Tax Assignment:
A Helping or a Grabbing Hand?*

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Abstract

Contributions to the second generation theory of fiscal federalism posit that lower-tier governments are inclined to promote private sector development when they capture a large portion of revenues generated by economic activities within their jurisdictions. So far, however, empirical evidence to support these claims is scattered and that partly due to the lack of comparative and cross-country information on intergovernmental tax arrangements. This paper draws from our newly constructed dataset on tax assignment and proposes an empirical analysis linking the multi-layer tax structure to reported fiscal burden of enterprises in a large number of developing and emerging economies. From the new dataset are derived several indicators which capture the decision-making power of all government tiers over significant tax instruments and across several obligations such as the setting of tax rates or tax administration. The empirical strategy is centred around a multi-level logistic regression model with firm-level data nested in country context while controlling for firms and countries heterogeneous characteristics. The results indicate that enterprises in countries with a higher degree of tax assignment or tax decentralisation do perceive a higher burden of the tax structure on their business operations. The findings are robust to the use of longitudinal firm-level data and alternative measurement of the fiscal burden on the private sector.

Keywords: Tax Structure; Fiscal Federalism; Fiscal Burden; Business Operations

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1 Introduction

In recent decades, developing and emerging economies have experienced a trend towards decentralising their public sector. At the core of these reforms are scholars of the new institutional economics which posit good governance as the foundation of economic prosperity. By devolving power and responsibilities to lower-tier governments, decentralisation is argued to promote efficiency and public accountability which are crucial for private market development.

The recent prominence of these reforms contributed to reviving the theoretical debate on fiscal decentralisation, starting with early contributions on the informal gains of decentralisation and the benefits of inter-jurisdictional competition (Hayek, 1948; Tiebout, 1956, 1961; Musgrave, 1969) to more recent inputs on the role of incentives embedded in intergovernmental fiscal institutions and the resulting behaviours of different groups of stakeholders (Qian and Weingast, 1997; Weingast, 2009, 2014, 1995; Oates, 2005; Montinola et al., 1995; Jin et al., 2005). This latter part of the debate gave birth to what is known as the second generation theory of fiscal federalism (hereafter SGFF).

Since Musgrave (1983) *"Who should tax, where, and what"*, tax and revenue assignment in multi-layer governments has been a core subject in the intergovernmental fiscal relations literature. While some denote the benefits of tax sharing and inter-jurisdictional tax competition[1], sceptics point out the potential threats of disintegrated economic space, race to the bottom, and fiscal erosion (Ferreira et al., 2005; Shah, 2004; Feld and Schnellenbach, 2011; Prud'Homme, 1995; Rodden, 2006).[2]

The SGFF has furthered the debate on tax and revenue assignment by drawing attention to its incentivising effects on lower-tier governments. According to this literature strand, local authorities are inclined to promote private sector development when they control a large portion of revenues generated by economic activities within their jurisdictions (Weingast, 1995, 2009; Oates, 2005; Jin et al., 2005). As competition creates incentives for credible market-based commitments, tax assignment implies that local governments would display less predatory behaviours when their interest is tied to local economic prosperity.

Adherents to this strand often depict China as a success model where the incentives generated by the fiscal contract system in the 1980s appear to have created a basis for the country's remarkable economic success (Jin et al., 2005; Zhang and Zou, 1998; Montinola et al., 1995; Oi, 1992). Thus, while there remains inconclusive evidence on the impact of decentralisation policies[3], these authors hint that a positive outcome might be through the

[1] Tiebout (1961), Musgrave (1969), Rodden (2004), among others, have argued that appropriate tax and expenditure assignment to different government layers are essential for capturing the benefits of decentralisation and disciplining lower-tier governments

[2] According to Bird (2010, 1999), the intergovernmental tax structure mostly reflects the sceptics arguments as illustrated by the limited decision-making power of lower-tier governments over tax and revenue instruments

[3] Empirical evidence on the impact of decentralisation policies remains inconclusive (Davoodi and Zou, 1998; Shah, 2004; Feld and Schnellenbach, 2011)

intergovernmental tax and revenue arrangements which incite lower-tier governments to devise or implement policies that are conducive to economic prosperity. There remains, however, a lack of empirical evidence to support these claims(Rodden and Rose-Ackerman, 1997; Garzarelli, 2004). To date, the literature linking tax and revenue assignment to local economic prosperity or firm-level outcome is sparse and based on case studies such as China and Russia (Jin et al., 2005; Zhuravskaya, 2000; Yang, 2016; Qian and Weingast, 1996).

Most importantly, exploring any potential causal link requires a good understanding of tax assignment and the intergovernmental fiscal structure within and across countries. Conventional indicators of fiscal decentralisation do not inform on the vertical structure of decision-making in tax and fiscal matters (Stegarescu, 2005; Oecd, 1999). These elements are however crucial in the debate about fiscal incentives, fiscal competition and strategic responses of stakeholders – such as local authorities.

This paper revisits these theoretical arguments and investigates whether tax assignment is associated with a lower fiscal burden on private business operations in a sample of developing and emerging economies. The paper is the first to use a novel dataset on tax and revenue assignment, created with the aim of filling the void of empirical evidence on tax arrangements in multi-layer governments. The dataset provides a comprehensive picture of each tier discretionary power over important tax instruments (such as income, property or value-added tax) and across several obligations (tax rates or tax administration). The dataset allows for the construction of several indicators which are representative of cross-country differences in the multi-layer tax structure. To these new data, we align the World Bank Enterprises Surveys which inform on the financial and administrative burden of the tax structure on private business operations in developing and emerging economies. With these sources, we ask the following question: ***"Is tax assignment associated with a favourable climate for private enterprises?"***

The results suggest that the greater the subnational control over the fiscal space, the higher the likelihood of firms reporting the tax rates and tax administration as obstacles to their business operations. Zooming into different components of tax assignment, the findings indicate that the tax rates assignment – subnational control over the setting of taxes – negatively impacts business operations, whereas the tax administration assignment– or the subnational control over the tax administration does not have a significant effect on the enterprises.

Comparing the enterprises in two countries with *similar* level of tax assignment, the estimates show that the fiscal burden is much higher in the country with the greater ratio of subnational tax revenues in total tax revenues. This suggests that the greater the subnational control over lucrative tax bases, the greater the burden on private business operations. These results therefore contrast with the SGFF claim on the likely positive incentivising effect of tax assignment on the favourable business climate for private enterprises. It is worth noting

that these results are robust to the use of the traditional measures of tax decentralisation, longitudinal analysis and the use of other proxies for the outcome variables.

Besides contributing to the recent intergovernmental fiscal relations literature, this paper also adds to the academic debate on the effects of complex institutional and regulatory structure on private sector development. To the best of our knowledge, it is also the first to provide a comparative and cross-country analysis of the correlation between the vertical structure on tax-related decisions and private sector production.

The paper is organised as follows. Section 2 and 3 provide an overview of the background literature. Section 4 extends a simple theoretical framework upon which we set the hypotheses to be tested. Section 5 details our empirical strategy. Section 6 presents and discusses our results while Section 7 concludes with recommendations for future research.

2 (Multilayer) Government Regulation

There are two ways in which governments intervene on the production side of the economy: as producers of public goods and services, and as regulators. As regulators, governments influence private production through policy measures such as taxation, subsidies, licenses and quality control. Existing literature on government regulations is primarily divided into two branches: one in which public officials are seen as benevolent players pursuing economic efficiency through the internalisation of production externalities, and another branch in which government regulations are mainly regarded as damaging and socially inefficient.[4]

Part of the second strands relates to the tollbooth view whereby regulations serve as tools that benefit politicians who seek rents, bribes or campaign financing. (Shleifer and Vishny, 1994, 1998; Tullock, 1967; Rowley et al., 1988). Cross-country empirical research has contributed to reinforcing this thesis by stressing harmful policies of public officials at the expenses of residents and firms (Djankov et al., 2002; Hopkin and Rodriguez Pose, 2007; McChesney, 1988). The tollbooth view has also been echoed by institutional economists such as North (1994, p. 360) which argued that *"Institutions are not necessarily or even usually created to be socially efficient; rather they, or at least the formal rules, are created to serve the interests of those with the bargaining power to create new rules."* In developing and emerging economies, more particularly, regulations are predominantly portrayed as a "grabbing hand" on businesses [5], with politicians often pursuing their own objectives through unwieldy rules, fees and taxes and cumbersome rules and taxes (Guasch and Hahn, 1999; Emery et al., 2000; Shleifer and Vishny, 1993; Jacobs and Coolidge, 2006).

The multi-layer governance structure of the state adds to the complexity of regu-

[4]See Stigler (1971), Peltzman (1976) and McChesney (1988) for an overview of the theoretical underpinning of regulations.

[5]Expression from Shleifer and Vishny (1998)

lations. As stipulated in the fiscal federalism literature, vertical and horizontal competition create externalities. Tax instruments, seen as the primary regulatory tools, may not be set by the same layers and even less in a coordinated manner Hindriks and Myles (2013, p. 585). Notwithstanding, proponents of decentralisation reforms have rather suggested that the multi-layer structure of regulations might be beneficial for the economy. Their arguments are grounded in the theoretical framework whereby intergovernmental competition lessens information asymmetries and enhances public accountability, thereby inducing an improved climate for business operations and private market development (Bordignon et al., 2004; Besley and Case, 1992). Early contributions, such as Brennan and Buchanan (1980), already contended on the positive impact of multi-layer government on the economy: *"the total government intrusion into the economy should be smaller, ceteris paribus, the greater the extent to which taxes and expenditures are decentralized [...]"* .

The assumptions of capital and labour mobility which are at the core of the intergovernmental competition literature are however not always justified in developing and emerging economies (Cai and Treisman, 2005; Bardhan, 2002).Urban agglomeration considerably attenuates the drive for competition and lessens the impact of lower-tier government policies on business operations (Brülhart et al., 2012). Existing literature also suggests that the sharing of common resources pool by upper and lower-tier may lead to suboptimal over-extraction of the same tax base and the aggregated tax rates too high in a non-cooperative equilibrium (Shleifer and Vishny, 1993; Treisman, 2000b; Keen and Kotsogiannis, 2002, 2004).[6]

These opposite views have led fiscal federalism scholars to propose some new refinements whereby the intergovernmental fiscal arrangements are key to preventing distortionary and rent-seeking behaviour of the authorities, and reducing the adverse effects of vertical externalities. Some have emphasized on the need of tying local expenditure to revenue generation given that rulers are likely to abstain from confiscatory demands if the ability to extract rents is tied to the prosperity of the local economy (Rodden, 2002; Fisman and Gatti, 2002; Lockwood, 2005; Montinola et al., 1995; Qian et al., 1998).

The convergence between revenues and expenditure appears to justify the decentralisation of tax and revenue instruments along with public spending assignment. Previous contributions postulated that such a convergence would be conducive of welfare (Musgrave, 1959; Oates, 1972). In an empirical investigation of the relationship between fiscal decentralisation and growth in 21 OECD countries, Filippetti and Sacchi (2016) concluded that the pro-growth effects of fiscal decentralisation depend critically on the authority of sub-national governments to regulate their tax base. The authors found that tax decentralisation leads to higher (lower) rates of economic growth when coupled with high (low) administrative and

[6]In contrast to the informational gain argument, Bardhan and Mookherjee (2000) suggest that the cohesiveness of local interest groups may lead to greater state capture and increase in corruption at the subnational level.

political decentralisation. Empirical evidence by Cull et al. (2017), Oi (1992), Qian and Weingast (1996), Qian and Weingast (1997) and others also suggest that the intergovernmental fiscal arrangements were motivating factors for business promotion by local authorities in China as they fostered the self-reliance in revenue generation. These findings and others corroborate some of the arguments of the SGFF, especially on the incentivising role of tax and revenue assignment in multi-layer government structure.

3 The incentivising role of tax assignment

In the SGFF, researchers explore the working of political and fiscal institutions with an emphasis on the incentives that they embody and the induced behaviours of utility-maximising participants (Oates, 2005, p. 356).[7] Drawing from contemporary organisation theories and behavioural insights, they revisited the possible transaction-cost minimizing role of the state, the proper assignment of decision rights among layers of government, and the alignment of incentives in the vertical structure of the public sector (Garzarelli, 2004, p. 5).

They contended that the incentive problems are similar in government hierarchies as in firms: political institutions serve to authorities what firms are to managers (Qian and Weingast, 1997, p.91). As argued by Oates (2005, p. 356), officials do not simply act on behalf of the welfare of their constituents; as other participants in the political process, they have their objective functions that they seek to maximise in a political setting that provides constraints on their behaviour. Therefore, just like market competition pressures firm managers to reflect the interests of shareholders, competition among local governments helps to limit government's predatory behaviour – such as imposing debilitating taxes or excessive regulation(Qian and Weingast, 1997, p. 88). Any departure from this stance would put the authorities in a competitive disadvantage as excessive regulation is likely to lower entrepreneurial activity and shrinks the governmental tax base (Montinola et al., 1995; Oates, 2005, 2008).[8]

Empirical evidence on the incentivising role of tax and revenue assignment is however scarce and limited to a few countries– mainly China and Russia (Montinola et al., 1995; Jin et al., 2005; Oi, 1992; Qian and Weingast, 1996; Jin et al., 2005; Zhuravskaya, 2000). The contributions on China often suggest that the intergovernmental fiscal arrangements and the fiscal contract system in the 1980s incentivised local governments to adopt effective regulatory policies and promote business development, which eventually led to the country's remarkable

[7] See Oates (2005) , Oates (2008),Garzarelli (2004), and Vo (2010) for extensive reviews of the First and Second-Generation Theory of Fiscal Federalism

[8] Barry Weingast and his collaborators, most notable contributors to that literature strand, propose a new concept known known as the "market-preserving federalism" whereby the fiscal institutions, under certain conditions, allow politicians to make credible commitments to preserving markets (Weingast, 2009, 2014; Qian and Weingast, 1997; Montinola et al., 1995). See Montinola et al. (1995) for an overview of these conditions.

economic growth. In contrast to China, evidence on Russia indicates that the intergovernmental fiscal structure resulted in less benign private-sector oriented policies (Zhuravskaya, 2000; Jin et al., 2005).

These results and arguments have however been questioned. Rodden and Rose-Ackerman (1997), for instance, argue that the SGFF lacks theories and evidence to support the claims made, and that Weingast's work is insufficiently grounded in a theory of politics. The authors also question the value of the competitive view of fiscal federalism proposed by these scholars, the portrayal of China as a model for institutional reform in developing world, and argue that any marginal move to increase decentralisation may be harmful to nations prospect of growth. Despite the call for aligning expenditure and revenue assignment (Lockwood, 2005; Martinez-Vazquez and Rider, 2008; Shah, 2004), well-developed federations such as Russia have found it advantageous to have a relatively centralised tax system and a relatively decentralised expenditure system, as to the erosion of the fiscal space. Recent experiences of transition and developing economies – such as Brazil and Argentina – have also shown that local governments policies can not only be hostile to business operations and development but may also lead to higher state capture (Rodden, 2006) and inducing a "grabbing hand" as suggested by Shleifer and Vishny (1998).

The Chinese case as the prime evidence is also highly disputed (Lin and Liu, 2000; Cai and Treisman, 2006). For instance, Cai and Treisman (2006) found that there is no convincing link between political or fiscal decentralisation and China's successes. Yang (2016) demonstrated that the effect of decentralisation on local economic growth in China turns negative as the degree of decentralisation becomes excessively high (Yang, 2016, p. 520). Beyond China, van Cauwenberge et al. (2016), analysing firms in Belgium find a statistically significant negative effect of municipal taxation on added value firm growth.[9] According to Treisman (2000a), the division of power between different levels of government does appear to lead to a greater burden of venality for firms doing business, notably when several predatory governments set bribe rates on the same base in an uncoordinated fashion; the result will be an aggregate bribe rate set above the maximum-extraction rate or the revenue-maximizing level.[10] Treisman (2007, p. 99) also argue that inter-jurisdictional competition could lead to the under-provision of valuable public goods as local governments may prefer to spend money on attracting business rather than on educating children; therefore, competitive pressures could negatively impact businesses through under-provision of public goods and services.

The empirical gap on the linkages between tax and revenue assignment and local economic prosperity can partly be attributed to the lack of comparative and cross-country information on intergovernmental tax structure. As aforementioned, traditional measures of

[9] In contrast, the author founds a statistically significant and positive effect of municipal spending on added value growth and employment growth.

[10] Shleifer and Vishny (1993) also refers to the terminology of "decentralized corruption".

tax decentralisation fail to integrate the verticality of decision-making over the fiscal space – an aspect that is crucial in the debate on the incentivising effect of intergovernmental tax arrangements.

The paper aims to fill the existing evidence gap by investigating the linkage between tax assignment and private sector production using a range of country profiles and accounting for heterogeneity of the intergovernmental tax structure and the business climate. This paper overcomes the data constraint by relying on a newly-built comparative dataset on tax and revenue assignment across government tiers, described in sub-section 2. The dataset informs on the responsibilities of different government layers over the fiscal space. In line with Weingast (1995, 2009, 2014), Qian and Weingast (1997) and colleagues, we thereby investigate whether tax and revenue assignment is correlated with a favourable business climate for private enterprises operations in the sample of developing and emerging economies. In the following section, we extend a simple theoretical model developed by Jin et al. (2005); the model is representative of the SGFF arguments on the incentivising role of tax assignment, and sets the basis for our hypotheses.

4 A simple theoretical framework

Institutional economics have identified two contradictory roles played by governments with respect to the private sector: *(i)* a grabbing hand, illustrated by arbitrary taxes, inefficient tax administration and regulations; or *(ii)* a helping hand through procedural, regulatory or fiscal incentives (Shleifer and Vishny, 1998; Jacobs and Coolidge, 2006).

Jin et al. (2005) and other contributors to the SGFF argue that lower-tier governments' control over their jurisdictions fiscal space could be conducive of a favourable business climate and regulatory policies. Extending from Jin et al. (2005), we consider the following theoretical model of subnational decision to support private sector development.

Let p be the decision variable. p can be regarded as local government regulatory policy effort to support business operations. Such effort may include measures that limit or remove distortionary taxes or reduce excessive regulations. Let $Y(p)$ be the value-added of the private sector to the local economy. $Y(p)$ is assumed to be increasing with p, implying that the higher the government effort, the larger the size of the local economy. We consider $c(p)$ as the cost associated with the design, implementation and enforcement of these policies which is also increasing in $c(p)$. Tax revenue collection is positively associated with the size of the local economy, and thus with the private sector contribution and local government policy effort: $T\left(Y(p)\right)$.

Let us assume that there is a revenue-sharing mechanism across government layers such that a share θ of the collected tax revenues is defined as local tax revenues θT and $(1-\theta T)$ as central revenues. It must be noted that θT can be collected and managed by

either central or local authorities or both. In fact, conventional datasets on subnational tax revenues such as the IMF Governance Finance Statistics do not indicate the government tier that is in charge of collecting or administrating the tax and revenue instruments. Let F be an unconditional top-down grant from central to local governments. For simplicity reasons, we assume that there is no bottom-up transfers or additional sharing mechanism other than $(1 - \theta T)$ that is assigned to central authorities.

Let z be the discretionary power of local authorities over the taxes collected within their jurisdictions or the tax base at their disposal. The discretionary power can take several forms such as the setting of the tax rates or the administration of the revenues from specific tax instruments. It is expected that the authorities will use the discretion provided by z to maximise their revenues.

We assume that the local government will choose the level of policy effort p that maximises their expenditure net cost of effort as:

$$max\{z\theta T(p) - c(p) + F\} \tag{1}$$

Assuming that θ is constant, under the assumptions of concavity of $T(p)$ and convexity of $c(p)$, the optimal level of policy efforts p^* is an increasing function of z, and so is the size of the local economy $Y(p^*)$:

$$\frac{dp^*}{dz} > 0; \frac{dY(p^*)}{dz} > 0 \tag{2}$$

The model predicts that the higher the discretionary power over the tax and revenue instruments (z), the stronger the policy effort to support private business operations – as this is expected to enlarge the tax base and the size of the local economy. The model highlights the importance of local governments incentives in pursuing prosperity in the local economy when such incentives is tied to the local economy. It can thus be inferred that the regulatory business climate is likely to be favourable to firms the more extensive the degree of tax and revenue assignment.

$\mathbf{H}_1$ *The higher the degree of control over tax instruments, the greater the policy effort of subnational governments to support private business operations.*

Adjacent hypotheses are provided in sub-section 5.3. For instance, we postulate that the incentives generated by the multi-layer tax arrangements would be greater the more lucrative are the tax instruments assigned to lower-tier governments. In the empirical strategy below, we also argue that different type of intergovernmental tax arrangements – such as the subnational decision-making over the tax rates versus subnational ruling over tax administration – would have different effects on private sector operations. These considerations thus lead to

additional hypotheses in sub-section 5.3 and several empirical specifications whose results are reported in Section 6.

5 Empirical Strategy

5.1 Measuring Tax Assignment

The newly built dataset on tax and revenue assignment is an attempt to remediate to the lack of empirical research on this aspect of the fiscal federalism literature and the limited information on vertical decision-structure over the fiscal space (Stegarescu, 2005; Oecd, 1999).[11] The dataset aims to bring a comprehensive picture of countries intergovernmental tax and revenue arrangements and thereby contributes to a better understanding of cross-country differences which are an essential part of the debate on the quality of institutions, good governance and revenue mobilisation.

The dataset was primarily developed through desk–research with an in-depth review of tax codes, laws and decrees, technical reports and policy documents for each specific country, as well as grey and scientific publications in the areas of public finance and local taxation. The discretionary and decision-making power of each government tier regarding the setting the tax instruments, the rates, the bases and tax administration is coded for each tax instrument.

The coding procedures, as illustrated in Table 1, provide an excellent tool for empirical and comparative research focusing not just on each layer's discretionary power over the fiscal space, but also with regards to specific tax instruments – such as property or corporate income tax.

A score is derived for each decision component – tax instrument, tax base, tax rate, tax administration – by taking the ratio of subnational governments' involvement over the range of tax instruments. The tax assignment index (or TAI) is calculated by taking the average of the assignment components' scores.

Given that the intermediate governments in federal and quasi-federal countries hold significant power over the fiscal space, alternative indicators with specific weights for the

[11] In recent years, a number of attempts towards properly measuring fiscal decentralisation were made. Stegarescu (2005)'s indicators constitute a considerable improvement in measuring fiscal autonomy of lower government tiers. The indicators cover 23 OECD countries and are available for the period of 1965 to 2011 on an annual basis and they have shown that, indeed, traditional measures tend to considerably overestimate the extent of fiscal decentralisation. A second attempt was made by Arzaghi and Henderson (2002) in 1999; yet the tax sharing dimensions were integrated in a composite indicator of "fiscal federalism" and the original coding could not be retrieved. The most comprehensive work so far has been done by the OECD with the Tax Autonomy database which mainly contains the OECD countries (Oecd, 1999). The dataset is regularly updated so as to integrate country reforms. A fourth attempt is a dataset on Qualitative Indicators of Fiscal Decentralisation initiated by the World Bank in 1999. The dataset is very limited in scope and time, even for the countries that it covers. The matrix used in the construction of this new dataset is drawn from the World Bank Qualitative Decentralisation Indicators.

Table 1: Tax Assignment Dataset: Coding Procedures

	Income				Property		Consumption			Others						SCORE	
C: Central I: Intermediate L: Local	CIT	Business Tax	PIT	Payroll/Withholding	Property	Transfers of Property	Sales/VAT/Turnover	Excise	Fuel	Industry and Trade	Vehicles	Gambling	Stamps	Natural Resources	Development Levy	Assignment Score	Tax Assignment Index
Country Name																	0.17
Instrument	C	C	C	C	C	NA	C	C	NA	C,L	C,L	C	C	C	NA	*0.08*	
Base	C	C	C	C	C	NA	C	C	NA	C,L	L	C	C	C	NA	*0.13*	
Rate	C	C,L	C	C	C,L	NA	C	C	NA	C,L	C,L	C	C	C	NA	*0.17*	
Administration	C	C,L	C	C,L	L	NA	C	C	NA	C,L	C	L	C	C	NA	*0.29*	

intermediate governments are also considered in the empirical strategy, thereby correcting for the potential underestimation of the first set of indicators.

The degree of control over the tax instruments – z in the theoretical model – is operationalised through the tax assignment index (TAI). It must be noted that given our outcome variables (explained in the following section), we integrate the assignment scores related to the tax rates and tax administration – labelled more specifically the tax rates assignment (TRA) and the tax administration assignment (TAA) – in our estimation strategies.

5.2 Tax Burden of Private Firms

To the best of our knowledge, there exists no cross-country comparative data on subnational government regulatory policies. Measuring lower-tier policy efforts for private sector development is therefore empirically challenging. To overcome this limitation, we rely on the World Bank Enterprise Surveys (hereafter WBES) which so far provide the most comprehensive micro-level firm data in a large number of developing and emerging markets.

The WBES encompass managers and firms owners' reports on the effects of government regulations on their business operations. The micro datasets also contain information on the enterprises' performance, basic characteristics (age of operations, industry), as well as other aspects of the business climate such as the access to infrastructure or credit. The random selection of the samples and the standardised questionnaire make empirical estimations comparable across different types of enterprises and countries.[12]

Given that p^* is not directly observable, we postulate that government regulatory policies will be reflected in the firms' responses to the survey questionnaires. To assess the effect of tax assignment on private sector operations, we align the tax assignment indicators to the fiscal burden of the tax structure on business operations as reported by the managers and business owners in the WBES. Our dependent variables are operationalised through the answers to the following questions:

- *Financial Burden:* To what extent are tax rates an obstacle to current business operations?
- *Administrative Burden:* To what extent is tax administration an obstacle to current business operations?

The answers range from 0 to 4, with *(0)* = no obstacle; *(1)* = minor obstacle; *(2)* = moderate obstacle; *(3)* = major obstacle; *(4)* = very severe obstacle.

Given the structure of these outcome variables, our sub-research question is, therefore: ***"Are firms in countries with a larger degree of tax assignment less likely to perceive the tax rates and tax administration as obstacles to their business***

[12] See http://www.enterprisesurveys.org/methodology for more details on the methodology

operations?". As the WBES survey questions are directly linked with the tax rates and tax administration, our empirical strategy also considers the tax rates (TRA) and tax administration (TAA) assignments as alternative measurements. The use of these specific scores allows us to highlight the potential influence of specific assignment components on private sector operations.

5.3 Further considerations

In the theoretical model in Section 4, θT refers to local tax revenues, independently of which government layer is in charge of the design, collection or management. As such, $z\theta T$ stands for the share of local tax revenues that can be influenced by local government regulatory policies.

While the tax assignment indicators may be comparable across two countries, it is expected that their incentivising effects will be greater the more extensive the revenue base under the control of subnational governments, or the more lucrative the tax instruments assigned to lower-tier governments (e.g. income or property). Hence, in addition to the main hypothesis in Section 4, we conjecture the following:

H_2 *The higher the share of subnational tax revenues under the influence of subnational governments, the greater their policy effort to support private business operations.*

To test H_2, we weight the tax assignment indicators by the ratio of subnational tax revenues in total tax revenues with additional aggregated data from the IMF Government Finance Statistics (International Monetary Fund, 2018) and the Government Revenue Dataset (International Centre for Tax and Development and UNU-WIDER, 2016).[13]

Assuming that independently of which layer of government controls the tax instruments, local authorities might solely be incentivised by the tax revenues retention rate or θT. In other terms, their incentives to support private business operations could only come through the existence of a clear revenue-sharing mechanisms even in the absence of a decision-making power over the fiscal space (z).[14] Based on this consideration, we formulate a third hypothesis as follows:

H_3 *The higher the revenue retention rate, the greater the policy effort to support private businesses operations*

To test H_3, we mainly consider the traditional measurement of tax decentralisation, namely the share of subnational tax revenues in total tax revenues. In addition to that, we created

[13] It must be noted that the subnational and national tax revenues estimates from these two data sources are not disaggregated and do not inform on the vertical decision-making nor the discretionary power of each government tier over the fiscal space.

[14] Moreover, in a democratic process which gives voice to regional and hinterland politicians, the incentives to support the private sector development may come through partisan affiliation across government layers, even if no discretionary power over the fiscal space is granted to lower-tier governments.

a composite indicator in which we weight the tax revenue decentralisation by expenditure decentralisation. This composite variable translates into the share of subnational tax revenues that goes into the expenditure share assigned to subnational governments.

By accounting for the spending side, we relate to the public finance literature which posits taxation as an implicit contract between the state and the residents (Falkinger, 1995; Slemrod, 2010; Frey and Feld, 2002). As suggested by Helms (1985, p.581), a state's ability to attract, retain, and encourage business activity is significantly affected by its pattern of taxation, although taxes cannot be studied in isolation as a state may also encourage economic activity within its borders with appropriate expenditures and if tax revenues are devoted to the provision of public services which are valued by businesses and their employees.

All these considerations, therefore, call for thorough analyses on how different multi-layer tax arrangements, such as tax revenue decentralisation with or without discretionary power to the lower-tier, are linked to private production and other aspects of the economy.

5.4 Empirical Models

We estimate a mixed-effects ordered logistic model, also known as multi-level or hierarchical ordered logistic model Raudenbush and Bryk (2002); Rabe-Hesketh and Skrondal (2012). This identification strategy allows us to control for both firms and country heterogeneous characteristics as we assume that the fiscal burden on business operations is likely to be driven by both sets of parameters. The mixed-effects methodology is grounded on the premise that the hierarchical structure of data induces a violation of the independence assumption of standard regression model; by relaxing this assumption, the method is expected to deliver more accurate estimates of the extent to which higher-level parameters are accountable for micro-level outcomes.[15]

Let K be the number of response categories of the outcome variables; in this paper $K = 0, ..., 4$. Let J: $j = 1, ..., J$ be the number of clusters or countries with each cluster consisting of $i = 1, ...n_j$ observations or firms. The cumulative probability of a response being in a higher category than k conditional on a set of fixed effects parameters $\mathbf{x}_{ij}$, a set of cut-points κ and a set of random effects $\mathbf{u}_j$ is given by the following relation.

$$Pr(y_{ij} > k|\mathbf{x}_{ij},\, \kappa,\, \mathbf{u}_j) = H\left(\mathbf{x}_{ij}\beta + \mathbf{z}_{ij}\mathbf{u}_j - \kappa_k\right) \tag{3}$$

$H(\cdot)$ is the logistic cumulative distribution function that represents cumulative probability. The $1 \times p$ row vector $\mathbf{x}_{ij}$ represents the covariates for the fixed effects with coefficients β. The $1 \times q$ vector of $\mathbf{z}_{ij}$ are covariates corresponding to the random effects and can be used

[15]The mixed-effects analysis of economic development has been more systematic in recent years with numerous studies in the field of health and labour economics, linking the macro and the micro patterns. Besides, innovation and management studies have also argued for the need to consider both firms' capabilities and the national environment (Goedhuys and Srholec, 2010).

to represent both the random intercepts and random coefficients which, in the former case, is simply the scalar 1. The random effects u_j are assumed to be independently distributed across countries and independent of the covariates represented by the row vector $\mathbf{x}_{ij}$.

The model can alternatively be written in terms of latent responses y^*_{ij} where the error terms ϵ_{ij} follow standard logistic distributions with mean 0 and variance variance $\pi^2/3$ and are independent of the vector $\mathbf{x}_{ij}$ and across u_j.

$$y^*_{ij} = \mathbf{x}_{ij}\beta + \mathbf{z}_{ij}\mathbf{u}_j + \epsilon_{ij} \tag{4}$$

The fiscal burden of the tax rates and tax administration on business operations is thus related to the latent responses via the threshold model:

$$y_{ij} = \begin{cases} 0 & \text{if} \quad y^*_{ij} \leq \kappa_0 \\ 1 & \text{if} \quad \kappa_1 < y^*_{ij} \leq \kappa_1 \\ \vdots & \quad \vdots \\ 4 & \text{if} \quad \kappa_3 < y^*_{ij} \end{cases} \tag{5}$$

In the robustness checks, we consider a subsample of firms that have been surveyed more than once in the WBES. The longitudinal data are used to test H_1 and H_2. By introducing the time dimension, we investigate whether any variation in the share of subnational tax revenues in total tax revenues is reflected in the answers given by the same firms at different rounds of the WBES. The time dimension induces a three-level hierarchical model in which the occasions become the lowest level in the hierarchy.

Following Liu and Hedeker (2006) and Rabe-Hesketh and Skrondal (2012), we denote t the number of occasions that each firm i was surveyed. The three-level model for the underlying latent variable with longitudinal data can be written in terms of y^*_{tij} as follows, where $\mathbf{x}'_{tij}$ is the vector of covariates, β the vector of fixed effects coefficients, $\mathbf{z}'_{tij}$ is the covariates corresponding to the random subjects effects (country-level) and $\mathbf{u}_j$ the level-3 random subject effects which follow a multivariate normal distribution. d'_{tij} is the $m \times 1$ indicator vector for the repeated items, and $T_{(2)}$ is the random-effects standard deviation vector from the level-2 subject-availability θ_{ij} which itself follows a standard normal distribution (Liu and Hedeker, 2006, p. 262-263).

$$y^*_{tij} = \mathbf{x}'_{tij}\beta + \mathbf{z}'_{tij}\mathbf{u}_j + d'_{tij}T_{(2)}\theta_{ij} + \epsilon_{ijt}$$

Given that not all firms have the same number of occasions (some with two, others with three), it is convenient to represent the random subjects in a standardized form. As in Liu and Hedeker (2006, p. 262) (citing Gibbons and Bock (1987)), we decompose $\mathbf{u}_j = T_{(3)}\theta_i$ where $T_{(3)}T'_{(3)} = \sum_{(3)}$ is the decomposition of the $r \times r$ matrix $\sum_{(3)}$ and θ_i is the vector of standardized level-3 random effects.

$$y^*_{ijk} = \mathbf{x}'_{tij}\beta + \mathbf{z}'_{tij}T_{(3)}\theta_i + d'_{tij}T_{(2)}\theta_{ij} + \epsilon_{tij} \tag{6}$$

In order to capture the trend, and not a year-based estimate, we take the 3-year average of the continuous country-level covariates, such that for each response at time t (year of the survey) corresponds an estimate $x_{2sj,t} = \frac{\Sigma_{t=1}^{t-2} x'_{2sj}}{3}$.

5.4.1 Description of the Covariates

In all of our empirical estimations, we control for firms heterogeneity using a number of characteristics provided through the WBES. These include, at first, the *Age* of operations, the *Industry* and the *Size*. The existing literature on capture theory indicates that governments might facilitate firms that can provide the maximum of rents or contribute to unemployment reduction – this latter being a prime objective of the state(Stigler, 1971; Peltzman, 1976). Thus, the size or the age of operation of an enterprise could explain its fiscal regulatory burden and the treatment received by the state. On the other hand, however, government policies might favour younger firms where efficiency gains are likely to be greater, leading to much lower fiscal pressure. On the industry or sector of operations, Yang (2016) found that the effect of revenue and expenditure decentralisation on economic growth varies across the three main sectors, with the largest impact on the secondary sector. The author also found that tax burden hurt the secondary and tertiary sector much more than the primary sector (Yang, 2016, p. 524), thereby highlighting the relevance of these parameters in our econometric setting.

In addition to the size, age and sector of operations, we also control for the *Location* of the firm – whether it is located in the capital or main business city or elsewhere. The location variable aims to capture the size of the immediate market available to the enterprises, which can also be viewed as the size of the local economy in which they operate. We account for openness to trade by including a binary variable indicating if a firm is involved in *Export* activities. We postulate that exporting enterprises could benefit from fiscal and regulatory incentives which may drive their appraisal of the tax structure. Moreover, exporting firms are likely to have higher leverage and more efficient tools to counter excessive fiscal pressure. As foreign firms might be subject of different sets of regulation, we account for enterprises *Ownership* (1=national, 0=foreign). Enterprise financial stance is accounted for through the firms' access to a *Credit Line*, and the level of *Sales(ln)* in the year preceding the survey.

Besides the firms' characteristics, explanatory variables include proxies for the interactions with the government, such as the *Tax Inspection Frequency*, a measure of *Corruption of tax officials* – translated as whether any informal gift was requested by the tax inspector, and the average *Time Spent* by management in deadline with government-related matters. Lastly, we created two composite variables which measure the quality of the business envir-

onment surrounding the firms (*Business environment 1 & 2).* The first one measures the extent to which electricity, transport, crime, informal sector, access to finance are considered as obstacles to business operations, whereas the second measures the firms' perception of other regulatory measures such as business licenses, trade and labour regulations.

At the country-level and in addition to our variables of interest, we control for country context by including *Per Capita GDP* – a widely used measure of a country's development level, and the *Regulatory Quality* index of the World Governance Indicators.[16] In specifications related to the burden of tax administration, we introduce an index of *Ethnic Fragmentation* under the assumption that ethnically fragmented countries would have a particular preference for decentralised tax administration as indicated by previous research (Campbell, 2003).

6 Results and Discussion

To recall, the financial and administrative burden of the tax structure are operationalised via the answers to the questions "*to what extent are(is) tax rates (tax administration) an obstacle to business operations*" with the answers ranging from *0* to *4* (0=no obstacle; 4=very severe obstacle).

A positive and significant coefficient indicates a higher probability of being in the upper categories of the responses, thus perceiving the tax rates and tax administration as obstacles to business operations. As previously mentioned, and in line with the theoretical foundations, we investigate whether a country's level of tax assignment or tax decentralisation is associated with the likelihood of its firms responding in the lower thresholds of the WBES.

One way to assess the heterogeneity of the countries in our setting is to compute the variance partition coefficient (*VPC)* or the proportion of total residual variable (level 1 and level 2) that is attributable to between-countries variances. The VPC is given by the following: $VPC = \frac{\sigma_u^2}{\sigma_u^2+3.29}$.[17]

The estimated between-country variance in the null model is respectively 0.546 for the financial burden and 0.505 for the administrative burden of the tax structure on business operations. Therefore, the variance partition coefficient is 0.142 for answers related to the tax rates and 0.133 for those related to the tax administration, implying thereby that respectively 14% and 13% of the variations in the answers to these questions are due to between-country differences. These percentages justify the need of having the firm-level data nested in the country context.

Figure 1 is graphical representation of the country effects. It is obtained by calculating the empirical Bayes predictions (a.k.a., posterior means or shrinkage estimates) of the

[16] See the following link for details on the concept measurement http://info.worldbank.org/governance/wgi/pdf/rq.pdf

[17] For a logistic model, the level 1 residuals are assumed to follow a standard logistic distribution with variance of $\pi^2/3 = 3.29$.

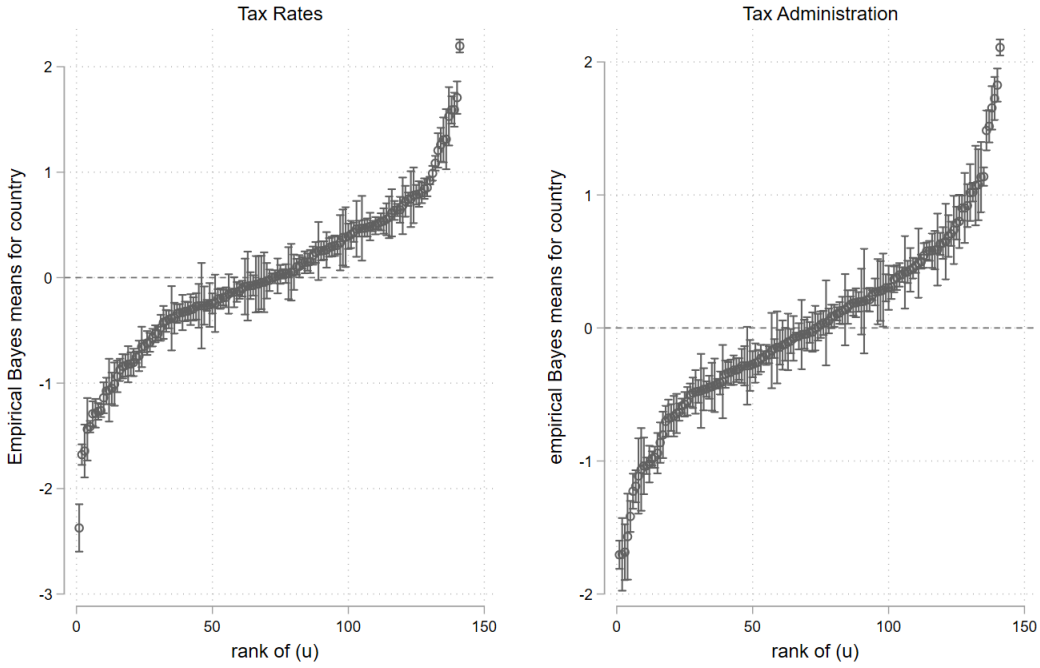
Table 2: Tax Assignment and Fiscal Burden on Business Operations

Null Model

	Financial Burden		Administrative Burden	
cut1	-1.218***	-0.072	-0.765***	-0.067
cut2	-0.323***	-0.066	0.164***	-0.062
cut3	0.763***	-0.065	1.291***	-0.064
cut4	2.211***	-0.079	2.694***	-0.083
Var(cons, country)	0.546***	-0.078	0.505***	-0.072
N *Firms*	203744		203744	
N *Countries*	141		141	
Log-likelihood	-307862.7		-296591.2	
VPC	***0.142***		***0.133***	

Cluster-Robust Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

Figure 1: Caterpillar Plot of the Country Effects (random effects)



random effects in the null model in rank order with 95% confidence interval. The caterpillar plot shows that for a large number of countries, the 95% confidence interval does not overlap zero, which indicates that the fiscal burden of tax rates and tax administration is significantly above or below the average (the zero line) at the 5% level for these countries.

Hypothesis 1 The empirical estimations testing 4 are presented in 3. They indicate that, all else being equal, firms in countries with, on average, a higher level of subnational decision making over the tax instruments (TAI), are more likely to report tax rates and tax administration as being obstacles to their business operations (1.1 and 2.1). It must be noted that these results are in line with Treisman (2000a) who previously hinted that there is a greater burden of venality for firms doing business with subnational control over the fiscal space.

Besides the average score, we introduce the tax rates and the tax administration assignment scores (TRA and TAA) in respective specifications (1.2 and 2.2). The results bound in the same direction for tax rates assignment, indicating that higher the subnational discretion over the setting of tax rates, the higher the likelihood of firms indicating these rates as being a burden on their operations.

On the other hand, however, the tax administration assignment alone does not appear to statistically correlate with the administrative burden of the tax system on business operations. These results are enlightening as they show that different parameters of the intergovernmental tax arrangements could have a different consequence on private sector operations and, eventually, on other stakeholders. The policy implications would be that decentralising the tax collection and management might be less harmful than the decentralisation of tax rates.

Besides our main explanatory variables, the results suggest that firms in richer countries, measured by *Per capita GDP (ln)*, tend to respond in the lower thresholds of the answers. At the firm-level (bottom-part of Table 3), it is revealed that older firms and those that operate in a poor business environments (measured by *business environment 1 and 2*) are more likely to respond in the upper thresholds– thus reporting a larger burden of tax rates and tax administration on their business operations. On the other hand, however, national firms (*Ownership*), those involved in *Export* activities, and those that experienced an increase in *Sales* prior to the survey do report a lesser burden of the tax system on their production.

Comparing the four specifications, it is evidenced that the firms' interaction with their respective governments do drive their answers upwards. The frequency of tax inspection and the corruption of tax officials as well as the time spent dealing with government regulations positively and significantly increase the likelihood of reporting a much higher negative impact of both the tax rates and tax administration on business operations. In Appendix B, we report similar estimations (Table 8) using revised versions of the indices of tax assignment in which

Table 3: Tax Assignment and Fiscal Burden on Business Operations

	Hypothesis 1							
	(1.1) Financial Burden		(1.2) Financial Burden		(2.1) Administrative Burden		(2.2) Administrative Burden	
			Country-level					
Tax Assignment Index (TAI)	1.720**	(0.715)			0.874*	(0.473)		
Tax Rate Assignment (TRA)			1.954***	(0.586)				
Tax Administration Assignment (TAA)							0.243	(0.311)
Per Capita GDP (ln)	-0.797***	(0.284)	-0.793***	(0.281)	-0.476***	(0.138)	-0.465***	(0.137)
Regulatory Quality (WGI)	0.315	(0.286)	0.321	(0.279)	0.222	(0.159)	0.215	(0.161)
Ethnic Fragmentation					-0.725**	(0.342)	-0.712**	(0.342)
			Firm-level					
Age (ln)	0.044**	(0.021)	0.045**	(0.021)	0.029*	(0.015)	0.029*	(0.015)
Industry (b=manufacturing)								
Retails	-0.017	(0.044)	-0.017	(0.044)	0.037	(0.042)	0.037	(0.042)
Services	-0.052	(0.041)	-0.053	(0.041)	0.038	(0.046)	0.038	(0.046)
Size (b=large)								
Micro	-0.251	(0.162)	-0.252	(0.161)	0.074	(0.109)	0.073	(0.109)
Small	0.062	(0.087)	0.061	(0.087)	0.052	(0.059)	0.051	(0.059)
Medium	0.123***	(0.040)	0.123***	(0.040)	0.065*	(0.034)	0.064*	(0.034)
Location	0.046	(0.039)	0.045	(0.039)	0.019	(0.042)	0.019	(0.042)
Ownership	-0.100***	(0.025)	-0.101***	(0.025)	-0.087***	(0.032)	-0.087***	(0.032)
Exporting	-0.170***	(0.046)	-0.170***	(0.046)	-0.077*	(0.044)	-0.077*	(0.044)
Sales (ln)	-0.011	(0.009)	-0.011	(0.009)	-0.024***	(0.008)	-0.024***	(0.008)
Credit Line	-0.021	(0.044)	-0.021	(0.045)	0.046	(0.034)	0.046	(0.034)
Tax Inspection Frequency	0.002*	(0.001)	0.002*	(0.001)	0.003***	(0.001)	0.003***	(0.001)
Corruption of Tax officials	0.202**	(0.082)	0.202**	(0.082)	0.389***	(0.110)	0.389***	(0.109)
Business Environment 1	0.452***	(0.054)	0.452***	(0.054)	0.348***	(0.036)	0.348***	(0.037)
Business Environment 2	0.717***	(0.096)	0.717***	(0.096)	1.023***	(0.072)	1.023***	(0.072)
Time Spent					0.003*	(0.001)	0.003*	(0.001)
cut1	-5.976**	(2.532)	-5.922**	(2.514)	-2.913**	(1.442)	-2.860**	(1.443)
cut2	-4.920**	(2.506)	-4.866*	(2.487)	-1.708	(1.433)	-1.655	(1.434)
cut3	-3.546	(2.507)	-3.491	(2.488)	-0.246	(1.446)	-0.194	(1.447)
cut4	-1.970	(2.524)	-1.915	(2.506)	1.327	(1.459)	1.380	(1.460)
Var(cons, country)	0.965**	(0.416)	0.909**	(0.395)	0.321***	(0.064)	0.332***	(0.066)
N *Firms*	36001		36001		33918		33918	
N *Countries*	117		117		112		112	
Chi2	1448.6		1448.5		2026.1		1919.6	
Log likelihood	-50151.8		-50149.1		-45029		-45030.6	
AIC	100349.5		100344.2		90108		90111.2	
BIC	100544.8		100539.5		90318.8		90322	

Cluster-Robust Standard errors in parentheses. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

we weigh local and intermediate governments separately (instead of subnational governments as a whole). The new estimates also integrate the regional fixed effects which account for the potential regional spillover effects of institutional settings and are run without the business climate proxies. The results are similar to Table 3 indicate a greater likelihood of reporting a higher fiscal burden in countries with greater overall level of tax assignment or tax rates assignment while tax administration assignment remains statistically not significant.

Hypothesis 2 Table 4 presents the estimations testing 5.3. To recall: we argued that the incentivising effect of the intergovernmental tax arrangement would be greater in the event of lucrative tax instruments or the greater the share of subnational tax revenues in total tax revenues, also known as tax revenue decentralisation (*TaxRevDec*). Weighing the tax assignment indicators by the tax revenue decentralisation provides an estimate of the share of subnational taxes relative to total tax revenues that can be influenced by subnational governments policies or decisions. Given the regional variation in tax revenues collection[18], these estimations take into account the regional fixed effects.

In addition to the product *TAI*TaxRevDec*, we also consider the products of the tax revenue decentralisation by the tax rates and tax administration assignment – *TRA*TaxRevDec* and *TAA*TaxRevDec*. These latter are translated as the share of subnational tax revenues that can be influenced through either through the setting of the tax rates or tax administration by subnational governments.

The coefficient estimates in specifications (1.1) and (2.1) of Table 4 indicate that firms in countries with a large share of subnational tax revenues under the discretion of subnational governments are more likely to report a larger financial and administrative burden of the tax structure on their business operations. The results using the tax rates and tax administration assignment (specifications 1.2 and 2.2) bound in the same direction.

In contrast to Table 3, these suggest that for the same level of tax administration assignment across two countries, subnational ruling over tax administration would have a negative impact the higher the share of subnational tax revenues in total tax revenues or the more lucrative are the tax instruments being handled by subnational governments. These further highlight how different intergovernmental tax structure may have a different effect on private sector development.

Like in Table 4, proxies for the poor business climate, the firms' interactions with their respective governments, the corruption of tax officials and the time spent dealing with government regulations do drive the answers upwards. The coefficients on firms ownership are also consistent with previous findings. At the country level, it is also evidenced that enterprises in wealthier countries tend to have a better appraisal of tax rates and tax administration –

[18]The average tax revenues collection is much lower in Sub-Saharan Africa than in East-Asia or Latin America

a result which is consistent with previous estimations. z In Appendix B, we extend these estimations by using the revised versions of the tax assignment indicators with local and intermediate having different weights. The interpretations of the coefficient estimates are similar to those of Table 4.

Hypothesis 3 To test H_3, we consider the ratio of subnational tax revenues in total tax revenues as a proxy for the tax revenues retention rate. We postulate that the incentivising effect could be a result of a fair tax revenue-sharing mechanism even in the absence of a certain level of discretion over the fiscal space. In addition to the tax revenue decentralisation ratio, we created a composite indicator in which we weigh the tax revenue decentralisation by expenditure decentralisation. Like in previous estimations, we also control for the regional disparities in tax collection. Table 5 reports the coefficient estimates testing 5.3. They suggest that firms in countries with a higher ratio of subnational government tax revenues in total tax revenues do report a greater burden of the tax rates and tax administration on their business operations. The effect loses its significance however when we weight tax decentralisation by the expenditure decentralisation (with no significant effect on the likelihood of reporting an administrative burden).

Comparing these results with previous ones, it is demonstrated that the decentralisation of the tax system, with or without lower-tier decision-making over the fiscal space, is associated with a greater financial and administrative burden of the tax system on private business operations. The coefficient estimates on the quality of the business environment, firm ownership, the corruption of tax officials, tax inspection frequency and the time spent dealing with government regulations are also consistent in almost all the specifications and appear to statistically explain the responses given by the firms in the WBES.

6.1 Robustness Checks

6.1.1 Longitudinal Analysis

To account for the time variation, we estimated a three-level hierarchical model for H_2 and H_3 (explained in Section 5.4). By considering the time dimension, we investigate whether any change in tax decentralisation is reflected in the responses given by the same firms at different rounds of the surveys, using the sample of firms that have been surveyed more than once.

The results are reported in Table 6. The coefficient estimates of the main variables of interest remain consistent over time. The products of the tax assignment index, the tax rates and tax administration assignment and the the tax revenue decentralisation are associated with a greater likelihood of the firms reporting a fiscal burden of the tax structure on their

Table 4: Tax Assignment and Fiscal Burden on Business Operations

Hypothesis 2

	(1.1) Financial Burden		(1.2) Financial Burden		(2.1) Administrative Burden		(2.2) Administrative Burden	
			Country-level					
*TAI * TaxRevDec*	4.748**	(1.898)			3.556***	(1.280)		
*TRA * TaxRevDec*			5.023**	(2.016)				
*TAA * TaxRevDec*							3.135***	(1.037)
Per Capita GDP(ln)	-0.893**	(0.372)	-0.901**	(0.373)	-0.437*	(0.235)	-0.439*	(0.233)
Regulatory Quality (WGI)	0.405	(0.335)	0.405	(0.332)	0.215	(0.258)	0.219	(0.256)
Ethnic Fragmentation					-0.300	(0.348)	-0.200	(0.346)
Regional Fixed Effects	Yes		Yes		Yes		Yes	
			Firm-level					
Age (ln)	0.009	(0.027)	0.010	(0.027)	0.007	(0.023)	0.008	(0.023)
Industry (b=manufacturing)								
Retails	-0.085	(0.056)	-0.085	(0.056)	0.027	(0.057)	0.026	(0.057)
Services	-0.120***	(0.046)	-0.120***	(0.046)	-0.047	(0.051)	-0.047	(0.051)
Size (b=large)								
Micro	0.273	(0.224)	0.273	(0.224)	0.270	(0.222)	0.272	(0.222)
Small	0.167**	(0.066)	0.167**	(0.066)	0.113**	(0.055)	0.114**	(0.055)
Medium	0.122**	(0.052)	0.121**	(0.052)	0.055	(0.040)	0.056	(0.040)
Location	0.019	(0.045)	0.019	(0.045)	0.021	(0.058)	0.021	(0.058)
Ownership	-0.106***	(0.034)	-0.106***	(0.034)	-0.069**	(0.032)	-0.069**	(0.032)
Export	-0.104*	(0.056)	-0.104*	(0.056)	0.031	(0.042)	0.030	(0.042)
Sales (ln)	-0.007	(0.010)	-0.007	(0.010)	-0.022***	(0.006)	-0.022***	(0.006)
Credit Line	0.022	(0.055)	0.022	(0.055)	0.073	(0.051)	0.072	(0.051)
Tax Inspection Frequency	0.004**	(0.001)	0.004**	(0.001)	0.004***	(0.001)	0.004***	(0.001)
Corruption of Tax Officials	0.210***	(0.064)	0.210***	(0.064)	0.455***	(0.108)	0.455***	(0.108)
Business Environment 1	0.367***	(0.033)	0.367***	(0.033)	0.313***	(0.034)	0.313***	(0.034)
Business Environment 2	0.805***	(0.056)	0.806***	(0.056)	1.081***	(0.041)	1.082***	(0.041)
Time Spent					0.005**	(0.002)	0.005**	(0.002)
cut1	-7.967**	(3.479)	-8.022**	(3.486)	-2.569	(2.222)	-2.505	(2.186)
cut2	-6.967**	(3.447)	-7.022**	(3.454)	-1.400	(2.211)	-1.335	(2.175)
cut3	-5.516	(3.448)	-5.571	(3.455)	0.186	(2.205)	0.251	(2.169)
cut4	-3.911	(3.447)	-3.967	(3.454)	1.749	(2.182)	1.814	(2.147)
Intercept Variance	0.515***	(0.159)	0.515***	(0.159)	0.287***	(0.066)	0.282***	(0.066)
N *Firms*	20587		20587		19189		19189	
N *Countries*	66		66		64		64	
Chi2	1560		1554		2448		3025	
Log likelihood	-28594		-28593		-24902		-24900	
AIC	57244		57241		49863		49860	
BIC	57466		57463		50099		50096	

Cluster-Robust Standard errors in parentheses. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01

Table 5: Tax Assignment and Fiscal Burden on Business Operations

Hypothesis 3

	(1.1) Financial Burden		(1.2) Financial Burden		(2.1) Administrative Burden		(2.2) Administrative Burden	
			Country-level					
TaxRevDec	2.128***	(0.797)			1.520**	(0.692)		
TaxRevDec / ExpDec			0.778*	(0.442)			0.863	(0.597)
Per Capita GDP(ln)	-0.885**	(0.358)	-1.554***	(0.528)	-0.450*	(0.239)	-0.762**	(0.315)
Regulatory Quality (WGI)	0.446	(0.338)	0.842***	(0.327)	0.261	(0.287)	0.628**	(0.318)
Ethnic Fragmentation					-0.362	(0.355)	-1.046	(0.764)
Regional Fixed Effects	Yes		Yes		Yes		Yes	
			Firm-Level					
Age	0.01	(0.027)	0.037	(0.029)	0.008	(0.023)	0.025	(0.027)
Industry (base=manufacturing)								
Retails	-0.086	(0.056)	-0.133**	(0.059)	0.025	(0.057)	-0.033	(0.064)
Services	-0.121***	(0.045)	-0.158***	(0.044)	-0.048	(0.051)	-0.034	(0.052)
Size (base=large)								
Micro	0.274	(0.224)	0.378*	(0.216)	0.276	(0.222)	0.403*	(0.231)
Small	0.170**	(0.067)	0.177**	(0.081)	0.116**	(0.055)	0.165***	(0.057)
Medium	0.123**	(0.052)	0.135**	(0.056)	0.057	(0.040)	0.103**	(0.041)
Location	0.018	(0.045)	0.008	(0.047)	0.022	(0.058)	0.023	(0.063)
Ownership	-0.107***	(0.034)	-0.215***	(0.027)	-0.069**	(0.032)	-0.102***	(0.031)
Export	-0.102*	(0.056)	-0.08	(0.054)	0.031	(0.042)	0.011	(0.054)
Sales (ln)	-0.007	(0.010)	-0.02	(0.015)	-0.021***	(0.006)	-0.023**	(0.009)
Credit Line	0.019	(0.055)	0.111**	(0.054)	0.07	(0.051)	0.106*	(0.057)
Tax Inspection Frequency	0.004**	(0.001)	0.003	(0.002)	0.004***	(0.001)	0.003***	(0.001)
Corruption of Tax Officials	0.211***	(0.064)	0.187*	(0.113)	0.456***	(0.108)	0.524***	(0.176)
Business Environment 1	0.366***	(0.033)	0.300***	(0.029)	0.313***	(0.034)	0.258***	(0.038)
Business Environment 2	0.806***	(0.056)	0.822***	(0.063)	1.082***	(0.041)	1.072***	(0.053)
Time Spent					0.005**	(0.002)	0.006**	(0.003)
cut1	-7.645**	(3.325)	-14.118***	(5.032)	-2.534	(2.227)	-5.415*	(2.939)
cut2	-6.645**	(3.292)	-13.110***	(5.009)	-1.365	(2.216)	-4.235	(2.946)
cut3	-5.194	(3.293)	-11.593**	(4.986)	0.221	(2.210)	-2.62	(2.933)
cut4	-3.59	(3.293)	-9.956**	(4.979)	1.784	(2.188)	-1.066	(2.900)
Intercept Variance	0.484***	(0.145)	1.066***	(0.411)	0.299***	(0.069)	0.503***	(0.155)
N *Firms*	20587		13255		19189		12154	
N *Countries*	66		38		64		37	
Chi2	1691.7		5367.6		2434.6		9417.8	
Log likelihood	-28592.2		-18154		-24901.8		-15564.8	
AIC	57240.3		36358		49863.7		31185.5	
BIC	57462.5		36545.3		50099.5		31392.9	

Cluster-Robust Standard errors in parentheses. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

business operations.

Beyond the subnational discretionary over the fiscal space, the ratio of subnational tax revenues in total tax revenues is in itself associated with a greater fiscal burden on private sector operations. At the firm-level, interactions with the governments such as the corruption of tax officials and the frequency of tax inspections have lost their significance – a result that is understandable as they may have not changed within a span of three years. On the other hand, however, the coefficients associated with the quality of the business climate and the time spent dealing with governments officials are in line with previous findings.

6.1.2 Country-Level Analysis

Alternatively to the mixed-effects ordered logistic model, we estimate pooled-OLS regressions using another dependent variable drawn from the Doing Business Index of the World Bank.[19] While we account for both firms and country level heterogeneity, we acknowledge that the multi-level model does have its limitations. Moreover, as our main explanatory variables are measured at the country-level, a macro perspective may appear more reliable to some readers.

To remain close to the ordinal dependent variables of the mixed-effects model, we have selected the "Distance to the Frontier - Paying Taxes" (hereafter DTF-Taxes) from the Doing Business Index. The terminology "Distance to the Frontier" implies the absolute level of regulatory performance of a country in comparison to the best performer over time. Hence, the DTF-Taxes measures the gap between a particular economy's tax administration performance and the best performance at any point in time. It is an aggregate of several aspects of the tax structure as experienced and reported by business owners and managers. It accounts for the easiness of paying taxes, the size of the total or profit tax rates, the number of payments per year and the time spent in dealing with tax officials. The index DTF-Taxes ranges from 0 to 100, where 0 represents the lowest performance and 100 the frontier. A score of 70 indicates that the economy is 30 percentage points away from the frontier constructed from the best performances across all economies and across time while a score of 20 indicates that the country is further away.

To the DTF-Taxes, we adjoin our indicators of tax assignment (TAI) and its revised version ($TAI\text{-}3\ levels$) and the ratio of subnational tax revenues in total tax revenues ($TaxRevDec$). The previously listed country-level covariates are also included along with other proxies for the overall business environment such as the distance to the frontier in registering a company, the easiness of getting crediting or obtaining a construction permit, which are also reflected the hierarchical model through our composite indicators on the quality of the business climate. To ensure the comparability of these results with those of the hierarchical

[19] The limited variation in years also explains the choice of pooled-OLS regressions in lieu of panel fixed-effects estimations.

Table 6: Tax Assignment and Fiscal Burden on Business Operations

Robustness Checks 1 - Longitudinal Analysis

	(1.1) Financial Burden		(1.2) Financial Burden		(1.3) Financial Burden		(2.1) Administrative Burden		(2.2) Administrative Burden		(2.3) Administrative Burden	
					Country-level							
*TAI * TaxRevDec*	15.301***	(5.176)					7.847***	(2.313)				
*TRA * TaxRevDec*			13.578***	(4.437)								
*TAA * TaxRevDec*									6.859***	(2.199)		
TaxRevDec					5.212***	(1.586)					3.434***	(1.233)
Per Capita GDP(ln)	-1.383**	(0.705)	-1.388**	(0.701)	-1.359**	(0.605)	-0.558**	(0.248)	-0.569**	(0.250)	-0.726**	(0.298)
Regulatory Quality (WGI)	0.81	(0.529)	0.779	(0.505)	1.038**	(0.492)	0.239	(0.195)	0.238	(0.201)	0.499*	(0.280)
Ethnic Fragmentation							-0.623	(0.652)	-0.540	(0.639)	-1.041	(0.705)
Regional Fixed Effects	Yes		Yes		Yes		Yes		Yes		Yes	
					Firm-level							
Age	0.009	(0.051)	0.01	(0.051)	0.009	(0.051)	-0.030	(0.031)	-0.030	(0.031)	-0.028	(0.031)
Industry (base=manufacturing)												
Retails	-0.164**	(0.067)	-0.164**	(0.067)	-0.162**	(0.066)	0.115	(0.071)	0.116*	(0.070)	0.115	(0.070)
Services	-0.167**	(0.073)	-0.167**	(0.073)	-0.167**	(0.073)	0.060	(0.074)	0.062	(0.074)	0.061	(0.074)
Size (base=medium&large)	-0.093	(0.210)	-0.096	(0.211)	-0.119	(0.209)	0.124	(0.375)	0.125	(0.375)	0.125	(0.375)
Micro	-0.047	(0.102)	-0.049	(0.102)	-0.050	(0.103)	0.077	(0.070)	0.076	(0.070)	0.077	(0.066)
Small	-0.016	(0.074)	-0.018	(0.074)	-0.016	(0.074)	0.018	(0.053)	0.018	(0.053)	0.020	(0.051)
Location	-0.289	(0.207)	-0.294	(0.206)	-0.292	(0.205)	-0.495***	(0.149)	-0.491***	(0.149)	-0.463***	(0.155)
Ownership	-0.217***	(0.036)	-0.218***	(0.036)	-0.219***	(0.036)	-0.061	(0.041)	-0.061	(0.041)	-0.063	(0.041)
Export	-0.005	(0.064)	-0.004	(0.064)	-0.005	(0.063)	0.136*	(0.069)	0.136*	(0.069)	0.137**	(0.069)
Sales (ln)	-0.076***	(0.018)	-0.077***	(0.017)	-0.077***	(0.017)	-0.030**	(0.012)	-0.030**	(0.012)	-0.031***	(0.012)
Credit Line	0.014	(0.033)	0.014	(0.033)	0.013	(0.033)	0.023	(0.032)	0.023	(0.032)	0.022	(0.032)
Tax Inspection Frequency	0.007	(0.004)	0.007	(0.004)	0.007	(0.004)	0.001	(0.001)	0.001	(0.001)	0.001	(0.001)
Corruption of Tax Officials	-0.015	(0.018)	-0.015	(0.018)	-0.015	(0.018)	-0.032*	(0.020)	-0.032*	(0.020)	-0.033*	(0.019)
Business Environment 1	0.289***	(0.035)	0.289***	(0.036)	0.286***	(0.036)	0.235***	(0.051)	0.235***	(0.051)	0.232***	(0.051)
Business Environment 2	0.839***	(0.071)	0.840***	(0.071)	0.842***	(0.071)	1.173***	(0.056)	1.173***	(0.056)	1.174***	(0.057)
Time Spent							0.007***	(0.002)	0.007***	(0.002)	0.007***	(0.002)
cut1	-15.042**	(6.640)	-15.086**	(6.609)	-14.272**	(5.626)	-5.479**	(2.367)	-5.452**	(2.333)	-6.793**	(2.739)
cut2	-14.008**	(6.604)	-14.051**	(6.572)	-13.237**	(5.589)	-4.215*	(2.364)	-4.187*	(2.331)	-5.528**	(2.737)
cut3	-12.401*	(6.560)	-12.443*	(6.529)	-11.629**	(5.546)	-2.661	(2.378)	-2.633	(2.344)	-3.973	(2.753)
cut4	-10.711	(6.541)	-10.752*	(6.510)	-9.940*	(5.527)	-1.184	(2.359)	-1.156	(2.325)	-2.495	(2.747)
Var(cons, country)	0.716*	(0.379)	0.708*	(0.368)	0.593**	(0.271)	0.314***	(0.075)	0.308***	(0.072)	0.352***	(0.081)
Var(cons, country panelid)	0.350*	(0.185)	0.354*	(0.184)	0.353*	(0.183)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
N Firms	7413		7413		7413		7135		7135		7135	
N Countries	40		40		40		39		39		39	
Chi2	1462.7		1442.6		2053.3		4166		4206.4		4526.1	
Log likelihood	-10325.2		-10324.9		-10323		-9415		-9413.2		-9413.3	
AIC	20702.4		20701.8		20698.1		18883.9		18880.4		18880.7	
BIC	20882		20881.4		20877.8		19069.5		19066		19066.2	

Cluster-Robust Standard errors in parentheses. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01

models, we only selected the years that are included in the WBES for each country in the sample. In line with previous hypotheses, we postulate that the higher discretion over the fiscal space, the lower the distance to the frontier (the higher the DTF-Taxes).

The results in Table 7 (specification (1) to (3)) suggest that the higher the tax assignment or the tax decentralisation indicators, the further away are the countries from the frontier (or the best estimate in paying taxes). In speciations (4) and (5), we estimate 2SLS regressions in which we instrument the tax assignment index (TAI) by the number of taxing tiers [20]. The relevance and over-identification tests for valid instruments are satisfied. While we cannot affirm the full exogeneity of the instruments, we argue that they are likely to affect the DTF-Taxes through the multi-layer tax structure, measured by the tax assignment indicators. The results with the instrumented indices corroborate the previous findings such as the higher the overall subnational discretion over the fiscal space, the further away are countries from the frontier.

7 Concluding remarks

In this paper, we proposed to fill the existing empirical gap related to one of the key arguments of the second generation theory of fiscal federalism (SGFF): that lower-tier governments are inclined to support private sector development when they control revenues generated within their jurisdictions. Empirical evidence on this claim has so far been scarce, which can be partly explained by the lack of cross-country information on intergovernmental tax structure. This limitation is overcome in this paper with the use of a newly-built dataset on tax and revenue assignment covering a large number of developing and emerging economies. The dataset informs on the discretionary power of all government tiers over important tax instruments and across four types of decision components. From the new data are derived several indicators, including the tax assignment index, the tax rates and tax administration assignment scores used in this research and which stand as the extent to which subnational governments can influence the fiscal space more generally, or through the setting of the tax rates or tax administration.

Given that local government policy efforts are not easily observable, the paper relies on the World Bank Enterprises Surveys (WBES) which provide estimates on how fiscal regulations, namely the tax rates and tax administration, affect business operations in a large number of developing and emerging economies. Adjoining these data sources, and controlling for both firms and country heterogeneous characteristics, we investigated whether a larger degree of tax assignment and by extension the tax rates and tax administration assignments,

[20] It must be noted that some nominally unitary countries do have intermediate taxing tiers.

Table 7: Tax Assignment and Distance to the Frontier in Paying Taxes

Robustness Checks 2 - Country-Level Analysis

	Pooled-OLS			2SLS			
	(1)	(2)	(3)	(4.0)	(4)	(5.0)	(5)
				First Stage		*First-Stage*	
	DTF_Taxes	DTF_Taxes	DTF_Taxes	TAI	DTF_Taxes	TAI (3 levels)	DTF_Taxes
TAI	-21.874**				-57.483***		
	(8.46)				(22.00)		
TAI (3-levels)		-21.630**					-56.983***
		(8.40)					(21.59)
TaxRevDec			-18.900**				
			(9.20)				
Per capita GDP (ln)	-0.300	-0.289	0.665	-0.004	-1.154	-0.002	-1.039
	(1.54)	(1.54)	(1.94)	(0.02)	(2.22)	(0.02)	(2.22)
Regulatory Quality	8.389***	8.377***	7.741**	0.037	14.703***	0.037	14.672***
	(2.49)	(2.49)	(3.06)	(0.03)	(3.27)	(0.03)	(3.25)
Ethnic Fragmentation	-0.640	-0.561	8.786	-0.009	1.670	0.001	2.266
	(5.07)	(5.07)	(6.27)	(0.06)	(6.89)	(0.06)	(6.89)
DTF-Construction Permit	-0.120*	-0.122*	-0.168**	-0.002**	-0.227**	-0.002**	-0.233**
	(0.07)	(0.07)	(0.08)	(0.00)	(0.10)	(0.00)	(0.10)
DTF-Electricity	0.172***	0.171***	0.204***	0.000	-0.009	0.000	-0.012
	(0.07)	(0.07)	(0.08)	(0.00)	(0.09)	(0.00)	(0.09)
DTF-Registration	0.297***	0.298***	0.317***	0.000	0.207	0.000	0.211
	(0.08)	(0.08)	(0.11)	(0.00)	(0.14)	(0.00)	(0.14)
DTF-Access to Credit	-0.075	-0.076	-0.098	0.000	-0.114	0.001	-0.114
	(0.06)	(0.06)	(0.07)	(0.00)	(0.10)	(0.00)	(0.10)
DTF-Trade Regulations	-0.012	-0.011	-0.131*	0.000	-0.034	0.000	-0.030
	(0.06)	(0.06)	(0.07)	(0.00)	(0.10)	(0.00)	(0.10)
DTF-Contract Enforcement	-0.108	-0.108	0.139	0.000	0.114	0.000	0.110
	(0.10)	(0.10)	(0.11)	(0.00)	(0.17)	(0.00)	(0.17)
		Instrumental Variables					
Number of Taxing Tiers				0.083***		0.085***	
				(0.02)		(0.02)	
Number of third-tiers				0.000**		0.000**	
				(0.000)		(0.000)	
Constant	57.922***	57.786***	38.594**	0.075	87.811***	0.056	86.763***
	(15.20)	(15.20)	(19.09)	(0.15)	(19.33)	(0.16)	(19.18)
N *Countries*	238	238	144	96	96	96	96
R^2	0.282	0.282	0.300	0.469	0.311	0.479	0.316
Adjusted-R^2	0.250	0.250	0.247	0.400		0.410	
AIC	1967.6	1967.7	1144	-160.9	775.2	-159	774.5
BIC	2005.8	2005.8	1176.6	-130.2	803.4	-128.2	802.7
Hansen J statistic (p-value)					0.549		0.578
Kleibergen-Paap rk LM statistic (p-value)					0.000		0.000

Robust Standard errors in parentheses. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01

is associated with the likelihood of firms reporting a lower fiscal burden on their business operations.

The results indicate that all things equal, firms in countries with larger subnational discretionary power over the fiscal space have a greater likelihood of reporting a higher burden of tax structure on their business operations. Focusing on tax rates more specifically, it is revealed that subnational governments' control over the tax rates do have an adverse effect on business operations, while subnational tax administration remains statistically insignificant. These results are enlightening as they show that different parameters of the intergovernmental tax arrangements tend to have different effect on private sector production, and eventually on other stakeholders.

In a different setting, we postulate that the incentivising effects of the tax and revenue assignment will be more significant the more lucrative are the revenue sources that are controlled by subnational authorities. As such, we weighted the indicators of tax assignment by the ratio of subnational tax revenues in total tax revenues in a new set of estimations. The results bound in the same direction, implying that for two countries with similar level of subnational discretion over the fiscal space, the likelihood of firms reporting the tax rates and tax administration as obstacles increases with the ratio of subnational tax revenues in total tax revenues. While the tax administration assignment, in itself, is not statistically correlated with the reported fiscal burden of the firm, the results differ in the context of lucrative tax bases or higher ratio of subnational tax revenues with respect to total tax revenues.

In a third hypothesis, we argue that independently of which layer has the control over the tax instruments, local authorities might solely be incentivised by the retention rate, as long as there is a fair sharing-revenue mechanism between the upper and lower-tier governments. Using the tax revenue decentralisation as a proxy for the sharing structure, the results indicate that even without any discretionary power of subnational authorities, firms in countries with a higher ratio of subnational tax revenues in total tax revenues are much likely to indicate that tax rates and tax administration are burden to their business operations.

In the robustness checks, we first introduced a time dimension in a three-level hierarchical model to assess whether any variation in the ratio of subnational tax to total tax revenues is reflected in the answers provided by the same firms at different rounds of the survey. The results of the longitudinal analysis are consistent with previous estimations. Finally, we moved beyond the hierarchical model to estimate pooled-OLS regressions with an alternative outcome variable: the the Distance to the Frontier in Paying Taxes from the Doing Business Index. The results corroborate previous findings such that the greater the overall subnational discretion over the fiscal space, the poorer the fiscal regulatory environment in a country.

The findings from all the different specifications thus highly contrast with the main hypotheses and the arguments of some contributors to the SGFF. Although we are unable

to properly measure subnational governments' policy effort, our coefficient estimates indicate a discrepancy between this theoretical framework and the environment in countries covered by the WBES. These results also question the (positive) incentivising role of tax and revenue assignment for local economic prosperity so far highlighted in the literature. While the arguments linking China's fiscal contract in the 1980s to the country's economic prosperity might, to some extent, be valid, a similar structure could well be harmful elsewhere, especially in the developing and emerging markets. Multi-layer tax or regulatory frameworks can be built with insights from success models; yet, such institutional structure should take into account the risks and the perverse incentives that appear to be embedded in such structure.

Most importantly, Musgrave's "*who should tax, where and what?*", remains a legitimate question which needs to be further explored as new empirical and cross-data emerge. As highlighted in the tax assignment dataset (see Appendix A), countries differ quite significantly in terms of the multi-layer governance structure of the fiscal space. These differences are even accentuated when considering specific components of tax assignment – such as the tax rates or tax administration assignment. This paper has shown how different assignment components (tax rates versus tax administration) appear to have different effects on private sector operations. In view of figure 4, the classification of countries into nominally federal or unitary is also very questionable . All these insights call for further comparative research on the intergovernmental tax structure as well as in-depth investigation of the underlying determinants of cross-country differences, which could partly explain the empirical findings of this paper and others.

Our paper is not without limitations. The indicators of tax assignment are so far measured on a cross-sectional basis. Improving the dataset and integrating ongoing and future reforms would constitute a valuable contribution to the academic community and researchers in this and related fields. As intergovernmental fiscal data remain scarce, time-series information on multi-tier fiscal relations would facilitate research on a broader range of topics at the cross-section of public, institutional and development economics. Another limitation relates to our dependent variables which are operationalise via answers to survey questions. A more objective approach could be the use of firm-level administrative data on tax payments and tax incentives, or within-country information on subnational regulatory and fiscal policy.

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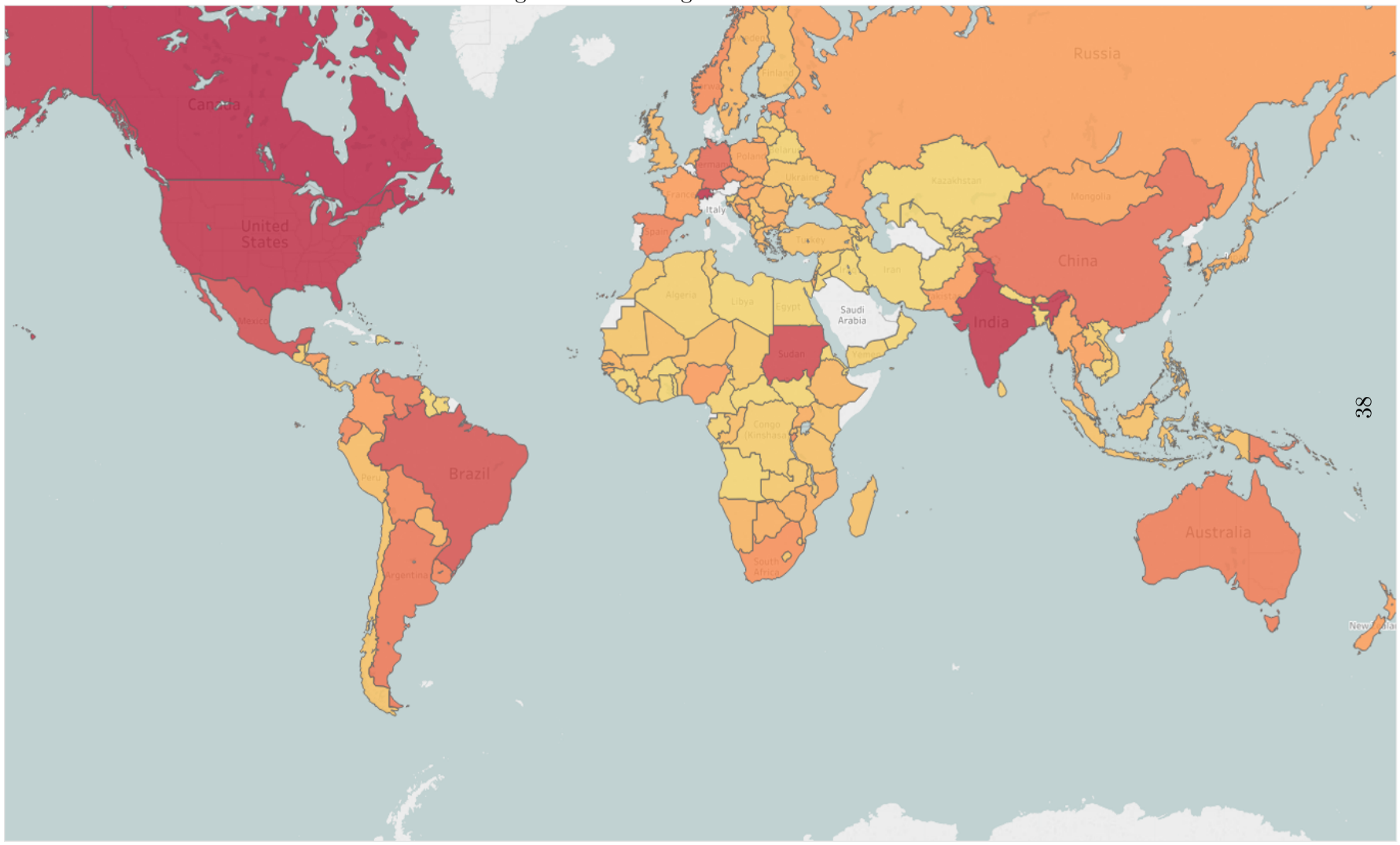
Appendix A: The Tax Assignment Dataset

Figure 2 and Figure 3 illustrate the distribution of the tax assignment index (TAI) across countries and development level. It must be noted that only a subsample of these countries are used in our estimations given that the World Bank Enterprise Surveys primarily cover developing and emerging economies. Figure 4 illustrate the tax rates (color) and the tax administration (size) assignment scores. The picture demonstrates how countries differ regarding

specific assignment components. While Russia and Germany are close in their score for the tax rates assignment (the color), subnational governments in Germany have greater discretionary power over tax administration than their counterparts in Russia (size). In comparison to Canada, subnational governments in Germany have much less decision-making power over the setting of the tax rates. The aggregated scores for Russia and Colombia appears to be very much alike, which leads to further questioning the classification of countries into federal and unitary with regards to the multi-layer tax structure.

Appendix B: Supplementary Results and Variables Description

Figure 2: Tax Assignment Index



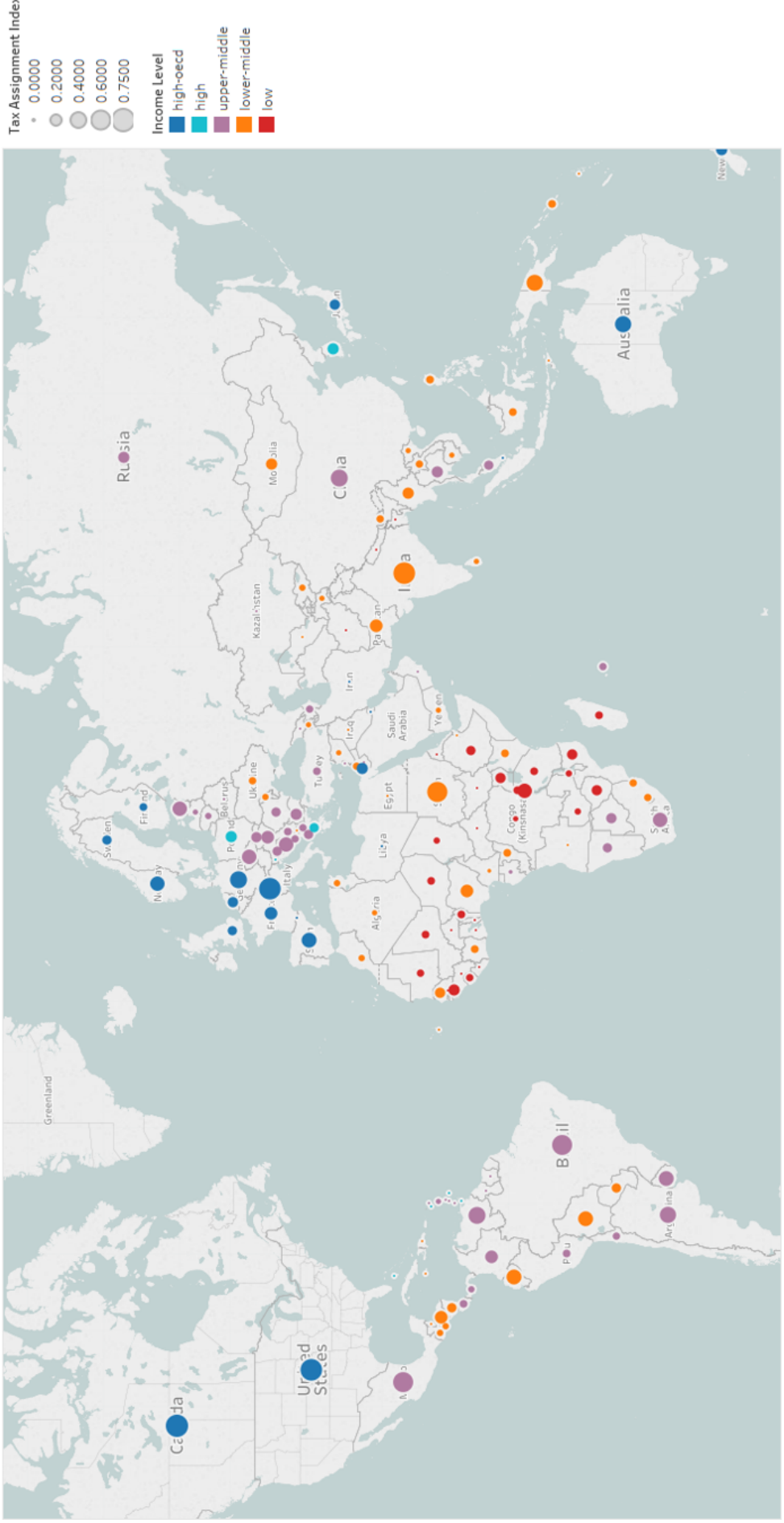


Figure 3: Tax Assignment Index (by income level)

Figure 4: Tax Rate vs Tax Administration Assignment

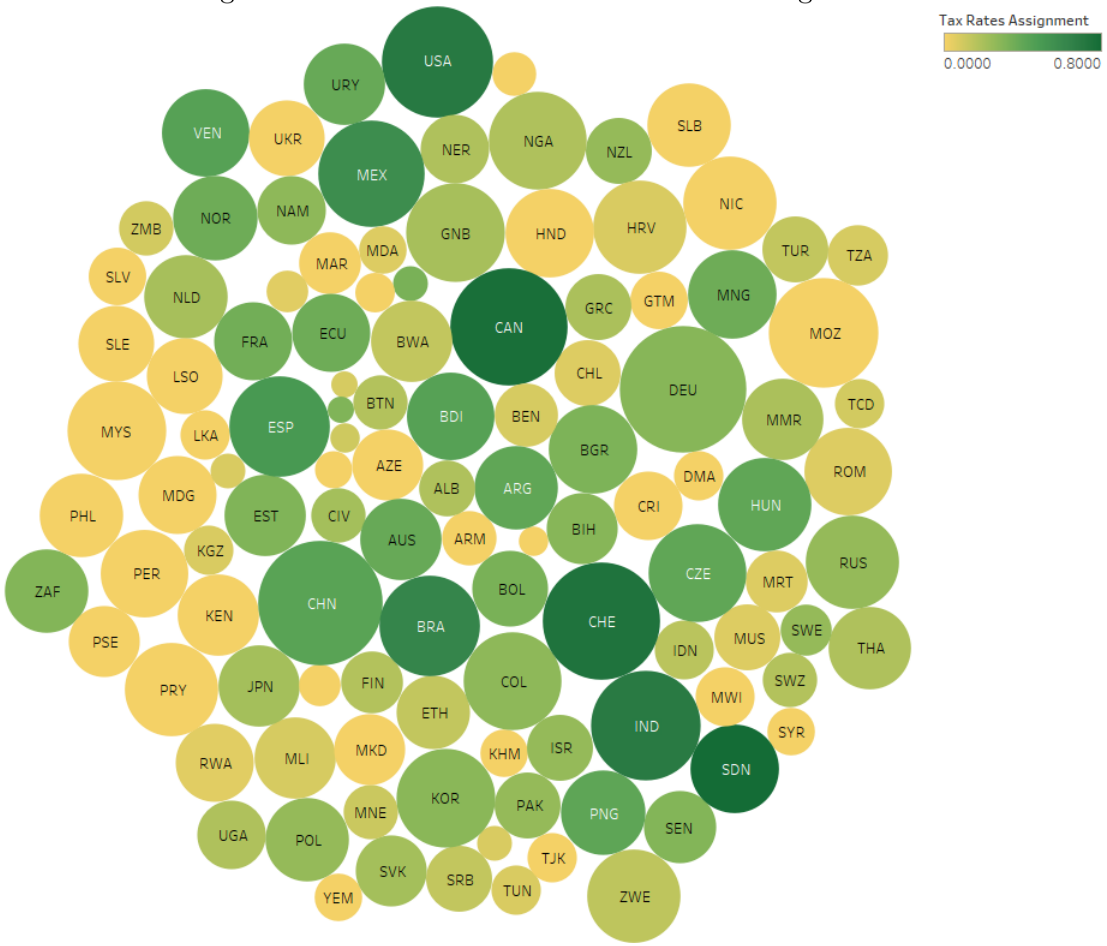


Table 8: Tax Assignment and Fiscal Burden on Business Operations

	Hypothesis 1							
	(1) Financial Burden		(2) Financial Burden		(3) Administrative Burden		(4) Administrative Burden	
			Country-Level					
TAI (3-levels)	2.257***	(0.843)			1.307*	(0.738)		
TRA (3-levels)			2.217***	(0.684)				
TAA (3-levels)							0.44	(0.553)
Per Capita GDP(ln)	-1.342***	(0.366)	-1.343***	(0.365)	-0.926***	(0.293)	-0.923***	(0.293)
Regulatory Quality (WGI)	-0.140	(0.436)	-0.134	(0.434)	-0.280	(0.423)	-0.290	(0.426)
Ethnic Fragmentation					-0.724	(0.499)	-0.686	(0.490)
Regional Fixed Effects	Yes		Yes		Yes		Yes	
Firm-Level								
Age (ln)	0.055***	(0.018)	0.055***	(0.018)	0.047***	(0.018)	0.047***	(0.018)
Industry (base=manufacturing)								
Retails	-0.094**	(0.037)	-0.094**	(0.037)	-0.038	(0.045)	-0.038	(0.045)
Services	-0.092**	(0.039)	-0.092**	(0.039)	-0.019	(0.049)	-0.019	(0.049)
Size (base=large)								
Micro	-0.310**	(0.121)	-0.310**	(0.121)	-0.097	(0.114)	-0.097	(0.114)
Small	0.006	(0.053)	0.006	(0.053)	-0.04	(0.042)	-0.04	(0.042)
Medium	0.086**	(0.037)	0.086**	(0.037)	0.012	(0.032)	0.012	(0.032)
Location	0.092**	(0.040)	0.092**	(0.040)	0.100**	(0.045)	0.100**	(0.045)
Ownership	-0.065**	(0.029)	-0.065**	(0.029)	-0.066*	(0.035)	-0.066*	(0.035)
Export	-0.107*	(0.058)	-0.107*	(0.058)	0.098**	(0.047)	0.098**	(0.047)
Sales (ln)	-0.01	(0.013)	-0.01	(0.013)	-0.016	(0.010)	-0.016	(0.010)
Credit Line	0.098***	(0.034)	0.098***	(0.034)	0.179***	(0.037)	0.179***	(0.037)
Tax Inspection Frequency	0.006***	(0.001)	0.006***	(0.001)	0.007***	(0.001)	0.007***	(0.001)
Corruption of Tax Officials	0.451***	(0.085)	0.451***	(0.085)	0.673***	(0.104)	0.673***	(0.104)
Time Spent					0.007***	(0.002)	0.007***	(0.002)
cut1	-13.927***	(3.469)	-13.895***	(3.457)	-9.480***	(2.865)	-9.477***	(2.879)
cut2	-13.014***	(3.450)	-12.982***	(3.438)	-8.483***	(2.861)	-8.481***	(2.874)
cut3	-11.815***	(3.451)	-11.782***	(3.439)	-7.263**	(2.864)	-7.261**	(2.877)
cut4	-10.415***	(3.475)	-10.383***	(3.463)	-5.912**	(2.877)	-5.910**	(2.890)
Var(cons, country)	1.391**	(0.564)	1.353**	(0.551)	0.864**	(0.371)	0.889**	(0.383)
N *Firms*	44342		44342		40765		40765	
N *Countries*	117		117		112		112	
Chi2	256.9		252.9		272		268	
Log likelihood	-65494.7		-65493.2		-59042.3		-59043.5	
AIC	131041.3		131038.3		118140.6		118143	
BIC	131267.5		131264.5		118381.9		118384.2	

Cluster-Robust Standard errors in parentheses. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01
3-levels: Intermediate and Local Governments are weighted separately

Table 9: Tax Assignment and Fiscal Burden on Business Operations

Hypothesis 2

	(1) Financial Burden		(2) Financial Burden		(3) Administrative Burden		(4) Administrative Burden	
			Country-Level					
TAI (3-levels) * TaxRevDec	4.726**	(1.890)			3.541***	(1.275)		
TRA (3-levels) * TaxRevDec			5.039**	(2.011)				
TAA (3-levels) * TaxRevDec							3.102***	(1.027)
Per Capita GDP(ln)	-0.894**	(0.372)	-0.902**	(0.373)	-0.437*	(0.235)	-0.439*	(0.233)
Regulatory Quality (WGI)	0.406	(0.335)	0.406	(0.332)	0.216	(0.258)	0.219	(0.256)
Ethnic Fragmentation					-0.302	(0.348)	-0.203	(0.346)
Regional Fixed Effects	Yes		Yes		Yes		Yes	
			Firm-level					
Age (ln)	0.009	(0.027)	0.01	(0.027)	0.007	(0.023)	0.008	(0.023)
Industry (base=manufacturing)								
Retails	-0.085	(0.056)	-0.085	(0.056)	0.027	(0.057)	0.026	(0.057)
Services	-0.120***	(0.046)	-0.120***	(0.046)	-0.047	(0.051)	-0.047	(0.051)
Size (base=large)								
Micro	0.273	(0.224)	0.273	(0.224)	0.27	(0.222)	0.272	(0.222)
Small	0.167**	(0.066)	0.167**	(0.066)	0.113**	(0.055)	0.114**	(0.055)
Medium	0.122**	(0.052)	0.121**	(0.052)	0.055	(0.040)	0.056	(0.040)
Location	0.019	(0.045)	0.019	(0.045)	0.021	(0.058)	0.021	(0.058)
Ownership	-0.106***	(0.034)	-0.106***	(0.034)	-0.069**	(0.032)	-0.069**	(0.032)
Export	-0.104*	(0.056)	-0.104*	(0.056)	0.031	(0.042)	0.03	(0.042)
Sales (ln)	-0.007	(0.010)	-0.007	(0.010)	-0.022***	(0.006)	-0.022***	(0.006)
Credit Line	0.022	(0.055)	0.022	(0.055)	0.073	(0.051)	0.072	(0.051)
Tax Inspection Frequency	0.004**	(0.001)	0.004**	(0.001)	0.004***	(0.001)	0.004***	(0.001)
Corruption of Tax Officials	0.210***	(0.064)	0.210***	(0.064)	0.455***	(0.108)	0.455***	(0.108)
Business Environment 1	0.367***	(0.033)	0.367***	(0.033)	0.313***	(0.034)	0.313***	(0.034)
Business Environment 2	0.805***	(0.056)	0.806***	(0.056)	1.081***	(0.041)	1.082***	(0.041)
Time Spent					0.005**	(0.002)	0.005**	(0.002)
cut1	-7.968**	(3.479)	-8.026**	(3.485)	-2.571	(2.222)	-2.503	(2.187)
cut2	-6.968**	(3.447)	-7.026**	(3.453)	-1.401	(2.211)	-1.334	(2.176)
cut3	-5.517	(3.448)	-5.575	(3.453)	0.185	(2.205)	0.252	(2.170)
cut4	-3.912	(3.447)	-3.971	(3.453)	1.748	(2.182)	1.815	(2.148)
Var(cons, country)	0.516***	(0.159)	0.515***	(0.159)	0.287***	(0.066)	0.283***	(0.066)
N *Firms*	20587		20587		19189		19189	
N *Countries*	66		66		64		64	
Chi2	1560.3		1554.3		2444.1		2990.8	
Log likelihood	-28593.8		-28592.5		-24901.5		-24900	
AIC	57243.6		57241		49862.9		49860.1	
BIC	57465.7		57463.1		50098.8		50096	

Cluster-Robust Standard errors in parentheses. Significance level * p < 0.10, ** p < 0.05, *** p < 0.01
3-levels: Intermediate and Local Governments are weighted separately

Table 10: Variables Description

Variables	Description	Data Sources
	Dependent Variables	
Financial Burden	If tax administration represents an obstacle to business operations. Type: ordinal [0 = no; 1=minor; 2=moderate; 3=major; 4=very severe]	WBES
Admnistrative Burden	If tax rates represent an obstacle to business operations. Type: ordinal [0 = no; 1=minor; 2=moderate; 3=major; 4=very severe]	WBES
DTF-Taxes	Distance to the Frontier in Paying Taxes (a measure of the ease of doing business ranking based on several indicators). Continuous	Doing Business Index
	Country-Level Variables	
Tax Assignment Index (TAI)	Overall discretion of subnational governments over the range of tax instruments in a country	Author's
Tax Rate Assignment (TRA)	Subnational Discretion over the setting of tax rates given the range of tax instruments in a country	Author's
Tax Administration Assignment (TAA)	Subnational Discretion over tax administration given the range of tax instruments in a country	Author's
Tax Revenue Decentralisation (TaxRevDec)	The ratio of subnational tax revenues in total tax revenues	Author's, data from the IMF GFS and GRD
TaxRevDec/ExpDec	The ratio of tax revenue decentralisation over expenditure decentralisation	Author's, data from the IMF GFS and GRD
Per Capita GDP(ln)	Standard measure of country's socio-economic development estimated at PPP international $	World Development Indicators
Regulatory Quality (WGI)	Measure of regulatory quality, tax inconsistency and how tax regulations affect business operations	World Governance Indicator
Ethnic Fragmentation	A country's score of ethnic fragmentation	Quality of Government Dataset (from Alesina (2003))
DTF-Construction Permit	Distance to the Frontier in obtaining a construction permit	Doing Business Index
DTF-Electricity	Distance to the Frontier in having access to electricity	Doing Business Index
DTF-Registration	Distance to the Frontier in registering a company	Doing Business Index
DTF-Access to Credit	Distance to the Frontier in having access to credit	Doing Business Index
DTF-Trade Regulations	Distance to the Frontier in terms of trade regulations	Doing Business Index
DTF-Contract Enforcement	Distance to the Frontier in contract enforcement	Doing Business Index
Number of taxing tiers	Number of government tiers with taxing capacity	Author's
Number of third-tiers	Number of third-tiers in the country	Database of political institutions
	Firm-Level Covariates	
Age	Number of years since a firm started its operation	WBES
Industry	Industry in which the firm operations (manufacturing, retails or services)	WBES
Size (base=large)	Size of the firms based on the number of employees	WBES
Location	If a firm is located in the capital or a main business city	WBES
Ownership	If a firm is nationally-owned	WBES
Exporting	If a firm exports its products and services	WBES
Sales (ln)	The level of sales prior to the survey	WBES
Credit Line	If a firm has access to a credit line	WBES
Tax Inspection Frequency	Frequency of tax inspection over the year preceding the survey	WBES
Corruption of Tax officials	If tax inspectors requested bribes from the firm owners	WBES
Business Environment 1	Composite index of the business climate - the extent to which electricity, transport, crime, informal sector, access to finance are considered as obstacles to business operations.	Author's with data from the WBES
Business Environment 2	Composite index of the business climate - the extent to which other regulatory measures such as business licenses, trade and labour regulations are obstacles to business operations	Author's with data from the WBES
Time Spent	Estimates of the number of days that a firm's manager spent dealing with government regulations	WBES

Table 11: Summary Statistics

	N	*Mean*	*SD*	*Min*	*Max*
Financial Burden	203744	1.79	1.34	0.00	4.00
Administrative Burden	203744	1.42	1.29	0.00	4.00
TAI	203744	0.18	0.20	0.00	0.70
TRA	203744	0.17	0.20	0.00	0.80
TAA	203744	0.31	0.22	0.00	0.89
TaxRevDec	119044	0.21	0.21	0.00	0.71
TaxRevDec/ExpDec	58327	0.64	0.38	0.07	2.72
Per Capita GDP(ln)	203196	8.74	0.86	6.16	10.50
Regulatory Quality (WGI)	200332	-0.24	0.63	-2.18	1.48
Ethnic Fragmentation	197052	0.45	0.23	0.00	0.93
Age	200227	17.30	15.63	0.00	341.00
Industry=manufacturing	201486	0.53		0.00	1.00
Industry=Retail	201486	0.20		0.00	1.00
Industry=Services	201486	0.27		0.00	1.00
Size=Micro	185120	0.01		0.00	1.00
Size=Small	185120	0.51		0.00	1.00
Size=Medium	185120	0.31		0.00	1.00
Size=Large	185120	0.17		0.00	1.00
Location	203744	0.39		0.00	1.00
Ownership	203744	0.79		0.00	1.00
Export	151523	0.30		0.00	1.00
Sales (ln)	174412	15.53	4.14	-1.55	35.53
Credit Line	170535	0.47	0.50	0.00	1.00
Tax Inspection Frequency	121863	3.72	10.08	0.00	720.00
Corruption of Tax Officials	119656	0.20	0.40	0.00	1.00
Business Environment 1	166122	2.15	0.89	0.89	4.64
Business Environment 2	178925	1.99	0.90	0.84	4.95
Time Spent	186372	10.03	17.19	0.00	100.00
DTF-Taxes	464	58.85	18.54	0.00	91.45
DTF-Construction Permit	464	57.61	17.68	0.00	91.38
DTF-Electricity	249	61.71	18.54	11.96	94.34
DTF-Registration	464	63.43	18.37	0.00	99.86
DTF-Access to Credit	464	50.75	22.22	6.25	93.75
DTF-Trade Regulations	464	56.51	23.29	0.00	94.25
DTF-Contract Enforcement	464	56.98	13.49	2.08	83.44
Number of third tiers	200	198.14	564.98	14.00	5564.00
Number of taxing tiers	464	2.05	0.63	1.00	3.00