alternative way of measure tax compliance norms, two estimations strategies are adopted: the baseline model (GLMM) and the extended probit with instrumental variables. The results, reported in Table A.3, are in line with previous findings. The higher the level of sub-national taxing rights or discretion over tax administration, the lower the likelihood of respondents agreeing with the statement that “citizens should pay taxes in a democracy”.

6. Conclusion

This paper investigated how multi-level tax arrangements shape tax compliance norms, using individual survey data for 49 Latin American and African countries, and new indicators measuring sub-national taxing rights and sub-national governments' discretion over tax rates and tax administration. The empirical estimations focus on developing and emerging economies where tax non-compliance remains a significant policy challenge, and undermines governments' ability to provide essential public goods and services. The paper bridges the fiscal federalism and tax compliance literature and argues for the consideration of inter-governmental tax arrangements in attempts to understand tax compliance. To date, the theoretical and empirical research on compliance is dominated by frameworks in which the taxpayer-government relationship is regarded as bilateral; however, in practice, taxpayers often have multiple payment obligations and towards more than one tier of government. Thus, as with any other form of institutional arrangements, it is expected that the multi-layer tax structure and the assignment of taxing rights to lower-tier authorities would influence tax compliance norms and behaviours by, for instance, enhancing the fiscal exchange between the state and residents, enhancing the monitoring and tracking down of dishonest taxpayers or, reversely, increasing compliance costs for taxpayers who deal with multiple procedures.

The contributions of the paper are threefold. First, it identifies some channels through which such institutional arrangements could shape compliance norms and behaviours. Considering tax compliance as the ultimate aim, the analytical framework builds upon the pro- and con- arguments for having decentralized tax institutions. Second, it assesses how different dimensions of the multi-layer tax structure, such as sub-national authorities' discretion over tax administration or tax rates, or their discretion over major tax revenue instruments (i.e., income, consumption and property taxes), influence the likelihood of citizens refusing to pay their dues to the government. Third, it provides heterogeneous analyses by zooming into factors that might play a mitigating role in how such institutional design may affect compliance.

The paper adopts a generalized linear mixed effects model with probit estimation as the primary empirical strategy. The findings confirm the overarching hypothesis that inter-governmental tax arrangements matter for understanding tax compliance norms. More specifically, they indicate that the higher the level of taxing rights of sub-national authorities or discretion over tax administration, the lower the tendency towards compliance, whereas sub-national discretion over tax rates matters to a lesser extent. Exploring different contextual parameters, the paper finds subjective evidence that the scarcity of tax knowledge exacerbates the negative effects of sub-national taxing rights or discretion over tax administration on tax compliance. While compliance costs at the national level – proxied by the total number of tax payments and the number of hours spent in filling taxes from nationally comparable databases – appear to matter slightly, they do not trump the relevance of the core institutional design. It is thus concluded that the reported adverse effects are due to more features and parameters embedded in the design of multi-layer tax institutions, most of which remain to be investigated, both theoretically and empirically. Apart from the main variables of interest, the results suggest that trust in public institutions and support for democracy at the individual level tend to increase compliance tendencies, whereas political involvement and a positive appraisal of the redistribution system tend to lower them. At the country-level, it is also noted that residents of wealthier countries are less compliant than those in poorer ones. The results are robust to multiple specifications, including consideration to within-country disparities and the use of instrumental variables to address potential endogeneity issues.

There remain numerous other channels through which inter-governmental tax institutions could impact on tax compliance. Such channels are not explored in this paper, either due to the absence of well-established theoretical frameworks or a lack of data. Going forward, possible avenues for research might include using administrative data on compliance with local and national tax offices in contexts of limited coordination. Future research endeavours could also involve laboratory and field experiments to test whether compliance with local taxes spillovers to national taxes and vice-versa, all the while using the empirical results of this paper as stylized facts and testing the above postulates in controlled environments.

Declaration of Competing Interest

The author declares no conflicting interest.

Appendix A

Table A.1

List of variables and data sources.

Variables	Description & Data Sources
Tax Assignment Index	Sub-national Taxing Rights. Data Source: Author's (Vincent, 2020)
Tax Assignment Index (*)	Sub-national Taxing Rights (*). Data Source: Author's (Vincent, 2020)
Tax Administration Assignment	Sub-national Discretion over Tax Administration. Data Source: Author's (Vincent, 2020)
Tax Administration Assignment (*)	Sub-national Discretion over Tax Administration (*). Data Source: Author's (Vincent, 2020)
Tax Rate Assignment	Sub-national Discretion over Tax Rate. Data Source: Author's
Tax Rate Assignment (*)	Sub-national Discretion over Tax Rate (*). Data Source: Author's (Vincent, 2020)
Tax Assignment Index (I,C,P)	Sub-national Taxing Rights (Income, Consumption, Property). Data Source: Author's (Vincent, 2020)
Tax Administration Assignment (I,C,P)	Sub-national Discretion over Tax Administration (Income, Consumption, Property). Data Source: Author's (Vincent, 2020)
Tax Rate Assignment (I,C,P)	Sub-national Discretion over Tax Rate (Income, Consumption, Property). Data Source: Author's (Vincent, 2020)
Per Capita GDP (ln)	Per Capita GDP (natural logarithm). Data Source: World Development Indicators
Area (ln)	Country size in km ² . Data Source: World Development Indicators
Population Density	Population size per km ² . Data Source: World Development Indicators
WGI Government Effectiveness	World Governance Indicators - Government Effectiveness Data Source: World Governance Indicators
Ethnic fractionalization	Ethnic fractionalization Data Source: Quality of Government Dataset
Low-Income Country	Low-income countries (World Bank Classification 2016). Data Source: World Development Indicators
Share of Labour Tax and Contributions	Labor tax and contributions (% of commercial profits). Data Source: World Development Indicators
Hours to Pay Taxes	Total number of hours per year it takes to prepare, file, and pay (or withhold) three major types of taxes: the corporate income tax, the value-added or sales tax, and labour taxes, including payroll taxes and social security contributions. Data Source: World Development Indicators
Number of Tax Payments	The total number of taxes paid by businesses, including electronic filing. Data Source: World Development Indicators
Tax Compliance (binary)	If a respondent has never refused to pay taxes or fees to his/her government. Data Source: Afrobarometer; Latinobarómetro
Citizens should pay taxes	If a respondent reports to believe that citizens should pay taxes in a democracy. Data Source: Afrobarometer; Latinobarómetro
Age (ln)	Age of the respondent (in natural logarithm). Data Source: Afrobarometer; Latinobarómetro
Gender	Gender of the respondent (1=male; 0=female). Data Source: Afrobarometer; Latinobarómetro
Education	Education level of the respondent (categorical). Data Source: Afrobarometer; Latinobarómetro
Employment Status	Respondent is employed at the time of the survey. Data Source: Afrobarometer; Latinobarómetro
Religiosity	Respondent adheres to a religious group or a religious assembly. Data Source: Afrobarometer; Latinobarómetro
Perception of Redistribution	Respondent positively views the current redistributive system. Data Source: Afrobarometer; Latinobarómetro
Trust in Institutions	Composite variable of trust in institutions. Data Source: Afrobarometer; Latinobarómetro
Pro-Democracy	Respondent supports democracy (democracy is preferable). Data Source: Afrobarometer; Latinobarómetro
Political Involvement	Composite variable of political involvement. Data Source: Afrobarometer; Latinobarómetro
Number of taxing tiers	Number of layers of government with taxing rights. Data Source: Author's (Vincent, 2020)
Geographic Fragmentation Index (GFI)	Indicator measuring spatial decay. Data Source: Canavire-Bacarreza et al. (2017, 2020)
Trust in Institutions [̄]	Regional average of the composite indicator of trust in institutions. Data Source: Afrobarometer; Latinobarómetro
Pro-Democracy [̄]	Regional average of respondents that support democracy. Data Source: Afrobarometer; Latinobarómetro
Political Involvement [̄]	Regional average of the composite indicator on political involvement. Data Source: Afrobarometer; Latinobarómetro
Perception of Redistribution [̄]	Regional average of respondents that positively appraise the redistribution system. Data Source: Afrobarometer; Latinobarómetro
Scarcity of Tax Knowledge [̄]	Regional average of the number of respondents with scarcity in tax knowledge. Data Source: Afrobarometer

Notes: (I,C,P) refers to the indicators that account solely for income, consumption and property taxes. (*) implies that the indicator has been revised to account for the relevance of the intermediate level of governments in joint decisions with central and local authorities. [̄] implies that these variables are averaged at the regional level (or enumeration areas).

Table A.2
Vertical taxing rights and tax compliance: Sensitivity checks on baseline results

	Generalized Linear Mixed Model (GLMM-Probit)					
	Dependent Variable: Tax Compliance (binary)					
	(1)	(2)	(3)	(4)	(5)	(6)
Country-level						
Tax Assignment Index (I,C,P)	-1.651*** (0.545)					
Tax Administration Assignment (I,C,P)		-0.939*** (0.328)				
Tax Rate Assignment (I,C,P)			-1.012 (0.677)			
Tax Assignment Index (*)				-1.272** (0.507)		
Tax Administration Assignment (*)					-0.870** (0.373)	
Tax Rate Assignment (*)						-0.470 (0.521)
Per Capita GDP (ln)	-0.356*** (0.109)	-0.379*** (0.110)	-0.380*** (0.114)	-0.342*** (0.116)	-0.367*** (0.112)	-0.383*** (0.118)
Individual-level						
Trust in Institutions	0.078*** (0.013)	0.079*** (0.013)	0.078*** (0.014)	0.079*** (0.013)	0.079*** (0.013)	0.078*** (0.014)
Pro-Democracy	0.209*** (0.025)	0.208*** (0.025)	0.209*** (0.025)	0.209*** (0.025)	0.208*** (0.025)	0.209*** (0.025)
Political Involvement	-0.805*** (0.069)	-0.805*** (0.069)	-0.805*** (0.069)	-0.805*** (0.069)	-0.805*** (0.069)	-0.805*** (0.069)
Perception of Redistribution	-0.075* (0.039)	-0.075* (0.039)	-0.075* (0.039)	-0.075* (0.040)	-0.075* (0.040)	-0.075* (0.040)
Constant	3.668*** (1.355)	4.446*** (1.062)	4.296*** (1.389)	3.637** (1.431)	4.252*** (1.184)	4.609*** (1.360)
σ_2^2	0.166*** (0.033)	0.171*** (0.035)	0.182*** (0.032)	0.173*** (0.034)	0.176*** (0.037)	0.188*** (0.033)
N Respondents	39,556	39,556	39,556	39,556	39,556	39,556
N Countries	49	49	49	49	49	49
ICC	0.142	0.146	0.154	0.147	0.149	0.158
Log-likelihood	-11,844.752	-11,845.470	-11,846.942	-11,845.776	-11,846.183	-11,847.705
Country-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents the results of sensitivity checks run on the baseline model. The sub-national taxing rights indicators, ending with (I,C,P), refer to the ones that are solely constructed with data for income, consumption and property taxes as those are the most common tax instruments across countries. Alternatively, (*) implies that the main versions of the sub-national taxing rights indicators were revised to account for the relevance of intermediate-level governments in joint decisions with central and local authorities. More details on the alternative scoring techniques can be found in the appendix or in Vincent (2020). ICC refers to the proportion of the total variance that is due to between-country differences. Country-level control variables include the WGI government effectiveness, ethnic fractionalization, country size, population density and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status and religiosity. Results on controls, including age and education, are similar to chap4:tab:tab1. Standard errors are robust-clustered at the country level. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3

Vertical taxing rights and tax compliance: Estimations with alternative outcome variable.

	GLMM Probit Extended Probit with IV			
	Dependent Variable: Citizens should pay taxes in a democracy			
	(1)	(2)	(3)	(4)
Country-level				
Tax Assignment Index	-1.273** (0.532)		-0.870*** (0.101)	
Tax Administration Assignment		-0.845** (0.386)		-0.488*** (0.075)
Constant	2.616** (1.171)	3.249*** (1.020)	2.210*** (0.167)	2.833*** (0.152)
σ_2^2	0.171*** (0.035)	0.175*** (0.039)		
First-stage				
Number of taxing layers			0.144*** (0.001)	0.190*** (0.001)
Geographical Fragmentation Index			0.022*** (0.001)	0.014*** (0.001)
Constant			-0.222*** (0.003)	-0.138*** (0.004)
$\sigma_{\varepsilon_{ijc}}^2$			0.012*** (0.000)	0.015*** (0.000)
$corr(\varepsilon_{ijc}, \varepsilon_{ij})$			-0.029*** (0.011)	-0.046*** (0.011)
N Respondents	39,268	39,268	39,268	39,268
N Countries	49	49		
ICC ₂	0.146	0.149		
Log-likelihood	-20,911.617	-20,912.121	9,433.511	4,680.152
Country-level Controls	Yes	Yes	Yes	Yes
Individual-level Controls	Yes	Yes	Yes	Yes

Notes: This table presents the results from using an alternative outcome variable to measure compliance norms, and using GLMM and endogenous probit estimations with instrumental variables techniques. First-stage estimates are reported in the lower part of the table. Country-level control variables include the WGI government effectiveness per capita GDP, ethnic fractionalization, country size, population density and the share of labour tax and contributions in total commercial profits. Individual-level controls include age, gender (male), education level, employment status and religiosity and other controls for socio-political attitudes'. Standard errors are robust-clustered at the country level. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4
Country List

Country	ISO3C	Observations	Low-income	Survey Data Source
Algeria	DZA	552	No	Afrobarometer
Argentina	ARG	874	No	Latinobarómetro
Benin	BEN	769	Yes	Afrobarometer
Bolivia	BOL	774	No	Latinobarómetro
Botswana	BWA	705	No	Afrobarometer
Brazil	BRA	814	No	Latinobarómetro
Burkina Faso	BFA	702	Yes	Afrobarometer
Burundi	BDI	784	Yes	Afrobarometer
Cameroon	CMR	681	No	Afrobarometer
Cape Verde	CPV	514	No	Afrobarometer
Chile	CHL	571	No	Latinobarómetro
Colombia	COL	941	No	Latinobarómetro
Costa-Rica	CRI	687	No	Latinobarómetro
Côte d'Ivoire	CIV	794	No	Afrobarometer
Dominican Republic	DOM	769	No	Latinobarómetro
Ecuador	ECU	901	No	Latinobarómetro
El Salvador	SLV	679	No	Latinobarómetro
Gabon	GAB	743	No	Afrobarometer
Ghana	GHA	1199	No	Afrobarometer
Guatemala	GTM	563	No	Latinobarómetro
Guinea	GIN	758	Yes	Afrobarometer
Honduras	HND	646	No	Latinobarómetro
Kenya	KEN	1239	No	Afrobarometer
Lesotho	LSO	488	No	Afrobarometer
Liberia	LBR	668	Yes	Afrobarometer
Madagascar	MDG	725	Yes	Afrobarometer
Malawi	MWI	1384	Yes	Afrobarometer
Mali	MLI	1023	Yes	Afrobarometer
Mauritius	MUS	795	No	Afrobarometer
Mexico	MEX	934	No	Latinobarómetro
Mozambique	MOZ	754	Yes	Afrobarometer
Namibia	NAM	661	No	Afrobarometer
Nicaragua	NIC	596	No	Latinobarómetro
Niger	NER	810	Yes	Afrobarometer
Nigeria	NGA	1360	No	Afrobarometer
Panama	PAN	625	No	Latinobarómetro
Paraguay	PRY	926	No	Latinobarómetro
Peru	PER	835	No	Latinobarómetro
Senegal	SEN	731	No	Afrobarometer
Sierra Leone	SLE	509	Yes	Afrobarometer
South Africa	ZAF	1311	No	Afrobarometer
Tanzania	TZA	1048	Yes	Afrobarometer
Togo	TGO	679	Yes	Afrobarometer
Tunisia	TUN	791	No	Afrobarometer
Uganda	UGA	1013	Yes	Afrobarometer
Uruguay	URY	576	No	Latinobarómetro
Venezuela	VEN	849	No	Latinobarómetro
Zambia	ZMB	573	No	Afrobarometer
Zimbabwe	ZWE	1233	No	Afrobarometer

Table A.5
Summary statistics.

Variables	N	Mean	SD	Min	Max
Tax Assignment Index	39,556	0.154	0.145	0	0.64
Tax Assignment Index (*)	39,556	0.156	0.147	0	0.65
Tax Assignment Index (I,C,P)	39,556	0.117	0.127	0	0.70
Tax Administration Assignment	39,556	0.305	0.175	0	0.71
Tax Administration Assignment (*)	39,556	0.308	0.178	0	0.73
Tax Administration Assignment (I,C,P)	39,556	0.248	0.174	0	0.71
Tax Rate Assignment	39,556	0.148	0.152	0	0.63
Tax Rate Assignment (*)	39,556	0.151	0.156	0	0.64
Tax Rate Assignment (I,C,P)	39,556	0.100	0.124	0	0.64
Per Capita GDP (ln)	39,556	8.587	0.999	6.65	10.03
Government Effectiveness	39,556	-0.465	0.562	-1.33	1.09
Ethnic Fractionalization	39,556	0.589	0.228	0.04	0.93
Area (ln)	39,556	12.620	1.542	7.62	15.94
Population Density	39,556	92.464	109.741	2.86	622.40
Labour tax and contributions % commercial profits	39,556	16.502	9.363	0	39.80
Low-income country	39,556	0.294	0.456	0	1
Hours to pay taxes (ln)	39,556	5.668	0.534	4.95	7.79
Number of Tax Payments	39,556	31.781	17.600	6	70
Tax Compliance (binary)	39,556	0.89	0.31	0	1
Citizen should pay taxes	39,268	0.70	0.46	0	1
Age(ln)	39,556	3.57	0.39	2.77	4.63
Gender (male=1)	39,556	0.52	0.50	0	1
Education==no formal education	39,556	0.14	0.35	0	1
Education==primary education	39,556	0.28	0.45	0	1
Education==secondary education	39,556	0.40	0.49	0	1
Employment	39,556	0.46	0.50	0	1
Religiosity	39,556	0.38	0.49	0	1
Trust in Institutions	39,556	2.19	1.14	0	4.27
Pro-Democracy	39,556	0.73	0.45	0	1
Political Involvement	39,556	0.51	0.32	0	1.02
Perception of Redistribution	39,556	0.23	0.42	0	1
Number of Taxing Layers	39,556	2.08	0.65	1	3
Geographical Fragmentation Index	39,556	3.51	0.41	1.57	3.84
Trust in Institutions [̄]	39,556	2.19	0.78	0.31	3.90
Pro-Democracy [̄]	39,556	0.71	0.16	0.15	1
Political Involvement [̄]	39,556	0.49	0.13	0.05	0.85
Perception of Redistribution [̄]	39,556	0.23	0.14	0	1
Scarcity of Tax Knowledge [̄]	25,996	0.43	0.19	0.03	0.91
N	39,556				

Notes: (I,C,P) refers to the indicators that account solely for income, consumption and property taxes. (*) implies that the indicator has been revised to account for the relevance of the intermediate level of governments in joint decisions with central and local authorities. [̄] implies that these variables are averaged at the regional level (or enumeration areas).

Appendix B

The Tax and Revenue Assignment Dataset

The Tax and Revenue Assignment dataset was built through in-depth reviews of more than two thousand documents that inform on the discretionary power of government layers over tax instruments across more than one hundred countries. The primary sources of information are summarized in table Table B.3. In the coding process, legal documents and official policy reports took precedence over scientific and grey publications. While it is acknowledged that the legal provisions may not be reflected in practice, they best reflect the constitutional and legal rights of each government tier and the extended possibilities of claiming those rights.

The legal texts include the constitution, the tax codes, statutes, laws and decrees on local public finance, the local government acts, the national budget laws, most of which were collected from the online and on-site libraries, websites of public institutions (e.g. National Assembly, Ministry of Interior, Ministry of Finance, Local Government Associations) and third-party entities (e.g. UN agencies, CELAC, World Bank, IMF, OECD, the African Union). The legal information is complemented with decentralization policy documents, reports on territorial and public administration reforms, national development plans or strategy documents, public financial reports, local public administration reports, and academic and grey publications. Academic and grey publications were gathered from major literature databases. These include Google Scholar, Scopus, Web of Science, EconLit, with using, on the one hand, the *country names*, and on the other keywords related to public finance struc-

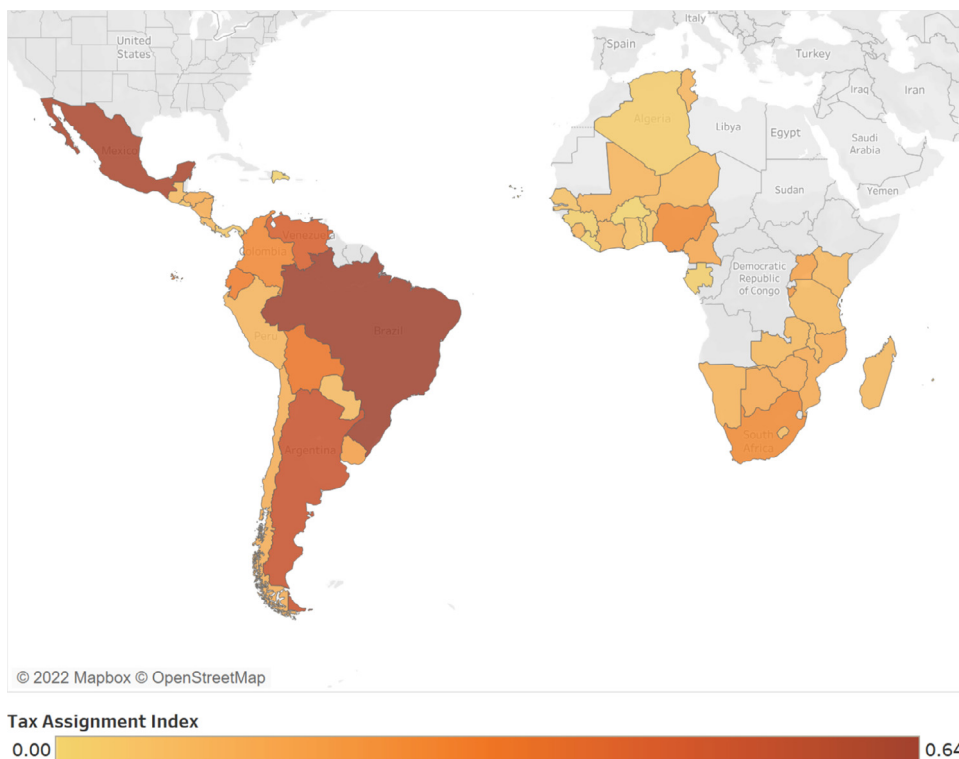


Fig. B.1. Discretionary Power of Sub-National Governments over the Tax System (the Tax Assignment Index) for Country Sample. This figure displays the tax assignment index - the primary proxy for measuring sub-national governments' overall discretion over the tax system - for selected countries (see for e.g. Vincent, 2020).

Table B.1
Main scoring procedure.

	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
C: Central I: Intermediate L: Local																
<i>Country Name</i>																<i>0.22</i>
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 Decentralisation Indicators

ture such as *tax code*, *taxing powers*, *local taxation*, *local revenue*, *tax decentralization*, *fiscal decentralization*, *tax assignment*. The gathered information is triangulated with archives of the International Bureau of Fiscal Documentation. The IBFD traces fiscal reforms and fiscal changes in most countries. Its archives include news (announcements of new reforms), scientific publications as well as technical reports compiled by tax experts at the country level. The archives provide very detailed information on changes in the tax structure or policies in a timely manner and have previously been used in the construction of other tax-related databases (see for e.g. Amaglobeli et al., 2018).

The dataset was constructed in four steps. The first step consisted of gathering information from various legal texts, policy documents, archives, scientific and grey literature that inform on the discretionary power of each government tier over key tax revenue instruments in each country and across four decision components. A systematic referencing system was developed to track and record all legal information from these sources. The second step consisted of coding a matrix for each country. The matrix, described in Table B.1 and Table B.2, includes the most commonly identified tax revenue instruments.

Table B.2
Alternative scoring procedure.

	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
C: Central I: Intermediate L: Local																
<i>Country Name</i>															<i>0.23</i>	
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 Decentralisation Indicators

Table B.3
Primary sources of information.

Legal Provisions	Tax Codes, Local Government Acts, Laws and Decrees on Local Public Finances and Taxation, Constitutions
Archives and Policy Documents	International Bureau of Fiscal Documentation, Decentralization Policy document, Territorial and Public Administration reforms documents, Development Strategies, Public Finance Reports, Regional and Local Councils Reports
Scientific publications and Grey literature	Peer-reviewed publications, edited volumes, working papers, multilateral organisations 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

For each tax instrument, the discretionary power of all government layers is coded according to the legal provisions and rules that define the governance of the tax system. The third step consisted in checking the accuracy of the collected information by comparing information sources and by contacting country experts and tax institutions for feedback on specific countries. In the fourth and final step, the information is aggregated using the methodology described above as to generate comparable indicators for analytical purposes. These steps are repeated whenever new documents or information from reliable sources are collected. The resulting indicators are also compared with existing sources on fiscal or tax autonomy from comparable databases (e.g. OECD tax autonomy or the Regional Authority Index). These comparisons provide confidence in the construction process and help to identify remaining gaps to be addressed in future research.

Given the cross-sectional nature of this first edition, the validity of the collected information is limited to the time period of 2010 to 2017. While seven years might seem extended, countries rarely change their intergovernmental fiscal structure, especially concerning tax and revenue instruments. The tax system is regulated by legal texts and therefore has a long-lasting nature. As a result, the aggregated indicators do not vary much in time, even when minor changes in one tax instrument are added. If a reform occurred between 2010 and 2017, the final coding reflects the latest structure. Indicators from this database have also been previously used in [Konte and Vincent \(2021\)](#). Further information on the database can be found in [Vincent \(2020, Chapter 2\)](#) and from this [website](#).

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