UNITED NATIONS UNIVERSITY
UNU-WIDER

WIDER Working Paper 2020/10

Is there a fiscal resource curse?

Resource rents, fiscal capacity, and political institutions in developing economies

Tania Masi,[1] Antonio Savoia,[2] and Kunal Sen[3]

February 2020

United Nations University World Institute for Development Economics Research
wider.unu.edu

Abstract: States' fiscal capacity plays a pivotal role in developing economies, but it is less clear what its determinants are or what explains cross-country differences. We focus on the impact of natural resources. Standard arguments suggest that natural resources rents may reduce incentives to invest in fiscal capacity. However, political institutions that limit rulers' discretion over the use of resource revenues may mitigate or neutralize this negative effect. We investigate this hypothesis using panel data for 1995 to 2015 for 62 developing countries. The results suggest: (1) point-source resources are negatively associated with fiscal capacity, while diffuse resources are not; (2) developing economies with institutionalized executive constraints can neutralize the negative effect of point-source resources; (3) the effect of resource rents works mainly through institutions that make the tax system accountable and transparent. Thus it is possible to develop both fiscal capacity and the natural resources sector, without any trade-off.

Key words: state capacity, fiscal capacity, resource curse, institutions, constraints on the executive, economic development

JEL classification: D7, N4, O4, P5

Acknowledgements: An earlier version of this paper was published as:

Masi, T., A. Savoia, and K. Sen (2018). 'Is There a Fiscal Resource Curse? Resource Rents, Fiscal Capacity and Political Institutions'. Working Paper 96. Manchester: ESID. Available at: www.effective-states.org/wp-content/uploads/working_papers/final-pdfs/esid_wp_96_masi_savoia_sen.pdf (accessed 10 February 2020).

[1] University of Milano-Bicocca, Milan, Italy [2] Global Development Institute, University of Manchester, Manchester, UK, corresponding author: antonio.savoia@manchester.ac.uk [3] UNU-WIDER, Helsinki, Finland and Global Development Institute, University of Manchester, Manchester, UK

This study has been prepared within the UNU-WIDER project Fiscal states—the origins and developmental implications, which is part of the Domestic Revenue Mobilization programme. The programme is financed through specific contributions by the Norwegian Agency for Development Cooperation (Norad).

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-767-5

https://doi.org/10.35188/UNU-WIDER/2020/767-5

Typescript prepared by Merl Storr.

The United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

The effect of natural resources abundance on less developed economies has been a lively area of research for many years.[1] Traditionally, most research has concentrated on long-term growth effects, initially finding a 'resource curse', and more recently arguing that the long-term effect of specializing in natural resources depends on the types of resource (e.g., Isham et al. 2005) and the quality of the institutional environment in the economy (e.g., Mehlum et al. 2006).[2] As yet, less analysis has been devoted to other development outcomes. For example, underexplored areas include the effects on inequality (Carmignani 2013; Fum and Hodler 2010; Goderis and Malone 2011), education (Ebeke et al. 2015; Stijns 2006), health, and living standards (Caselli and Michaels 2013; Edwards 2016; Pineda and Rodriguez 2010). This paper contributes to this literature by looking at a further underexplored issue: the effects of natural resources income on state capacity, particularly fiscal capacity[3] in less developed economies.

Our hypothesis is that natural resources rents reduce governments' incentives to invest in the tax system, but that this effect depends on whether political institutions limit the power of the executive and hence reduce rulers' discretion over the use of resource revenues. We test this hypothesis using panel regressions on a sample of 62 developing countries from 1995 to 2015, using data from the new 'Wealth Accounting' data set (World Bank 2018a) and two different measures of fiscal capacity constructed using the recent government revenues data set, which provides improved country coverage and crucially distinguishes between resource and non-resource revenues (ICTD/UNU-WIDER 2019). After extensive robustness checks, we find evidence that rents coming from point-source resources have a negative effect on fiscal capacity, but in countries with political institutions that place institutionalized constraints on executive power, this effect disappears. Hence, a fiscal resource curse does not necessarily materialize. We complement panel results with further analysis assessing how the interaction between political institutions and resource rents affects specific aspects of tax systems. Using a recent set of indicators by the Public Expenditure and Financial Accountability project (PEFA 2006), cross-

[1] The literature has referred to resource 'abundance' or 'richness', 'dependence', 'intensity', 'boom', or 'windfall' (see Brunnschweiler and Bulte 2008; Norman 2009; Stijns 2006). The term 'dependence' usually refers to the structure of the economy (e.g., captured as resource exports as a share of gross domestic product). 'Intensity' refers to the rate at which one exploits natural resources. 'Boom' and 'windfall' pertain to shocks, either because new natural resources are discovered or because there is an increase in commodity prices. 'Abundance' or 'richness' concern the value of the natural resources endowments or the income they generate, measurable as subsoil wealth or resource rents, but they have also been used as terms that encompass all the above aspects. Here we use them in this latter sense.

[2] Many studies have addressed the counter-intuitive idea that countries that are rich in exploitable natural resources perform worse than those without such resources. Much of the early literature argues for the adverse effect of natural resources abundance on economic growth (e.g., Gylfason 2001; Rodriguez and Sachs 1999; Sachs and Warner 2001). See van der Ploeg (2011) for a comprehensive survey of the hypotheses and evidence. Alongside the focus on growth, the literature has also shown that natural resources abundance leads to higher levels of corruption (e.g., Caselli and Michaels 2013), civil conflicts (e.g., Collier and Hoeffler 2004), and less democracy (e.g., Ross 2015). The negative effects of natural resources are controversial, however. For example, Alexeev and Conrad (2009) claim that a large endowment of oil and mineral resources has a positive effect on long-term economic growth and does not negatively impact on the quality of institutions. Cotet and Tsui (2013) contradict the statistical association between the value of oil reserves and the onset of civil war, and Haber and Menaldo (2011) find that increasing resource dependence does not promote dictatorship over the long run. Bjorvatn and Naghavi (2011) argue that higher resources rents may promote political stability. Finally, Stijns (2006) does not find any robust negative effect of resources abundance on human capital.

[3] Following Besley and Persson (2011), fiscal capacity is the ability of a fiscal system to raise revenues from a broad tax base.

section evidence suggests that the effect works mainly through institutions that make the tax system accountable and transparent, thereby facilitating a fiscal bargain between ruler and citizens.

As well as contributing to the literature on the resource curse, our paper adds to the research on the determinants of fiscal capacity. This is an area that has seen extensive research on the origins of fiscal states in currently advanced economies. But there has been relatively little analysis so far of developing economies, especially empirical work, even though fiscal capacity is considered to be at the root of long-run development (Savoia and Sen 2015). Indeed, the capacity to collect revenues is at the heart of state formation and is indispensable for the provision of public goods and investments in infrastructure in less developed economies (e.g., Besley and Persson 2011, 2013; Osafo-Kwaako and Robinson 2013), but stylized facts suggest that they collect on average a significantly smaller share of taxes compared with advanced market economies (Besley and Persson 2014). Hence, assessing whether a geographical feature that shapes the structure of the economy, such as the presence of a significant natural resources sector, comes with the likely price of weaker tax systems may have relevant economic and policy trade-offs. We find that this is not the case if countries have suitable political institutions.

The paper is structured as follows. Section 2 reviews the literature and sets out our hypotheses; Section 3 describes the empirical strategy and data. In Section 4, we test our hypotheses and present evidence on the mechanisms through which natural resources affect the fiscal system. Section 5 concludes.

2 Resource rents, fiscal capacity, and political institutions

Standard arguments suggest that increasing natural resources rents may be harmful to taxation, as governments tend to substitute tax revenues with resource revenues. Hence, there may be a fiscal resource curse. Part of the literature has studied this hypothesis with respect to the short-term macroeconomic consequences for taxation, in terms of amount and composition of tax revenues, and public finance management. James (2015) argues that, in response to higher resource revenues, governments decrease non-resource tax rates and increase spending and savings, providing US state-level evidence: a US$1 increase in resource revenues results in a US$0.25 decrease in non-resource revenues, a US$0.43 increase in government spending, and a US$0.32 increase in public savings. Arezki and Brückner (2012) show that resource revenue windfalls have a heterogeneous effect on sovereign bond spreads, reducing the spread in democracies, but increasing it in autocracies. Focusing on the consequences for tax composition in resource-rich economies, Crivelli and Gupta (2014) find a large negative impact of resource revenues on the taxation of goods and services, and a more modest impact on corporate income tax and trade taxes. Looking at tax performance, Morrissey et al. (2016) find that a reliance on natural resources amplifies the negative effects of macroeconomic shocks (terms of trade, exchange rates, and natural disasters) on total revenues. However, democracies tend to outperform non-democracies in revenue resilience to shocks in lower-income countries.

Another part of the literature has looked instead at the long-term consequences, i.e. the effect of natural resources rents on tax system-building. The political science literature has long described rentier states, whose main features are their dependence on revenues from natural resources and the weakness and lack of accountability of their state institutions (e.g., see Karl 2004). Building on this line of research, Besley and Persson (2011) formally show that governments discovering natural resources today with anticipated revenues in future years see a reduced incentive to invest in fiscal capacity, because the availability of natural resources endowments provides a new and easy-to-obtain source of revenues (where taxation relies on royalty payments) compared with

value-added tax and income taxes. Knack (2009) presents initial cross-section evidence that is partly consistent with this hypothesis. Jensen (2011) provides further evidence from a panel of 30 hydrocarbon-rich economies, finding that a one per cent increase in hydrocarbon revenues is associated with a 1.5 per cent decrease in non-resource tax effort, used as a proxy for fiscal capacity. An earlier panel study by Bornhorst et al. (2009), on a similar sample of countries and variables, finds a smaller effect: an additional percentage point of revenue from hydrocarbons reduces revenues from other domestic sources by 0.19 percentage points of gross domestic product (GDP).

Although the literature hypothesizes a negative effect of natural resources rents on fiscal capacity, the actual empirical evidence is fairly limited, often fraught with methodological challenges (e.g., measurement of fiscal capacity, endogeneity, sample size), and hence in need of systematic investigation if one wants to probe into the generality of a fiscal resource curse. Above all, existing studies do not consider a crucial aspect at the heart of our analysis: the interplay between natural resources rents and the quality of institutions. A number of papers argue, and empirically demonstrate, that institutions can mitigate or even reverse the resource curse (e.g. Bhattacharyya and Hodler 2010, 2014; Boschini et al. 2007; Brunnschweiler 2008; Ebeke et al. 2015; El Anshasy and Katsaiti 2013; Masi and Ricciuti 2019; Melhum et al. 2006; Omgba 2015).[4] Two explanations have been put forward to understand the role of institutions: one emphasizes rent-seeking mechanisms (Melhum et al. 2006; Tornell and Lane 1999; Torvik 2002), and the other patronage (Caselli and Cunningham 2009; Robinson et al. 2006).[5] According to the former, the economic institutions governing the private sector are key. Thus, natural resources hinder economic growth only if the quality of institutions that govern the profitability of productive enterprise is such that individuals switch from productive to unproductive activities. For example, Melhum et al. (2006) argue that the combination of resource abundance and 'grabber-friendly' institutions is detrimental to economic development, while 'producer-friendly' institutions help countries to take full advantage of their natural resources endowments. On the other hand, the patronage explanation focuses on the institutions governing the use of public sector resources. Resource rents increase the value of incumbency and provide ruling groups with more funds that can be used to retain power (e.g., to influence the outcome of elections), thereby increasing resource misallocation in the rest of the economy.

Rent-seeking and patronage effects are not mutually exclusive and can operate together. However, the presence of accountability mechanisms for state leadership can neutralize the perverse incentives that resource rents create. This is where political institutions that place effective constraints on a ruler can play a major role so that an economy can have both private sector and state institutions that avert rent-seeking and patronage mechanisms. For example, it has been argued that limits on executive power promote contracting and property rights institutions that foster productive activities so that a large cross-section of society can take advantage of economic opportunities (Acemoglu et al. 2005). Similarly, limits on executive power promote a common

[4] The literature interested in the effects on growth has proposed additional mitigating mechanisms. Andersen and Aslaksen (2008) argue that what matters in reducing negative effects on growth is the constitutional arrangement: presidential regimes and proportional electoral systems are more likely to be afflicted by the resource curse. The detrimental effect of natural resources on growth may also be reversed by high human capital endowments (Kurtz and Brooks 2011), while public spending might mitigate civil conflicts related to oil wealth (Bodea et al. 2016).

[5] Caselli and Cunningham (2009) define the underlying mechanisms of these models as decentralized and centralized respectively. Other mechanisms (soft budget constraint and wealth effect) are considered to be of secondary importance.

interest environment in which the ruling minority are unable to hand out favours to their cronies or themselves (Besley and Persson 2011).

Coming to the focus of this paper, if natural resources rents harm fiscal capacity, why should a higher level of checks and balances on executive power be able to change this effect? This is because a ruler who is subject to institutionalized checks and balances has less discretion over public finance decisions than one who is not, including over decisions regarding the use of natural resources rents. One mechanism concerns the presence of independent institutional actors within the national government that can control and limit the use of state resources so as to demand greater accountability with respect to budgetary planning and implementation. For example, in parliamentary systems, an effective parliament can institutionally oversee and audit the state budget. This implies that the executive may be more likely to promote an effective and independent civil service (rather than one based on patronage, which might undermine the competence of the state bureaucracy) and so maintain or innovate fiscal infrastructures and the state's ability to raise revenues. Another mechanism concerns the possibility that chief executives subject to formal limitations on their power may be more likely to follow the rule of law, so that an independent judicial system may be more effective against any breach of tax laws or abuses in tax levies.

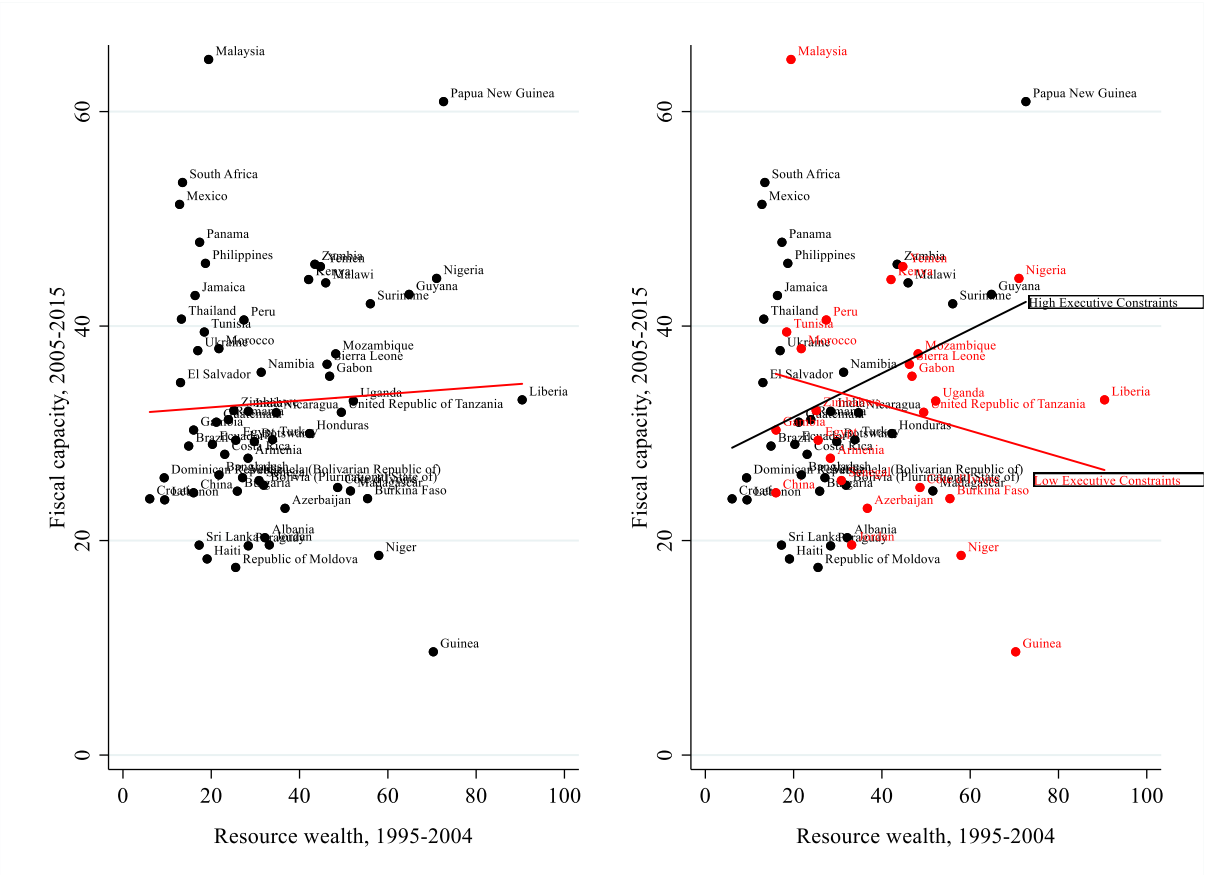
Let us reformulate our argument on the role of natural resources rents in developing fiscal capacity and their interplay with political institutions via two testable hypotheses:

1. Resource rents reduce incentives to invest in fiscal capacity, so resource-rich countries have less developed tax systems.
2. Political institutions that place limits on executive power promote accountability and common interests. The negative effect of natural resources rents on fiscal capacity is therefore mitigated or neutralized in countries with a higher level of executive constraint.

As a preliminary piece of evidence, Figure 1 seems to suggest that the level of resource rents a country collects is not well correlated with the level of fiscal capacity (left-hand side scatter). However, splitting the sample into countries with political institutions that place high or low levels of constraint on the executive power (right-hand side scatter) shows that the effect of resource rents on taxation can be heterogeneous, depending on the type of political institution.[6] The rest of this paper investigates the above hypotheses, starting with a discussion of the empirical strategy and data in the following section.

[6] Fiscal capacity is the ratio between the non-resource component of taxes on income, profits, and capital gains and total non-resource tax revenues excluding social contributions (from ICTD/UNU-WIDER 2019), averaged over the period 2005 to 2015. Resource rents are averaged between 1995 and 2004 and are from World Bank (2018a). To divide the sample, we consider the mean value of executive constraints from Polity IV (Marshall et al. 2014). Variables and sources are described in Table A1 in the Appendix. The apparently heterogeneous effect of natural resources rents is confirmed even when possible outliers such as Malaysia and Papua New Guinea are excluded from the sample (Figure A1 in the Appendix). Note also that resource rents do not include diamond revenues among the minerals, thereby obscuring interesting comparisons such as Botswana versus Sierra Leone.

Figure 1: Relationship between non-resource tax and natural resources rents



Source: authors' calculations based on data from World Bank (2018a) and ICTD/UNU-WIDER (2019).

3 Empirical strategy and data

There are two possible approaches to estimate the effect of resource rents on fiscal capacity. The first estimates the relationship under investigation using cross-country data in levels, since the types of mechanism we seek to document look at the structural conditions under which countries develop capable states, and are therefore long-term in nature. In this case, regressions based on cross-section averages, as shown in Figures 1 and A1, are suitable. However, there are at least two problems with this approach. The first is vulnerability to omitted variable bias, as there may be several hard-to-capture factors correlated with both the volume of resource rents and state capacity. The second is that shaping the structure of the economy, including its degree of reliance on natural resources, is a process driven by a variety of social forces, including state institutions. Hence, the estimated effect of reliance on natural resources might be affected by reverse causality and so subject to bias.

The second approach relies on assessing whether the type of relationship documented in Figures 1 and A1 disappears when we look at the effect of changes in resource rents on fiscal capacity. If it does not, we are probably capturing a causal effect. This approach involves the use of panel methods. In particular, looking at the effect of changes in resource income on fiscal capacity eliminates confounding time-invariant country-specific factors. That is, fixed effects can be added to take care of country-specific factors that affect both resource rents and fiscal capacity, while time effects can be added to control for common trends.

We prefer the panel approach, but we also present cross-section estimates, as we provide further results on how resource rents may affect the tax systems. This is coupled with the choice of a resource income variable that allows clean identification of its effect. We use the share of natural capital wealth over total wealth, from the 'Wealth Accounting' data set (World Bank 2018a). It measures the present value of natural resources rents, aggregating hydrocarbons, minerals, forest, and agricultural commodities. Because it captures the expected size of the rents accruing from natural resources at a certain point in time, this variable is in line with the intuition that a greater expected income from natural resources may reduce the incentive to tax. As resource rents are based on commodity prices, it presents an additional advantage.[7] Assuming that both the identity of a country's commodities and world prices are largely exogenous to state institutions, this measure avoids identification problems related to the estimation of the effects of natural resources. This assumption can be tested, albeit indirectly. We investigate whether it holds by excluding from the sample large commodity-producing countries that are potentially able to influence world prices.[8]

We estimate:

$$FC_{i,t} = b_0 + b_1 RR_{i,t\text{-bar}} + b_2 EC_{i,t\text{-}4} + b_3 RR_{i,t\text{-bar}} * EC_{i,t\text{-}4} + \boldsymbol{b}\mathbf{X}_{i,t} + \mu_i + \lambda_t + u_{i,t} \quad [1]$$

$FC_{i,t}$ is fiscal capacity for country i at year t. Capturing this concept is particularly challenging.[9] The literature proposes two approaches. The first—which is near ideal, as it is closer to the concept one wants to capture—is to have a direct measure of the institutions that are part of the tax system; but such measures are scarce, cover few countries (when available at all), and are not immune from methodological challenges themselves.[10] The second is to resort to outcome-based proxies, such as tax effort ratios. Such measures may well reflect the political preferences of a polity regarding the size of the public sector and the scope for redistribution (Lieberman 2002), but they have the major advantage of being available for a large number of countries over time. We use both types of fiscal capacity measure. In cross-section results, we use the first type, using a set of indicators on the quality of specific characteristics of the tax system. In panel regressions, we instead use two types of tax effort ratio. Our main measure of fiscal capacity is given by the ratio between non-resource taxes on income, profits, and capital gains and total non-resource tax revenues. Contrary to previous proxies of fiscal capacity, which are often based on total taxes as a share of GDP, ours is more likely to separate the capacity to raise taxes from governments' policy choices. Indeed, collecting income taxes requires major investments in fiscal infrastructures compared with other types of tax (Besley and Persson 2011: 41–42). For robustness, we also use as an alternative dependent variable the total non-resource tax revenues as a share of GDP. Data is from the recent 'Government Revenues' data set (ICTD/UNU-WIDER 2019). This data set combines data from

[7] Resource rent estimation is based on sources and methods fully described by the World Bank (2011), i.e. on the difference between the price of a commodity and the average cost of producing it, estimating the world price of units of specific commodities and subtracting estimates of average unit costs of extraction or harvesting costs (including a normal return on capital). The unit rents are then multiplied by the quantities countries extract or harvest to determine the rents for each commodity as a share of GDP. Such measures are based on estimates and therefore are subject to measurement error. However, as long as the noise approximates a classic errors-in-variable case, this is a source of attenuation bias. Therefore, it stacks the odds against our results, implying that estimates of the effects of natural resources rents may be conservative.

[8] This approach was first proposed by Caselli and Tesei (2016).

[9] The key challenge in measuring state capacity is to avoid conflating state capacity (which is about institutions) with state performance (which is about outcomes). See the discussion in Centeno et al. (2017).

[10] The practice of measurement involves making choices subject to significant trade-offs (e.g., objective versus subjective measurement, or *de jure* versus *de facto*). On this, see Savoia and Sen (2015).

several international databases, with marked improvements in data coverage. Crucially, it also allows us to distinguish the natural resources component of tax revenues from the non-resource component, thereby improving the accuracy of measurement compared with sources used in previous studies (see Prichard et al. 2014)).[11]

$RR_{i,t\text{-}bar}$ is the resource rent as described above, averaged over t-4 to t-1 (with a non-overlapping structure), allowing for possible lags in the reaction of fiscal authorities to events in the natural resources sector and in the political system.[12] $EC_{i,t\text{-}4}$ captures the quality of political institutions (at the beginning of the five-year episode). In line with our hypothesis, it is measured by the executive constraints variable (*xconst*) provided by the Polity IV data set (Marshall et al. 2014) and defining the extent of constitutional limits on the exercise of arbitrary power by the executive. $RR_{i,t\text{-}bar} * EC_{i,t\text{-}4}$ is the interaction between resources rents and political institutions.

$X_{i,t}$ is a set of time-varying controls (also averaged over t-4 to t-1, with a non-overlapping structure). Some of them are standard variables from the literature on the origins of state capacity, including population density, external and internal conflict, and aid. Population density should be positively correlated with fiscal capacity, assuming that it is less challenging to develop a fiscal apparatus in states where the population is concentrated in urban areas (Herbst 2000). We use the number of people per square kilometres of land, as calculated by the World Bank (2018b). External conflicts increase the demand for public services such as defence, and thereby increase the incentive to invest in state capacity. On the other hand, civil wars hinder the development of an efficient fiscal apparatus (Besley and Persson 2011). To capture these effects, we use external and internal conflicts (ICRG 2018) respectively. Development assistance has been compared to natural resources in terms of its possible patronage effect (e.g., Morrison 2010). Therefore we use data from the World Bank (2018b) that measures aid dependence to control for the potential negative effects of development assistance. Finally, given the nature of our proxy for fiscal capacity, we also add controls that are macroeconomic in nature, as suggested in empirical studies on tax effort (e.g., Crivelli and Gupta 2014): the level of external debt (IMF 2019), and the sum of exports and imports of goods and services measured as a share of GDP (World Bank 2018b). Tables A1 and A2 in the Appendix describe variables, sources, and the sample.

All regressions include country and year dummies (μ_i and λ_t respectively). Standard errors are clustered at the country level to allow for unknown forms of heteroskedasticity and serial correlation. We study a sample of 62 developing countries from 1995 to 2015. The descriptive statistics presented in Table 1 show that our key variables vary both across countries and over time.

[11] We use the merged version of the data set in order not to underestimate fiscal capacity in countries with a federal system.

[12] This approach appears to be standard in the resource curse literature (e.g., Bhattacharyya and Hodler 2010; Caselli and Tesei 2016), as well as in the broader political economy literature investigating institutional factors (e.g., Klomp and de Haan 2016). Presumably, empirical analyses using a panel with 'high-frequency' data (e.g., yearly) would fail to properly capture structural characteristics.

Table 1: Summary statistics

	Mean	Standard deviations			Minimum	Maximum
		Overall	Between	Within		
Fiscal capacity	0.30	0.11	0.10	0.05	0.12	0.65
Executive constraints	4.09	1.61	1.52	0.60	0	6
Resources wealth	0.29	0.17	0.18	0.04	0.06	0.99
Diffuse resources wealth	0.21	0.15	0.16	0.03	0.03	0.98
Point-source resources wealth	0.04	0.07	0.07	0.02	0	0.46
Agricultural wealth	0.17	0.12	0.13	0.03	0.01	0.54
Forest wealth	0.04	0.07	0.08	0.01	0	0.59
Mineral wealth	0.01	0.03	0.03	0.02	0	0.23
Coal wealth	0.002	0.008	0.008	0.02	0	0.07
Gas wealth	0.002	0.008	0.009	0.002	0	0.06
Oil wealth	0.03	0.07	0.07	0.02	0	0.41
External debt	57.81	43.87	46.54	32.30	9.46	443.62
Trade	78.17	34.17	34.83	10.73	18.99	219.46
Net ODA and aid per capita	47.99	47.79	45.07	20.41	-4.52	239.41
Population density	111.03	154.17	162.14	14.06	1.87	1203.46
External conflicts	1.96	1.23	1.09	0.70	0	6.72
Internal conflicts	3.12	1.51	1.22	0.93	0	11.08

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

4 Results

This section presents the results. We begin by assessing panel evidence on whether the effect of resource rents on fiscal capacity depends on the level of constraint on the executive. A series of robustness checks follows. We first look at whether and which types of natural resource drive the results, and whether the results hold when we use an alternative dependent variable. Then we assess the identifying assumption. Finally, we present further results based on cross-section estimates, investigating which specific institutions within the tax system are affected.

4.1 The effect of natural resources rents on fiscal capacity

Table 2 presents our baseline results. Column 1 shows a negative but insignificant effect of total natural resources rents on fiscal capacity. Apparently, there is no support for the hypothesis under scrutiny when we consider all types of natural resources together. What if the effect is different for different types of natural resource? A popular argument has suggested that the resource curse is specific to resources extracted from a narrow geographical base—called point-source resources—as they are more susceptible to predatory behaviour on the part of local elites, whereas those extracted from a broad geographical base—called diffuse resources—are less so (Isham et al. 2005). To consider this possibility, we isolate the effect of point-source rents by grouping together oil, minerals, gas, and coal rents. Similarly, we sum agricultural and forest rents to isolate the effect of diffuse resources.[13] The results show that, on average, fiscal capacity tends to be lower

[13] As Isham et al. (2005) note, classifying point-source and diffuse resources is not always a clear-cut exercise. Hence, no related measurement is perfect, including ours. Nonetheless, this exercise is in line with the original idea and the subsequent research that has pursued it. Future research should also consider the further distinction between lootable and non-lootable natural resources, as proposed by Vahabi (2016), who extends and generalizes the idea that the

when countries experience an increase in resource rents coming from point-source resources. However, the interaction term is significantly positive, suggesting that the negative effect of such resource rents is offset when the level of executive constraint increases. This effect seems to be absent for diffuse natural resources.

Table 2: Fiscal capacity and resource wealth

	(1) All resources	(2) Diffuse resources	(3) Point-source resources	(4) Diffuse and point-source resources
Executive constraints	-0.006	0.002	-0.003	-0.008
	(0.007)	(0.006)	(0.005)	(0.008)
Resource wealth	-0.088			
	(0.167)			
Resource wealth*Exec. constraints	0.029			
	(0.020)			
Diffuse resources		0.112		0.121
		(0.153)		(0.126)
Diffuse resources*Exec. constraints		0.008		0.021
		(0.021)		(0.019)
Point-source resources			-0.597*	-0.608**
			(0.303)	(0.300)
Point-source res.*Exec. constraints			0.140**	0.153***
			(0.054)	(0.057)
External debt	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.001**	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Aid per capita	-0.000	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
External conflicts	-0.000	-0.001	-0.000	-0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Internal conflicts	0.003	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Population density	0.001***	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.165**	0.089*	0.164***	0.137***
	(0.064)	(0.053)	(0.039)	(0.051)
Observations	213	213	213	213
Number of countries	62	62	62	62
Joint(p)	0.341	0.658	0.0388	0.0991
Adjusted R-squared	0.409	0.404	0.453	0.457
Year FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES

Notes: dependent variable is fiscal capacity measured as non-resource income tax as a percentage of non-resource total tax revenue. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

effects of natural resources are specific to their degree of appropriability. However, this is not something that available resource rents data allows us to investigate yet.

Table 3 shows the marginal effects of natural resources rents at different levels of constraint on the executive. This confirms that diffuse natural resources have no significant effect. Point-source resources, however, negatively affect fiscal capacity when the level of executive constraint is very low (a score of zero or one). For countries such as Nigeria and Saudi Arabia, where constitutional restrictions on executive action are weak for significant periods, a one percentage point increase in point-source resources rents would reduce the ability to raise direct taxes, our proxy for fiscal capacity, by approximately 0.61 percentage points. Considering that the (within) standard deviation in resource rents is above three percentage points, such effects also appear to be economically significant. Resource rents, however, have no effect in countries with medium or high levels of checks and balances on executive power (e.g., Peru and Chile).

Table 3: Marginal effects of resource wealth at different levels of executive constraint

	All resources	Diffuse resources	Point-source resources
Executive constraints	b/se	b/se	b/se
0	-0.088	0.121	-0.608**
	(-0.17)	(-0.13)	(-0.3)
1	-0.059	0.142	-0.455*
	(-0.16)	(-0.13)	(-0.27)
2	-0.03	0.163	-0.302
	(-0.16)	(-0.14)	(-0.25)
3	-0.001	0.183	-0.148
	(-0.15)	(-0.15)	(-0.24)
4	0.028	0.204	0.005
	(-0.16)	(-0.16)	(-0.24)
5	0.058	0.225	0.159
	(-0.16)	(-0.17)	(-0.26)
6	0.087	0.245	0.312
	(-0.16)	(-0.19)	(-0.28)

Notes: marginal effects of diffuse and point-source resources are calculated using the coefficients from Table 2, column 4.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

4.2 Do different natural resources have different effects?

Next, we study in more detail the effect of specific natural resources. This may reveal whether and which resources are more likely to affect fiscal capacity. Hence, in Table 4 we consider individual components of total natural resources rents: agricultural, forest, oil, gas, coal, and mineral rents. When disaggregated by type of resource, the results find that agriculture and oil may be the main drivers of the heterogeneous effect on fiscal capacity. Indeed, linear restriction tests on their coefficient and the respective interaction terms always reject the null that the effect of such resources is different from zero, while this is not the case for forest, mineral, gas, and coal rents. However, Table 5, which reports the marginal effects for each type of resource rent, shows that oil only has a negative and significant effect on fiscal capacity, but this effect vanishes when the level of executive constraint score is at least three.[14]

[14] Note that collinearity may prevent us from giving a clearer verdict, so we cannot conclusively state that no other interaction effect for other resources is at work. It is not uncommon that introducing (multiple) interaction terms generates significant collinearity. For example, in the last column of Table 4, most interaction terms are insignificant, but a test of the linear restriction that all resources and their interaction terms are jointly zero rejects the null. Tests on the linear restriction that the coefficient of both oil and agricultural rents and its respective interaction terms are

Table 4: Fiscal capacity and different types of resource wealth

	(1) Agricult. wealth	(2) Forest wealth	(3) Mineral wealth	(4) Coal wealth	(5) Oil wealth	(6) Gas wealth	(7) All resources
Executive constraints	-0.003	0.007	0.004	0.004	-0.000	0.001	-0.011
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)
Agricultural wealth	0.013						-0.087
	(0.203)						(0.153)
Agric. wealth*Exec. constraints	0.033						0.055**
	(0.028)						(0.023)
Forest wealth		0.119					0.208
		(0.158)					(0.176)
Forest wealth*Exec. constraints		-0.082					-0.036
		(0.053)					(0.062)
Mineral wealth			-0.049				-0.002
			(0.249)				(0.354)
Mineral wealth*Exec. constraints			0.091*				0.067
			(0.046)				(0.065)
Coal wealth				-0.200			-1.193
				(1.883)			(1.167)
Coal wealth*Exec. constraints				0.033			0.064
				(0.262)			(0.231)
Oil wealth					-0.664**		-0.667**
					(0.264)		(0.266)
Oil wealth*Exec. constraints					0.095		0.081*
					(0.061)		(0.041)
Gas wealth						-2.590	-0.993
						(4.462)	(4.842)
Gas wealth*Exec. constraints						1.328	0.991
						(1.095)	**(1.105)**
External debt	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.001**	0.001***	0.001**	0.001***	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Aid per capita	-0.000	-0.000	-0.000**	-0.000*	-0.000*	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
External conflicts	-0.001	-0.000	0.001	0.000	-0.000	0.000	-0.002
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Internal conflicts	0.003	0.003	0.003	0.003	0.003	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Population density	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.126**	0.109***	0.117***	0.119***	0.157***	0.133***	0.177***
	(0.054)	(0.041)	(0.041)	(0.043)	(0.038)	(0.044)	(0.056)

jointly equal to zero always reject it (the related p-value is 0.07 in both cases). The related p-value of the same tests for forest rents is 0.12, for mineral rents is 0.11, for coal rents is 0.95, and for gas rents is 0.29.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Observations	213	213	213	213	213	213	213
Number of countries	62	62	62	62	62	62	62
Joint(p)	0.353	0.0603	0.0444	0.992	0.0439	0.385	7.03e-05
Adjusted R-squared	0.407	0.411	0.416	0.399	0.451	0.413	0.470
Year FE	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES

Notes: dependent variable is fiscal capacity measured as non-resource income tax as a percentage of non-resource total tax revenue. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

Table 5: Marginal effects of resource wealth at different levels of executive constraint

	Agricult. wealth	Forest wealth	Mineral wealth	Coal wealth	Oil wealth	Gas wealth
Executive constraints	b/se	b/se	b/se	b/se	b/se	b/se
0	-0.087	0.208	-0.002	-1.193	-0.667**	-0.993
	(-0.15)	(-0.18)	(-0.35)	(-1.17)	(-0.27)	(-4.84)
1	-0.032	0.172	0.066	-1.129	-0.585**	-0.003
	(-0.15)	(-0.2)	(-0.31)	(-1.07)	(-0.25)	(-3.98)
2	0.024	0.135	-0.133	-1.064	-0.504**	0.988
	(-0.16)	(-0.25)	(-0.26)	(-1.02)	(-0.25)	(-3.26)
3	0.079	0.099	0.201	-1.00	-0.423*	1.979
	(-0.16)	(-0.29)	(-0.23)	(-1.02)	(-0.25)	(-2.8)
4	0.134	0.063	0.268	-0.936	-0.342	2.969
	(-0.17)	(-0.35)	(-0.22)	(-1.07)	(-0.26)	(-2.74)
5	0.189	0.027	0.335	-0.872	-0.261	3.96
	(-0.18)	(-0.4)	(-0.22)	(-1.16)	(-0.27)	(-3.11)
6	0.244	-0.01	0.403*	-0.807	-0.18	4.951
	(-0.2)	(-0.46)	(-0.24)	(-1.29)	(-0.29)	(-3.77)

Notes: the marginal effects of diffuse and point-source resources are calculated using the estimates from Table 4, Column 7.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

The general message remains that natural resources may be a curse or not, depending on the level of executive constraint and the type of natural resource. This set of results confirms earlier empirical findings on the negative effects of point-source resources, and in particular offers support to those arguing in favour of a curse of oil (e.g., Ross 2015), but it extends and qualifies those findings, suggesting that negative effects may not materialize, depending on the nature of political institutions.

4.3 Are the results robust to the use of an alternative dependent variable?

Panel results are already robust to controls for all time-invariant variables and for a number of time-varying variables included in the regressions, as well as to controls for time effects. In addition, we test if they hold with an alternative dependent variable. As has been considered in earlier studies (e.g., Bornhorst et al. 2009), we experiment with total non-resource tax revenues as a share of GDP from ICTD/UNU-WIDER (2019). Table 6 only reports the marginal effects from this exercise, to save space. They largely confirm our findings.

Table 6: Robustness checks using an alternative independent variable: marginal effects of resource wealth at different levels of executive constraint

	Dependent variable: total non-resource taxes/GDP		
	All resources	Diffuse resources	Point-source resources
Executive constraints	b/se	b/se	b/se
0	-0.037	0.009	-0.144**
	(-0.03)	(-0.04)	(-0.07)
1	-0.025	0.022	-0.120**
	(-0.03)	(-0.04)	(-0.06)
2	-0.012	0.036	-0.097*
	(-0.03)	(-0.04)	(-0.06)
3	0.001	0.049	-0.073
	(-0.03)	(-0.05)	(-0.06)
4	0.013	0.062	-0.05
	(-0.03)	(-0.05)	(-0.07)
5	0.026	0.075	-0.026
	(-0.04)	(-0.05)	(-0.08)
6	0.038	0.088	-0.002
	(-0.04)	(-0.06)	(-0.1)

Notes: dependent variable is fiscal capacity measured as total non-resource taxes as a percentage of GDP.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

4.4 Does the identifying assumption hold?

Our results are based on the assumption that resource rents, measured on the basis of international commodity prices, are exogenous to a country's institutions, whereas large commodity producers can potentially influence world commodity prices and so raise endogeneity concerns with respect to our variable of interest. Here we provide an indirect test of this assumption, by excluding from the sample all members of the Organization of the Petroleum Exporting Countries (OPEC) and countries that account for more than three per cent of total world production of a certain commodity.[15] As a result, the key findings on the heterogonous impact of natural resources prove to be robust (Tables 7 and 8).

[15] We identify OPEC members and big producers following Caselli and Tesei (2016).

Table 7: Robustness checks: excluding big producers and OPEC countries

	Excluding big producers				Excluding OPEC countries			
	All resources	Diffuse resources	Point-source resources	Diffuse and point-source resources	All resources	Diffuse resources	Point-source resources	Diffuse and point-source resources
Executive constraints	-0.011	-0.003	-0.004	-0.012	-0.002	0.005	-0.002	-0.005
	(0.007)	(0.007)	(0.006)	(0.008)	(0.007)	(0.007)	(0.005)	(0.008)
Resource wealth	-0.117				-0.034			
	(0.196)				(0.189)			
Resource wealth*Exec. constraints	0.042**				0.014			
	(0.019)				(0.020)			
Diffuse resources		0.169		0.218		0.210		0.148
		(0.184)		(0.151)		(0.140)		(0.130)
Diff. resources*Exec. constraints		0.030		0.037*		-0.009		0.012
		(0.024)		(0.022)		(0.019)		(0.021)
Point-source resources			-0.664**	-0.692**			-0.873***	-0.874***
			(0.312)	(0.300)			(0.270)	(0.269)
Point-source res.*Exec. constraints			0.162**	0.180**			0.239***	0.248***
			(0.073)	(0.075)			(0.069)	(0.074)
External debt	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.001**	0.001**	0.001***	0.001**	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Aid per capita	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
External conflicts	0.001	-0.001	-0.000	-0.003	0.001	-0.001	-0.001	-0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Internal conflicts	0.003	0.003	0.002	0.001	0.002	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Population density	0.000**	0.000**	0.000**	0.000	0.001**	0.001**	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.161*	0.048	0.158***	0.095	0.146**	0.070	0.158***	0.121**
	(0.081)	(0.069)	(0.047)	(0.064)	(0.066)	(0.056)	(0.039)	(0.050)
Observations	173	173	173	173	198	198	198	198
Number of countries	51	51	51	51	58	58	58	58
Joint(p)	0.106	0.279	0.0488	0.0307	0.762	0.311	0.00262	0.00886
Adjusted R-squared	0.436	0.431	0.481	0.498	0.406	0.416	0.479	0.482
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: dependent variable is fiscal capacity measured as non-resource income tax as a percentage of non-resource total tax revenue. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

Table 8: Robustness checks: marginal effects of resource wealth at different levels of executive constraint

	Excluding big producers			Excluding OPEC countries		
	All resources	Diffuse resources	Point-source resources	All resources	Diffuse resources	Point-source resources
Executive constraints	b/se	b/se	b/se	b/se	b/se	b/se
0	-0.117	0.218	-0.692**	-0.025	0.296*	-0.789*
	(-0.2)	(-0.15)	(-0.3)	(-0.25)	(-0.18)	(-0.47)
1	-0.075	0.255	-0.511*	-0.05	0.251	-0.694*
	(-0.19)	(-0.16)	(-0.27)	(-0.22)	(-0.16)	(-0.38)
2	-0.034	0.291*	-0.331	-0.074	0.207	-0.599**
	(-0.19)	(-0.17)	(-0.27)	(-0.2)	(-0.14)	(-0.3)
3	0.008	0.328*	-0.15	-0.099	0.162	-0.504*
	(-0.19)	(-0.18)	(-0.28)	(-0.18)	(-0.14)	(-0.26)
4	0.049	0.365*	0.03	-0.123	0.118	-0.409
	(-0.19)	(-0.2)	(-0.31)	(-0.17)	(-0.15)	(-0.27)
5	0.091	0.401*	0.21	-0.148	0.073	-0.314
	(-0.19)	(-0.21)	(-0.36)	(-0.17)	(-0.16)	(-0.32)
6	0.132	0.438*	0.391	-0.172	0.029	-0.219
	(-0.2)	(-0.23)	(-0.41)	(-0.18)	(-0.18)	(-0.4)

Notes: marginal effects of diffuse and point-source resources are calculated using the estimates from Table 7, columns 4 and 8.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

4.5 How do resource rents affect fiscal capacity?

Our findings suggest that point-source resources may create a fiscal resource curse, and that political institutions that limit executive power create the conditions to offset such negative effects on fiscal systems. However, we have not yet identified which specific tax institutions are affected, an exercise that might deliver insights on the mechanisms. Following Ricciuti et al. (2019), we unbundle fiscal capacity and distinguish between two aspects of tax systems: the accountability and transparency of such institutions, which we call impartiality; and their effectiveness in extracting revenues.

Impartiality concerns fairness in the exercise of taxation powers: it is the ability of tax systems to make the state accountable and transparent to its citizens, thereby building state-society relations that are conducive to quasi-compliance (e.g., Levi 1988). The other aspect concerns the ability of a tax administration to coerce citizens to pay taxes, and hence its effectiveness in raising revenues. These two different dimensions of tax systems constitute the key ingredients needed to develop revenue authorities in order to have fiscally capable states.[16] Outcome-based measures of fiscal capacity cannot differentiate between the two.

To test whether a fiscal resource curse works through impartiality or effectiveness (or both), we use variables from the recent 'Public Expenditure and Financial Accountability' data set (PEFA 2006). PEFA is a partnership of the World Bank with national and international donors, and it

[16] For example, Besley and Persson (2013) note that fiscal capacity is the product of investments in tax systems, including better tax administration and features that increase citizens' voluntary compliance with taxation. Improved tax administration can be related to the effectiveness dimension of fiscal capacity, while processes of tax payment and collection that lead to the greater transparency and accountability of tax authorities (and consequently make taxation systems more consensual between states and citizens) can be related to the impartiality dimension of fiscal capacity.

assesses public financial management performance in developing economies according to over 30 indicator areas of public finance.[17] In particular, we use six indicators that neatly capture the impartiality and effectiveness of tax systems (Table A3 in the Appendix reports a detailed description for each measure):

1. *transparency of taxpayer obligations and liabilities*, which evaluates taxpayers' access to information on tax liabilities and administrative procedures;
2. *tax appeals,* which assesses the functioning of a tax appeals mechanism;
3. *controls in the taxpayer registration system*, which assesses the quality and maintenance of a taxpayer database;
4. *effectiveness of penalties for non-compliance*, which addresses failures in registration and tax declaration obligations by assessing whether penalties for all areas of non-compliance are set sufficiently high to act as deterrents and are consistently administered;
5. *quality of tax audits*, which evaluates whether and how tax audits and fraud investigations are undertaken;
6. *effectiveness in the collection of tax payments*, which looks at the frequency of complete accounts reconciliation between tax assessments, collections, arrears, records, and receipts by the Treasury.

The first two indicators capture the impartiality aspect of fiscal capacity, since they look at the relationship between state and taxpayers, assessing whether the taxation power of the former is clearly defined and not subject to discretion. The remaining four measures assess key coercive aspects of tax systems. Hence we consider them to be effectiveness measures.[18] Higher scores indicate greater levels of fiscal capacity: both impartiality and effectiveness. We also combine the six PEFA measures in different ways, in order to create simple composite indicators. In particular, we take the simple average of the first two measures to capture impartiality, and of the last four for effectiveness. Similarly, we average all six measures together. This exercise is useful to capture possible complementarities among the different institutional characteristics of the tax system whereby improvements in one dimension may simultaneously support the others (Besley and Persson 2011).

[17] Details of the PEFA framework, indicators, and assessment method are given in PEFA (2006).

[18] Methodologically, these are *de facto* measures, based on the actual working of the system, and not on what is merely written in the law. This ensures that the assessment is based on institutional reforms, which react to the pressure of external authorities and are to some degree internalized by those who implement them.

Table 9: Potential channels of causation from point-source resource rents to fiscal capacity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. variable	Average of all PEFA measures	Average of impartiality measures	Average of effectiveness measures	Transparency of taxpayer obligations	Tax appeals mechanisms	Controls in the taxpayer registration system	Effectiveness of penalties for non-compliance	Quality of tax audits	Effectiveness in collection of tax payments
Exec. constraints	0.027	0.083	-0.000	-0.003	0.168	0.138	-0.221	0.042	0.040
	(0.140)	(0.135)	(0.172)	(0.163)	(0.156)	(0.178)	(0.203)	(0.205)	(0.366)
Diffuse resources	-1.285	-0.526	-1.665	-1.104	0.052	0.013	-3.251	-0.009	-3.411
	(1.895)	(1.884)	(2.197)	(2.289)	(1.946)	(2.088)	(2.769)	(2.262)	(4.445)
Diff. res.*Exec.Const.	-0.108	-0.418	0.047	-0.175	-0.660	-0.208	0.648	-0.544	0.293
	(0.448)	(0.456)	(0.536)	(0.645)	(0.475)	(0.503)	(0.688)	(0.568)	(1.088)
Point-source resources	-8.198*	-9.015**	-7.789	-10.911**	-7.118*	-9.951**	-13.670**	-7.932	0.395
	(4.058)	(3.493)	(4.779)	(4.389)	(3.624)	(4.725)	(5.205)	(5.065)	(8.617)
Point-source res.*Exec.Const	2.097	2.310	1.991	3.602	1.018	4.318	2.758	2.785	-1.898
	(2.465)	(1.797)	(3.095)	(2.575)	(2.093)	(3.094)	(4.399)	(2.958)	(4.953)
External debt	0.001	0.001	0.001	0.000	0.002	-0.001	-0.001	0.002	0.002
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.006)
Trade	-0.001	-0.002	-0.001	-0.001	-0.004	0.002	0.003	-0.007	-0.001
	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)	(0.006)	(0.006)	(0.008)
Aid per capita	0.000	0.001	-0.001	0.003	-0.000	-0.002	-0.001	-0.004	0.004
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)
External conflicts	0.109	-0.047	0.187	-0.082	-0.012	0.181	0.149	0.034	0.387*
	(0.096)	(0.110)	(0.113)	(0.156)	(0.097)	(0.131)	(0.113)	(0.097)	(0.217)
Civil conflicts	-0.145**	-0.045	-0.195**	0.059	-0.149**	-0.175*	-0.089	-0.113	-0.404*
	(0.069)	(0.077)	(0.084)	(0.115)	(0.072)	(0.095)	(0.113)	(0.102)	(0.212)
Population density	-0.001***	-0.001**	-0.001***	-0.001	-0.001	-0.001	-0.001*	-0.001***	-0.002**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Length of statehood	0.527	0.435	0.573	0.494	0.377	-0.072	0.228	1.165*	0.971
	(0.632)	(0.722)	(0.655)	(0.927)	(0.702)	(0.549)	(0.772)	(0.603)	(1.641)
Constant	2.243***	2.207***	2.261***	2.239**	2.175***	1.560*	2.907***	2.235***	2.344
	(0.588)	(0.686)	(0.642)	(0.845)	(0.736)	(0.790)	(0.971)	(0.581)	(1.440)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Observations	44	44	44	44	44	44	44	44	44
Adjusted R-squared	0.246	0.286	0.164	0.062	0.278	0.211	0.123	0.244	0.006
Joint(p)	0.0180	0.00439	0.0885	0.0519	0.00392	0.0562	1.42e-06	0.0143	0.835

Notes: Dependent variable is calculated as 2006–11 average. Explanatory variables are measured as 1995–2005 average (except length of statehood). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on data from World Bank (2018a, 2018b), ICTD/UNU-WIDER (2019), and PEFA (2006).

Table 10: Effects of point-source resources on fiscal institutions at different levels of executive constraint

Dep. variable	Average of all PEFA measures	Average of impartiality measures	Average of effectiveness measures	Transparency of taxpayer obligations	Tax appeals mechanisms	Controls in the taxpayer registration system	Effectiveness of penalties for non-compliance	Quality of tax audits	Effectiveness in collection of tax payments
Executive constraints	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
0	-8.198**	-9.015***	-7.789	-10.911**	-7.118**	-9.951**	-13.670***	-7.932	0.395
	(-4.06)	(-3.49)	(-4.78)	(-4.39)	(-3.62)	(-4.72)	(-5.2)	(-5.06)	(-8.62)
1	-6.101***	-6.705***	-5.799**	-7.310**	-6.100***	-5.633**	-10.912***	-5.147*	-1.503
	(-2.35)	(-2.46)	(-2.51)	(-3.06)	(-2.22)	(-2.25)	(-1.64)	(-2.67)	(-5.45)
2	-4.004	-4.395*	-3.808	-3.708	-5.082**	-1.314	-8.155**	-2.363	-3.401
	(-2.6)	(-2.52)	(-2.98)	(-3.57)	(-2.35)	(-2.64)	(-4.12)	(-2.48)	(-5.85)
3	-1.907	-2.085	-1.817	-0.107	-4.064	3.004	-5.397	0.422	-5.299
	(-4.49)	(-3.62)	(-5.54)	(-5.42)	(-3.86)	(-5.29)	(-8.37)	(-4.76)	(-9.37)
4	0.19	0.224	0.173	3.495	-3.047	7.322	-2.639	3.207	-7.197
	(-6.76)	(-5.13)	(-8.46)	(-7.7)	(-5.74)	(-8.26)	(-12.72)	(-7.53)	(-13.8)
5	2.287	2.534	2.164	7.097	-2.029	11.64	0.118	5.992	-9.095
	(-9.13)	(-6.78)	(-11.48)	(-10.12)	(-7.74)	(-11.3)	(-17.09)	(-10.4)	(-18.5)
6	4.384	4.844	4.155	10.698	-1.011	15.959	2.876	8.776	-10.992
	(-11.54)	(-8.49)	(-14.52)	(-12.61)	(-9.77)	(-14.36)	(-21.47)	(-13.31)	(-23.3)

Notes: marginal effects are calculated using the estimates from Table 9.

Source: authors' calculations based on data from World Bank (2018a), ICTD/UNU-WIDER (2019), and PEFA (2006).

We estimate an ordinary least squares cross-section version of equation 1 for over 40 developing economies, where each of the above measures and their composite indicators act as dependent variables.[19] The results are in Tables 9 and 10. Subject to the limitations of the cross-section approach discussed earlier, and bearing in mind that it is challenging to get a clear verdict given that the reduced degrees of freedom here may impair statistical significance, the results suggest that the effect of point-source resources is likely to work through institutions related to the impartiality of tax systems, while the evidence that they affect their effectiveness is less clear. In particular, the marginal effects indicate that a fiscal resource curse may affect the impartiality dimension of tax systems, as well as the basic infrastructure for tax collection (such as the system of penalties for non-compliance), only in political systems with low levels of checks and balances on executive power. The curse disappears in economies that can successfully limit the power of the executive. Under such political conditions, the fiscal bargain between ruler and citizens, which is at the heart of the construction of a fiscal state (e.g., Brautigam et al. 2008), may be facilitated.

5 Conclusions

This paper investigates whether natural resources rents undermine developing countries' ability to raise revenues. Building on previous studies demonstrating that institutions can create the conditions to neutralize the resource curse, we posit that the effect of resource rents on states' ability to raise revenues depends on whether political institutions effectively limit executive power, as they reduce incumbents' discretion over the use of resource rents. Using panel data covering the period 1995 to 2015 for 62 developing countries, the paper tests this hypothesis and offers three main findings. First, we find that point-source resources are negatively associated with fiscal capacity, while diffuse resources are not. Second, developing economies with a high level of executive constraint are able to neutralize the negative effect of point-source resources. Third, further analysis, based on cross-section estimates and a recent data set on the quality of tax systems in developing economies, shows that the effect of natural resources works mainly through institutions that make the tax system accountable and transparent to the citizenry.

Our results are in line with the recent literature arguing that resource abundance does not lead to worse development outcomes if a country has the 'right' institutions (e.g., Melhum et al. 2006; Robinson et al. 2006), but we extend this view to the case of fiscal capacity. Our findings are equally relevant to the emerging literature on the determinants of state capacity, where it has been argued that political institutions that constrain the power of the executive foster fiscal (and legal) capacity by creating a situation of common interest (Besley and Persson 2011). We add to this claim that another channel through which such political institutions may foster state capacity is by averting any deleterious effect of resource rents.

It remains an open question whether the fiscal resource curse can be turned into a blessing, i.e. whether natural resources income, under political institutions that limit executive power, can foster fiscal capacity. Recent case studies on Latin America and Africa indicate that, from a historical perspective, becoming a resource-rich economy can concurrently promote state-building, contingent on the social roots of the political coalitions that rule during the boom (Saylor 2014)

[19] Although the PEFA data set is gradually expanding, its structure is such that it covers a relatively small number of developing economies, and it does not yet enable panel analysis. In particular, PEFA variables range from 2005 to 2013 and have a t-bar of only 1.5, as well as exhibiting very little variation within countries. Apart from the variables used here, we experiment with a further effectiveness measure (looking at the effectiveness of transfer of tax collections to the Treasury by the revenue administration), finding results in line with Tables 9 and 10.

or on the existence of a stable democracy (Dargent et al. 2017). Future research will systematically address this question. Finally, in policy terms, our findings indicate that, in polities providing strong checks and balances on executive power, it is possible to develop both fiscal capacity and the natural resources sector, without any trade-off. Whether a fiscal resource curse exists or not is a question of what types of political institution countries adopted before they became resource-rich.

References

Acemoglu, D., S. Johnson, and J.A. Robinson (2005). 'Institutions as a Fundamental Cause of Long-Run Growth'. In P. Aghion and S.N. Durlauf (eds), *Handbook of Economic Growth*. Amsterdam: Elsevier.

Alexeev, M., and R. Conrad (2009). 'The Elusive Curse of Oil'. *Review of Economics and Statistics*, 91(3): 586–98.

Andersen, J.J., and S. Aslaksen (2008). 'Constitutions and the Resource Curse'. *Journal of Development Economics*, 87(2): 227–46.

Arezki, R., and M. Brückner (2012). 'Resource Windfalls and Emerging Market Sovereign Bond Spreads: The Role of Political Institutions'. *World Bank Economic Review*, 26(1): 78–99. doi: 10.1093/wber/lhr015.

Besley, T., and T. Persson (2011). *Pillars of Prosperity: The Political Economics of Development Clusters*. Princeton: Princeton University Press.

Besley, T., and T. Persson (2013). 'Taxation and Development'. In A. Auerbach, R. Chetty, M. Feldstein, and E. Saez (eds), *Handbook of Public Economics*. Amsterdam: Elsevier.

Besley, T., and T. Persson (2014). 'Why Do Developing Countries Tax So Little?' *Journal of Economic Perspectives*, 28(4): 99–120.

Bhattacharyya, S., and R. Hodler (2010). 'Natural Resources, Democracy and Corruption'. *European Economic Review*, 54(4): 608–21.

Bhattacharyya, S., and R.. Hodler (2014). 'Do Natural Resource Revenues Hinder Financial Development? The Role of Political Institutions'. *World Development*, 57: 101–13.

Bjorvatn, K., and A. Naghavi (2011). 'Rent Seeking and Regime Stability in Rentier States'. *European Journal of Political Economy*, 27(4): 740–48.

Bockstette, V., A. Chanda, and L. Putterman (2002). 'States and Markets: The Advantage of an Early Start'. *Journal of Economic Growth*, 7: 347–69

Bodea, C., M. Higashijima, and R.J. Singh (2016). 'Oil and Civil Conflict: Can Public Spending Have a Mitigation Effect?' *World Development*, 78: 1–12.

Bornhorst, F., S. Gupta, and J. Thornton (2009). 'Natural Resource Endowments and the Domestic Revenue Effort'. *European Journal of Political Economy*, 25(4): 439–46.

Boschini, A.D., J. Pettersson, and J. Roine (2007). 'Resource Curse or Not: A Question of Appropriability'. *Scandinavian Journal of Economics*, 109(3): 593–617.

Brautigam, D., O.H. Fjeldstad, and M. Moore (2008). *Taxation and State-Building in Developing Countries: Capacity and Consent*. Cambridge: Cambridge University Press.

Brunnschweiler, C.N. (2008). 'Cursing the Blessings? Natural Resource Abundance, Institutions, and Economic Growth'. *World Development*, 36(3): 399–419.

Brunnschweiler, C.N., and E.H. Bulte (2008). 'The Resource Curse Revisited and Revised: A Tale of Paradoxes and Red Herrings'. *Journal of Environmental Economics and Management*, 55(3): 248–64.

Carmignani, F. (2013). 'Development Outcomes, Resource Abundance, and the Transmission Through Inequality'. *Resource and Energy Economics*, 35: 412–28

Caselli, F., and T. Cunningham (2009). 'Leader Behaviour and the Natural Resource Curse'. *Oxford Economic Papers*, 61(4): 628–50.

Caselli, F., and G. Michaels (2013). 'Do Oil Windfalls Improve Living Standards? Evidence from Brazil'. *American Economic Journal: Applied Economics*, 5(1): 208–38.

Caselli, F., and A. Tesei (2016). 'Resource Windfalls, Political Regimes, and Political Stability'. *Review of Economics and Statistics*, 98(3): 573–90.

Centeno, M.A., A. Kohli, and D.J. Yashar (2017). 'Unpacking States in the Developing World: Capacity, Performance, and Politics'. In M.A. Centeno, A. Kohli, and D.J. Yashar (eds), *States in the Developing World*. Cambridge: Cambridge University Press.

Collier, P., and A. Hoeffler (2004). 'Greed and Grievance in Civil War'. *Oxford Economic Papers*, 56(4): 563–95.

Cotet, A.M., and K.K. Tsui (2013). 'Oil and Conflict: What Does the Cross Country Evidence Really Show?' *American Economic Journal: Macroeconomics*, 5(1): 49–80.

Crivelli, E., and S. Gupta (2014). 'Resource Blessing, Revenue Curse? Domestic Revenue Effort in Resource-Rich Countries'. *European Journal of Political Economy*, 35: 88–101.

Dargent E., A.E. Feldmann, and J.P. Luna (2017). 'Greater State Capacity, Lesser Stateness: Lessons from the Peruvian Commodity Boom'. *Politics & Society*, 45(1): 3–34.

Ebeke, C., L.D. Omgba, and R. Laajaj (2015). 'Oil, Governance and the (Mis)allocation of Talent in Developing Countries'. *Journal of Development Economics*, 114: 126–41.

Edwards, R.B. (2016). 'Mining Away the Preston Curve'. *World Development*, 78: 22–36.

El Anshasy, A.A., and M.S. Katsaiti (2013). 'Natural Resources and Fiscal Performance: Does Good Governance Matter?' *Journal of Macroeconomics*, 37: 285–98.

Fum, R.M., and R. Hodler (2010). 'Natural Resources and Income Inequality: The Role of Ethnic Divisions'. *Economics Letters*, 107(3): 360–63.

Goderis, B., and S.W. Malone (2011). 'Natural Resource Booms and Inequality: Theory and Evidence'. *Scandinavian Journal of Economics*, 113(2): 388–417.

Gylfason, T. (2001). 'Natural Resources, Education, and Economic Development'. *European Economic Review*, 45: 847–59.

Haber, S., and V. Menaldo (2011). 'Do Natural Resources Fuel Authoritarianism? A Reappraisal of the Resource Curse'. *American Political Science Review*, 105(1): 1–26.

Herbst, J. (2000). *States and Power in Africa: Comparative Lessons in Authority and Control*. Princeton: Princeton University Press.

ICRG (2018). 'International Country Risk Guide Rating'. East Syracuse, NY: PRS Group. Available at: www.prsgroup.com/explore-our-products/international-country-risk-guide/ (accessed 10 February 2020).

ICTD/UNU-WIDER (2019). 'Government Revenue Dataset'. Helsinki: UNU-WIDER. Available at: www.wider.unu.edu/project/government-revenue-dataset (accessed 10 February 2020).

IMF (2019). 'World Economic Outlook Database'. Washington, DC: IMF. Available at www.imf.org/external/pubs/ft/weo/2019/01/weodata/index.aspx (accessed 10 February 2020).

Isham, J., M. Woolcock, L. Pritchett, and G. Busby (2005). 'The Varieties of Resource Experience: Natural Resource Export Structures and the Political Economy of Economic Growth'. *World Bank Economic Review*, 19(2): 141–74.

James, A. (2015). 'US State Fiscal Policy and Natural Resources'. *American Economic Journal: Economic Policy*, 7(3): 238–57.

Jensen, A.D. (2011). 'State-Building in Resource-Rich Economies'. *Atlantic Economic Journal*, 39: 171–93.

Karl, T.L. (2004). 'Oil-Led Development: Social, Political, and Economic Consequences'. *Encyclopaedia of Energy*, 4: 661–72.

Klomp, J., and J. de Haan (2016). 'Election Cycles in Natural Resource Rents: Empirical Evidence'. *Journal of Development Economics*, 121: 79–93.

Knack, S. (2009). 'Sovereign Rents and Quality of Tax Policy and Administration'. *Journal of Comparative Economics*, 37(3): 359–71.

Kurtz, M.J., and S.M. Brooks (2011). 'Conditioning the "Resource Curse": Globalization, Human Capital, and Growth in Oil-Rich Nations'. *Comparative Political Studies*, 44(6): 747–70.

Levi, M. (1988). *Of Rule and Revenue*. Berkeley: University of California Press.

Lieberman, E.S. (2002), 'Taxation Data as Indicators of State-Society Relations: Possibilities and Pitfalls in Cross-National Research'. *Studies in Comparative International Development*, 36(4): 89–115.

Marshall, M.G., T.R. Gurr, and K. Jaggers (2014). 'Polity IV Project: Political Regime Characteristics and Transitions, 1800–2013'. Vienna, VA: Center for Systemic Peace. Available at: www.systemicpeace.org/polity/polity4.htm (accessed 10 February 2020).

Masi, T., and R. Ricciuti (2019). 'The Heterogeneous Effect of Oil Discoveries on Democracy'. *Economics & Politics*, 31(3): 374–402.

Mehlum, H., K. Moene, and R. Torvik (2006). 'Institutions and the Resource Curse'. *Economic Journal*, 116(508): 1–20.

Morrison, K.M. (2010). 'What Can We Learn About the "Resource Curse" from Foreign Aid?' *World Bank Research Observer*, 27: 52–73.

Morrissey, O., C. Von Haldenwang, A. Von Schiller, M. Ivanyna, and I. Bordon (2016). 'Tax Revenue Performance and Vulnerability in Developing Countries'. *Journal of Development Studies*, 52(12): 1689–703.

Norman, C.S. (2009). 'Rule of Law and the Resource Curse: Abundance Versus Intensity'. *Environmental and Resource Economics*, 43: 183–207.

Omgba, L.D. (2015). 'Why Do Some Oil-Producing Countries Succeed in Democracy While Others Fail?' *World Development*, 76: 180–89.

Osafo-Kwaako, P., and J.A. Robinson (2013). 'Political Centralization in Pre-colonial Africa'. *Journal of Comparative Economics*, 41 (1): 6–21.

PEFA (2006). 'Public Expenditure and Financial accountability (PEFA) Performance Measurement Framework'. Washington, DC: PEFA. Available at: pefa.org/content/pefa-framework (accessed January 2018).

Pineda, J., and F. Rodríguez (2010). 'Curse or Blessing? Natural Resources and Human Development'. Human Development Research Paper 2010/04. New York: UNDP.

Prichard, W., A. Cobham, and A. Goodall (2014). 'The ICTD Government Revenue Dataset'. Working Paper 34. Brighton: ICTD.

Ricciuti, R., A. Savoia, and K. Sen (2019). 'How Do Political Institutions Affect Fiscal Capacity? Explaining Taxation in Developing Economies'. *Journal of Institutional Economics*, 15(2): 351–80.

Robinson, J.A., R. Torvik, and T. Verdier (2006). 'Political Foundations of the Resource Curse'. *Journal of Development Economics*, 79(2): 447–68.

Rodriguez, F., and J.D. Sachs (1999). 'Why Do Resource-Abundant Economies Grow More Slowly?' *Journal of Economic Growth*, 4(3): 277–303.

Ross, M. (2015) 'What Have We Learnt About the Resource Curse?' *Annual Review of Political Science*, 18: 239–59.

Sachs, J.D., and A.M. Warner (2001). 'The Curse of Natural Resources'. *European Economic Review*, 45: 827–38.

Savoia, A., and K. Sen (2015). 'Measurement, Evolution, Determinants and Consequences of State Capacity: A Review of Recent Research'. *Journal of Economic Surveys*, 29(3): 441–58.

Saylor, R. (2014). *State Building in Boom Times: Commodities and Coalitions in Latin America and Africa*. Oxford: Oxford University Press.

Stijns, J.P. (2006). 'Natural Resource Abundance and Human Capital Accumulation'. *World Development*, 34(6): 1060–83.

Tornell, A., and P.R. Lane (1999). 'The Voracity Effect'. *American Economic Review*, 89(1): 22–46.

Torvik, R. (2002). 'Natural Resources, Rent Seeking and Welfare'. *Journal of Development Economics*, 67(2): 455–70.

Vahabi, M. (2016) *The Political Economy of Predation: Manhunting and the Economics of Escape*. New York: Cambridge University Press.

Van der Ploeg, F. (2011). 'Natural Resources: Curse or Blessing?' *Journal of Economic Literature*, 49(2): 366–420.

World Bank (2011). *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*. Washington, DC: World Bank.

World Bank (2018a). 'Wealth Accounting'. Washington, DC: World Bank. Available at: datacatalog.worldbank.org/dataset/wealth-accounting (accessed 10 February 2020).

World Bank (2018b). 'World Development Indicators'. Washington, DC: World Bank. Available at: data.worldbank.org/data-catalog/world-development-indicators (accessed 10 February 2020).

Appendix

Table A1: Variables and sources

Variable	Description	Source
Fiscal capacity	Non-resource component of taxes on income, profits, and capital gains as a percentage of non-resource component of total tax revenue excluding social contributions and natural resources revenue.	Authors' elaboration based on data from ICTD/UNU-WIDER (2019)
Non-resource tax/GDP	Non-resource component of total tax revenue excluding social contributions and natural resources revenue.	ICTD/UNU-WIDER (2019)
Executive constraints	Institutionalized constraints on the decision-making power of chief executives, recoded to range from 0 (unlimited authority) to 6 (limited authority). Values outside [0;6] are treated as missing.	Marshall et al. (2014)
Resource wealth	Includes energy, minerals, agricultural land, protected areas, and forests as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Diffuse resources wealth	Includes agricultural land and forests as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Point-source resources wealth	Includes coal, gas, minerals, and oil as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Agricultural wealth	Cropland and pastureland as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Forest wealth	Timber and some non-timber forest products as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Mineral wealth	Bauxite, copper, gold, iron ore, lead, nickel, phosphate, silver, tin, and zinc as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Coal wealth	Hard and soft coal as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Gas wealth	Gas as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
Oil wealth	Oil as a percentage of total wealth. Values are measured at market exchange rates in constant US dollars, using a country-specific GDP deflator.	World Bank (2018a)
External debt	General government gross debt (% of GDP).	IMF (2019)
Trade	Trade (% of GDP).	World Bank (2018b)
Net ODA and aid per capita	Net official development assistance and official aid received (constant 2013 US dollars) per capita.	Authors' elaboration based on data from World Bank (2018b)

Population density	Population density (people per square kilometre of land area).	World Bank (2018b)
External conflicts	An assessment of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc.) to violent external pressure (cross-border conflicts to all-out war). A score of 4 equates to very low risk, and a score of 0 to very high risk.	ICRG (2018)
Internal conflicts	An assessment of political violence in the country and its actual or potential impact on governance. A score of 4 equates to very low risk, and a score of 0 to very high risk.	ICRG (2018)
Length of statehood	State antiquity index, constructed by observing the state history over the period from 1 CE to 1950 CE. For each 50-year period, each country is allocated a score for the existence of a government above tribal level; whether the government was locally based or foreign; and how much of the territory of the modern country was ruled by this government.	Bockstette et al. (2002)

Source: authors' compilation.

Table A2: Countries

(a) Panel			
Albania	El Salvador	Malaysia	Sierra Leone
Armenia	Gabon	Mexico	South Africa
Azerbaijan	Gambia	Morocco	Sri Lanka
Bangladesh	Guatemala	Mozambique	Suriname
Bolivia	Guinea	Namibia	Thailand
Botswana	Guyana	Nicaragua	Tunisia
Brazil	Haiti	Niger	Turkey
Bulgaria	Honduras	Nigeria	Uganda
Burkina Faso	India	Panama	Ukraine
China	Jamaica	Papua New Guinea	United Republic of Tanzania
Costa Rica	Jordan	Paraguay	Venezuela
Côte D'Ivoire	Kenya	Peru	Yemen
Croatia	Lebanon	Philippines	Zambia
Dominican Republic	Liberia	Republic of Moldova	Zimbabwe
Ecuador	Madagascar	Romania	

Egypt	Malawi	Senegal	
		(b) Cross-section	
Armenia	Dominican Republic	Kenya	Philippines
Bangladesh	El Salvador	Liberia	Republic of Moldova
Belarus	Gabon	Madagascar	Senegal
Bolivia	Ghana	Malawi	Sierra Leone
Botswana	Guatemala	Mali	South Africa
Brazil	Haiti	Morocco	Thailand
Burkina Faso	Honduras	Mozambique	Togo
Colombia	India	Niger	Tunisia
Congo	Indonesia	Pakistan	Uganda
Costa Rica	Jamaica	Paraguay	Ukraine
Côte D'Ivoire	Jordan	Peru	Zambia

Source: authors' compilation.

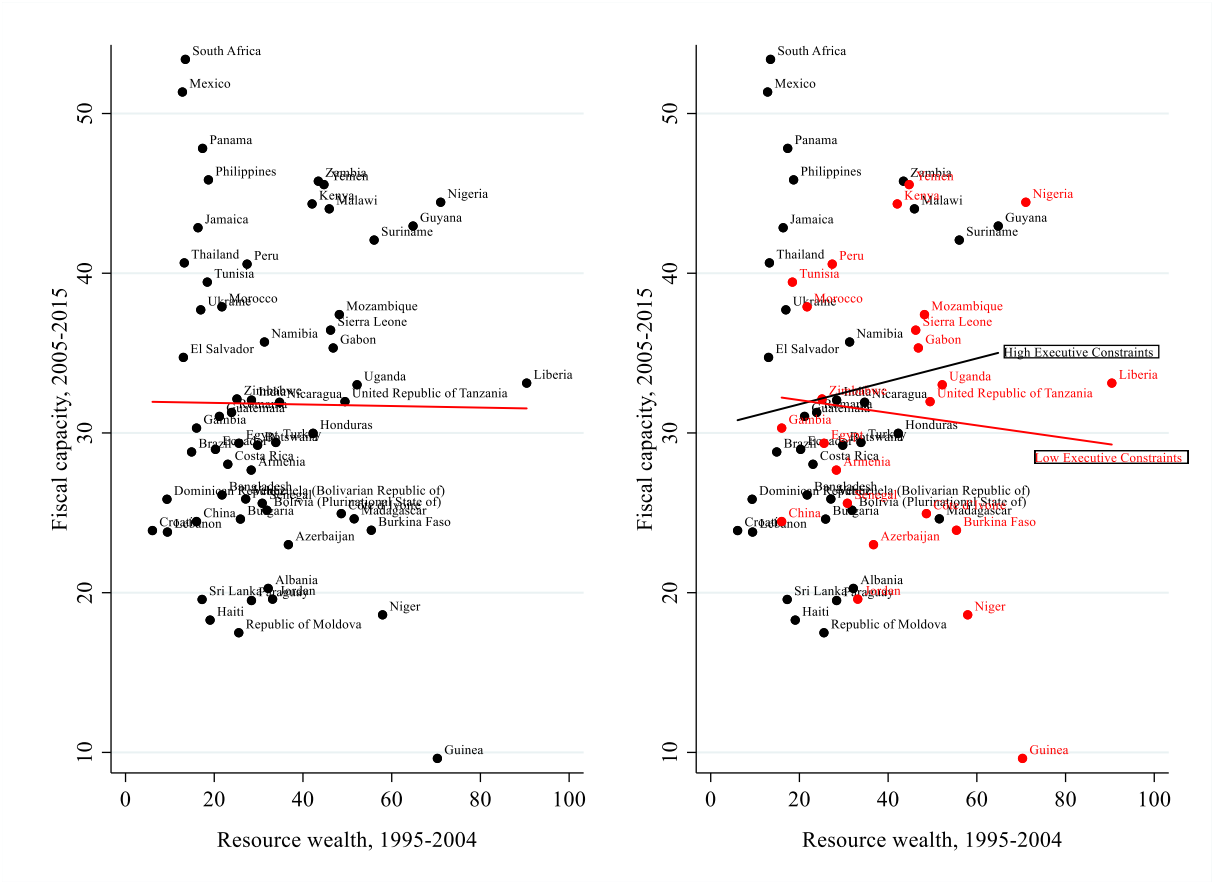
Table A3: Description of PEFA variables

Transparency of taxpayer obligations and liabilities PEFA PI13(ii)	Definition: Taxpayers' access to information on tax liabilities and administrative procedures. Average score over 2006–11. Scoring method: 3. Taxpayers have easy access to comprehensive, user-friendly, and up-to-date information on tax liabilities and administrative procedures for all major taxes, and the revenue authority supplements this with active taxpayer education campaigns. 2. Taxpayers have easy access to comprehensive, user-friendly, and up-to-date information on tax liabilities and administrative procedures for some of the major taxes, while for other taxes the information is limited. 1. Taxpayers have access to some information on tax liabilities and administrative procedures, but the usefulness of the information is limited due coverage of selected taxes only, lack of comprehensiveness, and/or not being up to date. 0. Taxpayer access to up-to-date legislation and procedural guidelines is seriously deficient.
Existence and functioning of tax appeals mechanisms PEFA PI13(iii)	Definition: Existence and functioning of a tax appeals mechanism. Average score over 2006–11. Scoring method: 3. A tax appeals system of transparent administrative procedures with appropriate checks and balances, and implemented through independent institutional structures, is completely set up and effectively operating with satisfactory access and fairness, and its decisions are promptly acted upon. 2. A tax appeals system of transparent administrative procedures is completely set up and functional, but it is either too early to assess its effectiveness or some issues relating to access, efficiency, fairness, or effective follow-up on its decisions need to be addressed. 1. A tax appeals system of administrative procedures has been

	established but needs substantial redesign to be fair, transparent, and effective. 0. No functioning tax appeals system has been established.
Controls in the taxpayer registration system PEFA PI14(i)	Definition: Quality and maintenance of a taxpayer database. Average score over 2006–11. Scoring method: 3. Taxpayers are registered in a complete database system with comprehensive direct linkages to other relevant government registration systems and financial sector regulations. 2. Taxpayers are registered in a complete database system with some linkages to other relevant government registration systems and financial sector regulations. 1. Taxpayers are registered in database systems for individual taxes, which may not be fully and consistently linked; linkages to other registration/licensing functions may be weak but are then supplemented by occasional surveys of potential taxpayers. 0. Taxpayer registration is not subject to any effective controls or enforcement systems.
Effectiveness of penalties for non-compliance with registration and tax declaration PEFA PI14(ii)	Definition: Effectiveness of penalties for non-compliance with registration and tax declaration. Average score over 2006–11. Scoring method: 3. Penalties for all areas of non-compliance are set sufficiently high to act as deterrents and are consistently administered. 2. Penalties for non-compliance exist for most relevant areas, but are not always effective due to insufficient scale and/or inconsistent administration. 1. Penalties for non-compliance generally exist, but substantial changes to their structure, levels, or administration are needed to give them a real impact on compliance. 0. Penalties for non-compliance are generally non-existent or ineffective (i.e. set far too low to have an impact, or rarely imposed).
Quality of tax audits PEFA PI14(iii)	Definition: Planning and monitoring of tax audit programmes. Average score over 2005–13. Scoring method: 3. Tax audits and fraud investigations are managed and reported on according to a comprehensive and documented audit plan, with clear risk assessment criteria for all major taxes that apply self-assessment. 2. Tax audits and fraud investigations are managed and reported on according to a documented audit plan, with clear risk assessment criteria for audits in at least one major tax area that applies self-assessment. 1. There is a continuous programme of tax audits and fraud investigations, but audit programmes are not based on clear risk assessment criteria. 0. Tax audits and fraud investigations are undertaken on an ad hoc basis if at all.
Effectiveness in collection of tax payments PEFA PI15(iii)	Definition: Frequency of complete accounts reconciliation between tax assessments, collections, arrears records, and receipts by the Treasury. Average score over 2006–11. Scoring method: 3. Complete reconciliation of tax assessments, collections, arrears, and transfers to Treasury takes place at least monthly within one month of end of month. 2. Complete reconciliation of tax assessments, collections, arrears, and transfers to Treasury takes place at least quarterly within six weeks of end of quarter. 1. Complete reconciliation of tax assessments, collections, arrears, and transfers to Treasury takes place at least annually within three months of end of year. 0. Complete reconciliation of tax assessments, collections, arrears, and transfers to Treasury does not take place annually or is done with more than three months' delay.

Source: authors' compilation based on information from PEFA (2006).

Figure A1: Relationship between non-resource tax and natural resources rents, excluding outliers



Source: authors' calculations based on data from World Bank (2018a) and ICTD/UNU-WIDER (2019).