Is there a fiscal resource curse?
Resource rents, fiscal capacity and political institutions in developing economies

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ABSTRACT

While several studies have focused on the effect of natural resources on economic development, less attention has been paid to their effects on other important development outcomes. We contribute to this literature by studying the impact of resource rents on fiscal capacity, i.e., the ability of states to raise revenues from broad tax bases. Standard arguments suggest that natural resource rents may reduce the incentives to invest in fiscal capacity. However, political institutions that limit the power of the executive, by reducing rulers' discretion over the use of resource revenues, may mitigate or neutralise such negative effect. We investigate this hypothesis using panel data covering the period 1995-2015 for 62 developing countries. The results suggest that: (i) *point-source resources* are negatively associated with fiscal capacity, while *diffuse resources* are not; (ii) countries with institutionalised executive constraints are able to neutralise the negative effect of *point-source resources*; (iii) the effect of resource rents works mainly through institutions that make the tax system accountable and transparent to the citizens. Our findings imply that it is possible to develop both fiscal capacity and the natural resources sector, without any trade-off.

Keywords: state capacity, fiscal capacity, resource curse, institutions, constraints on the executive, economic development
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1. Introduction

The effect of natural resource 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 specialising in natural resources depends on the type of resources (e.g., Isham et al., 2005) and the quality of the institutional environment in the economy (e.g., Mehlum et al., 2006; Orihuela, 2018).[2] As yet, less analysis has been devoted to other development outcomes. For example, underexplored areas include the effects on inequality (Carmignani, 2013; Goderis and Malone, 2011; Fum and Hodler, 2010) education (Ebeke et al., 2015; Stijns, 2006), health and living standards (Edwards, 2016; Pineda and Rodriguez, 2010; Caselli and Michaels, 2013). This paper contributes to the literature by looking at a further underexplored issue: the effects of natural resource income on state capacity and, in particular, fiscal capacity[3]. We provide a systematic econometric analysis of the effect of resource rents on tax systems, arguing that it depends on the quality of political institutions.

Our hypothesis is that natural resource rents reduce the incentives to invest in fiscal capacity, but such an 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 it using panel regressions on a sample of 62 developing countries from 1995 to 2015. Our main fiscal capacity measure, the share of non-resource taxes on income, profits and capital gains on non-resource total taxes, is based on the intuition that collecting income taxes requires a

[1] To explain its effects, research has referred to resource "abundance" or "rich", "dependence", "intensity", "boom" or "windfall" (see Norman, 2009; Stijns, 2006; Brunnschweiler and Bulte; 2008). The term "dependence" usually refers to the structure of the economy (e.g., captured as resource exports/GDP). "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 "rich" concern the value of the natural resource endowments or the income they generate, measurable as subsoil wealth or resource rents, but they have also been used as terms encompassing all the above aspects. Here we use them in this latter sense.

[2] Many studies have addressed the counter-intuitive idea that countries rich in exploitable natural resources perform worse than those without. Much of the early literature argues the adverse effect of natural resource abundance on economic growth (e.g., Sachs and Warner, 1999, 2001; Rodriguez and Sachs, 1999; Gylfason, 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 level of corruption (e.g., Caselli and Michaels, 2013), civil conflicts (e.g., Collier and Hoeffer, 2004), and less democracy (e.g., Ross, 2015). The negative effects of natural resources are, however, controversial. 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 resource rents may promote political stability. Finally, Stijns (2006) does not find any robust negative effect of resource abundance on human capital.

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

more sophisticated administrative structure than raising other types of taxes (Besley and Persson, 2014) and is constructed using the recent ICTD Government Revenues Dataset, which provides improved coverage and, crucially, distinguishes between resource and non-resource revenues (ICTD/UNU-WIDER, 2018). 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 placing institutionalised constraints on the executive power such effect disappears. Hence, a fiscal resource curse does not necessarily materialise. We complement these 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 provided by the Public Expenditure and Financial Accountability project (PEFA, 2006), we provide cross-section evidence suggesting that the effect works mainly through institutions that make the tax system accountable and transparent, so facilitating a fiscal bargain between the ruler and the citizens.

Apart from contributing to the literature on the resource curse, our paper also adds to the research on the determinants of state capacity. This is an area that has so far seen relatively little empirical analysis (Savoia and Sen, 2015), despite now being considered strategically important for economic development (Besley and Persson, 2011). 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 (2013); Osafo-Kwaako and Robinson, 2013), but stylised facts suggest that they collect, on average, a significantly smaller share of taxes compared to advanced market economies (Besley and Persson, 2014). Hence, assessing whether a geographical feature shaping 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 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 identify the specific channels through which natural resources affect the fiscal system. Section 5 concludes.

2. Resource rents, fiscal capacity and political institutions

There seems to be a consensus in the literature that increasing natural resources rents may be harmful to taxation, as governments tend to substitute tax revenues with resource revenues.

Part of the literature has discussed this effect with respect to the short-term macroeconomic consequences for taxation, in terms of the amount and composition of tax revenues, as well as spending. James (2015) argues that a benevolent government decreases non-resource tax rates and increases spending and savings in response to higher resource revenues, providing US-state level evidence: a $1 increase in resource revenues results in a $0.25 decrease in non-resource revenues, a $0.43 increase in government spending and a $0.32 increase in public savings. Morrison (2009) finds that an increase in non-tax revenues is associated with reduced taxation on elites in democracies, and more social spending in dictatorships. Focussing 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. Interestingly, they also find that democracies tend to outperform non-democracies in revenue resilience to shocks in lower income countries.

Recently, increasing attention has been paid to the long-term consequences, i.e., the effect of natural resources rents on tax system building. The political science literature had long characterised *rentier states*, whose main features are their weakness, lack of accountability of state institutions, and their dependence on revenues from natural resources (e.g., see Karl 2004). Building on this, the negative effect of resource rents on taxation can be explained by considering the incentives for investing in fiscal capacity, modelled as governments' investment choice under uncertainty (Besley and Persson, 2011). As incumbent governments can use resource revenues to provide public goods and services, and thereby increase political support, windfall revenues increase the likelihood that incumbents' choices is dominated by such *redistributive interest*, rather than a *common interest*, so reducing the incentive to invest in fiscal capacity. Knack (2009) provided initial cross-section evidence, partly consistent with this hypothesis. Jensen (2011) provides further evidence from a panel of thirty hydrocarbon-rich economies, finding that a 1% increase in hydrocarbon revenues causes a 1.5% decrease in non-resource tax effort, 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 GDP.

Although there is agreement on the 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 so in need of systematic investigation. Moreover, 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 argues, and empirically demonstrates, that institutions can mitigate or even reverse the resource curse (e.g., Melhum et al., 2006; Brunnschweiler, 2008; Boschini et al., 2007; El Anshasy and Katsaiti, 2013; Bhattacharyya and Hodler, 2010, 2014; Ebeke et al., 2015; Omgba, 2015; Masi and Ricciuti, 2019).[4] Two explanations have been put forward to understand the role of institutions: the *rent-seeking model* (Tornell and Lane, 1999; Torvik, 2002; Melhum et al., 2006) and the *patronage model* (Robinson et al., 2006; Caselli and Cunningham, 2009).[5] According to the former, the economic institutions governing the private sector are what matters. Resource rents change the preferences of private individuals so they switch from productive to unproductive activities. Thus, natural resources hinder economic growth only if the quality of institutions that govern the profitability of productive enterprise is such that rent seeking is fostered. For example, Melhum et al. (2006) argue that the combination of resource abundance and *grabber friendly* institutions is detrimental for economic development, while *producer friendly* institutions help countries take full advantage of their natural resource endowments. On the contrary, the *patronage model* 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.

Perverse effects from rent seeking and patronage are not mutually exclusive and can operate together. However, the presence of accountability mechanisms for state leadership can neutralise the perverse incentives that resource rents create. This is where political institutions that place effective constraints on a ruler can play a major role, such 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 the executive power promote contracting and property rights institutions fostering productive activities, so that a large

[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 could mitigate civil conflicts related to oil wealth (Bodea et al., 2016).

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

cross-section of society can take advantage of economic opportunities (Acemoglu, Johnson and Robinson, 2005). Similarly, limits on executive power promote a *common interest* environment, in which the ruling minority is unable to hand out favours to cronies or themselves (Besley and Persson, 2011).

Coming to the focus of this paper, if natural resource rents harm fiscal capacity, why should a higher level of checks and balances on the executive power can change this effect? This is because, when subject to institutionalised checks and balances, a ruler has less discretion over public finance decisions that one who is not, including over decisions on the use of natural resource rents. One mechanism concerns the presence of independent institutional actors within the national government that can control and subject to limits the use of state resources, so 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 may undermine the competence of the state bureaucracy) and so maintain or innovate fiscal infrastructures and the state's ability to raise tax revenues. Another mechanism concerns the possibility that chief executives subject to formal limitations to 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 abuse in tax levy.

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

i. *Resource rents reduce the incentives to invest in fiscal capacity, so resource-rich countries have less developed tax systems.*
ii. *Political institutions placing limits on the executive powers promote accountability and common interests. The negative effect of natural resources rents on fiscal capacity is therefore mitigated or neutralised in countries with a higher level of executive constraints.*

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-had side scatter). However, splitting the sample into countries with political institutions placing high and low levels of constraints 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

institutions.[6] The rest of the paper investigates the above hypotheses, starting with a discussion of the empirical strategy and data in the following section.

[Figure 1 about here]

3. Empirical strategy and data

In principle, there are two possible approaches to estimate the effect of resource rents on fiscal capacity. The first one 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 1A, are suitable. However, there are at least two problems with this approach. The first is the 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 natural resource reliance could be affected by reverse causality and so subject to bias.

The second approach relies on assessing if the type of relationship documented in Figures 1 and 1A disappears when looking 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, conditional at the initial level on political institutions. 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 affecting both resource rents and fiscal capacity, while time effects can be added to control for global trends.

We prefer the panel approach, but we also present cross-section estimates, as we attempt to capture the effects of resource rents on specific institutions within the tax systems.

[6] Fiscal capacity is defined as 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 (2018), averaged over 2005-2015. 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 1A in the Appendix. The apparently heterogeneous effect of natural resource rents is confirmed even when a possible outliers such as Malaysia and Papua New Guinea are excluded from the sample (Figure 1A in the Appendix). Note also that resource rents does not include diamond revenues amongst its minerals, hence obscures interesting comparisons such as Botswana vs. Sierra Leone.

This is coupled with the choice of a resource income variable allowing clean identification of its effect. We use the *share of natural capital wealth over total wealth*, provided by the World Bank (2018a). This is a measure of the present value of natural resource rents, which aggregates hydrocarbons, minerals, forest and agricultural commodities. Because it captures at a certain point in time the expected size of the rents accruing from natural resources, such variable is in line with the intuition that greater expected income from natural resources may reduce the incentive to tax. Moreover, resource rents are based on commodity prices.[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 approach was first proposed by Caselli and Tesei, 2016). This assumption can be tested, albeit indirectly. We investigate whether it holds by excluding from the sample large commodity producing countries, potentially able to influence world prices.

We estimate:

$$FC_{it} = b_0 + b_1 RR_{it\text{-}4\text{-}bar} + b_2 EC_{it\text{-}4\text{-}bar} + b_3 RR_{it\text{-}4\text{-}bar} * EC_{it\text{-}4\text{-}bar} + \boldsymbol{b}\mathbf{X_{it}} + \mu_i + \lambda_t + u_{it} \quad (1)$$

FC_{it} is fiscal capacity for country *i* at time *t*. Capturing this concept is particularly challenging.[8] The literature proposes two approaches. The first one, which is near ideal as 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), and are not immune from methodological challenges themselves.[9] The second one is to resort to outcome-based proxies, such as tax effort ratios. Such measures may well reflect political preferences of a polity towards 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 measures. In cross-section results,

[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 gross domestic product (GDP). Such measures are based on estimates and therefore are subject to measurement error. However, as long as the noise approximates classic errors in variables case, this is a source of attenuation bias. Therefore, it stacks the odds against our results implying that estimates of the effects of natural resource rents may be conservative.

[8] The challenge of 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).

[9] 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).

we use the first type. In panel regressions, instead, the second one: our 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, often based on the amount of total taxes as a percentage 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 to other types of taxes (Besley and Persson, 2011: 41-42). Data was taken from the recent Government Revenues Dataset (ICTD/UNU-WIDER, 2018). This dataset combines data from several international databases, with marked improvements in data coverage. Crucially, it also allows to distinguish the natural resources component of tax revenues from the non-resource one, so improving the accuracy of measurement compared to previous sources.[10]

$RR_{t\text{-}4\text{-}bar}$ 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.[11] $EC_{t\text{-}4\text{-}bar}$ captures the quality of political institutions from *t*-4 to *t*-1 (with a non-overlapping structure). In line with our hypothesis, it is measured by the *Executive Constraints* variable (*xconst*), provided by the Polity IV dataset (Marshall et al., 2014) and defining the extent of constitutional limits on the exercise of arbitrary power by the executive. $RR_{it\text{-}4\text{-}bar}$* $EC_{it\text{-}4\text{-}bar}$ is the interaction between natural resources and institutional quality.

X_{it} 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 state 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 contrary, civil wars, promoting redistributive interests, hinder the construction of an efficient fiscal apparatus (Besley and Persson, 2011). To capture these effects, we use *external* and

[10] See Prichard et al. (2014). We use the merged version of the GRD dataset in order not to underestimate fiscal capacity in countries with a federal system.

[11] This approach appears to be standard in the resource curse literature (e.g., Caselli and Tesei, 2016, and Bhattacharyya and Hodler, 2010), as well as 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.

internal conflicts (ICRG, 2018), respectively. Development assistance has often been compared to natural resources in terms of its possible *patronage effect* (e.g., Morrison, 2010). We use data from the Wold Bank (2018b) to assess whether aid dependence decreases investments in fiscal capacity. 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 gross domestic product (World Bank, 2018). Table 1A (in the Appendix) describes variables and sources, and Table 2A describes 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 the Table 1 show that our key variables vary both across countries and over time.

[Table 1 about here]

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 constraints on the executive. A series of robustness checks follows. We first look at whether and which type of natural resources drives the results and whether the results hold when using 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 resource rents on fiscal capacity. Apparently, there is no support for the hypothesis under scrutiny, when considering all types of natural resources together. What if the effect is different for different types of natural resources? A popular argument has suggested that the resource curse is specific to resources extracted from a narrow geographical base, *point-source resources*, as they are more susceptible to predatory behaviour on the part

of local elites; while those extracted from a broad geographical base, called *diffuse resources*, are less so (Isham et al., 2005). To consider such 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*.[12] The results show that, on average, fiscal capacity tends to be lower 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 constraints increases. Such effect seems to be absent for *diffuse natural resources*.

[Table 2 about here]

Table 3 shows the marginal effects of natural resource rents at different levels of constraints on the executive. This confirms that *diffuse natural resources* have no significant effect. *Point-source* resources, instead, negatively affect fiscal capacity, when the level of executive constraints is very low. For countries, such as Nigeria and Saudi Arabia, where constitutional restrictions on executive action are weak (*xconst*=0 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, instead, have no effect in countries with medium or high levels of checks and balances on the executive power (e.g., Albania and Costa Rica, which are in the top quintile).

[Table 3 about here]

4.2 Do different natural resources have different effects?

Next, we study in more detail the effect of specific natural resources. This may reveal if and which resources are more likely to affect fiscal capacity. Hence, in Table 4, we consider

[12] As Isham et al. (2005) noted, 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 generalises the idea that the effects of natural resources are specific to their degree of appropriablity. However, this is not something that available resource rents data allow investigating yet.

individual components of total natural resource rents: agricultural, forest, oil, gas, coal and mineral rents. When disaggregating by type of resource, the results find that agricultural and oil may be the main drive 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, reporting the marginal effects for each type of resource rent, shows that oil only has a negative and significant effect on fiscal capacity, but such effect vanishes when the level of executive constraints is at least 3. [13]

The general message remains that natural resources may be a curse or not, depending on the level of executive constraints and on the type of natural resources. In particular, 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 extends and qualifies them, suggesting that negative effects may not materialise, depending on the nature of political institutions.

[Table 4 and Table 5 about here]

4.3 Are the results robust to using an alternative dependent variable?

Panel results are already robust to controlling for all time-invariant variables and for a number of time-varying variables included in the regressions, as well as to controlling for time effects. In addition, we test if they hold with an alternative dependent variable. As it has been considered in earlier studies (e.g., Bornhorst et al., 2009), we experiment with the total amount on non-resource tax revenues as a share of GDP from ICTD/UNU-WIDER (2018). Table 6 report the marginal effects only from this exercise, to save space. They largely confirm our findings.

[Table 6 about here]

[13] Note that collinerity may prevent us from giving a clearer verdict, so we cannot conclusively rule out 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 jointly equal to zero always reject it (the related p-value is 0.07 in both cases). Instead, 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.

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 OPEC members and countries accounting for more than 3% of total world production of a certain commodity.[14] As a result, the key findings on the heterogonous impact of natural resources prove to be robust (Table 7 and 8).

[Table 7 and Table 8 about here]

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 limiting executive power create the conditions to offset such negative effects on fiscal systems. However, we have not identified hitherto which specific tax institutions are affected, an exercise that could deliver insights on the channels of causation. 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, so building state-society relations conducive to quasi-compliance (e.g., Levi, 1988). The other aspect concerns the ability of tax administration to coerce citizens to pay taxes, hence its effectiveness in raising revenues. These two different dimensions of tax systems constitute the key ingredients needed to develop revenue authorities so to have fiscally capable states.[15] 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 a novel set of indicators provided by the Public Expenditure and Financial

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

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

Accountability project (PEFA, 2006). PEFA is a partnership of national and international donors (e.g., IMF and the World Bank) assessing public financial management performance in developing economies according to over thirty indicator areas of public finance. In particular, we use six indicators from the PEFA database, neatly capturing the *impartiality* and *effectiveness* of tax systems. They are described below:[16]

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* assesses the quality and maintenance of a taxpayer database;
4. *Effectiveness of penalties for non-compliance* 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 deterrence and are consistently administered;
5. *Quality of tax audits* evaluates whether and how tax audits and fraud investigations are undertaken;
6. *Effectiveness in collection of tax payments* looks at the frequency of complete accounts reconciliation between tax assessments, collections, arrears, records and receipts by Treasury.

The first two indicators capture the *impartiality* aspect of fiscal capacity, since they look at the relationship between the State and the taxpayers, assessing whether the taxation power of the former is clearly defined and not subject to discretion. The third measure can be seen both a measure of *impartiality*, because expresses whether taxation is transparent to the taxpayers, but at the same time contains clear elements of coerciveness. So we include it amongst the *effectiveness* measures, together with the final three measures, which assess key coercive aspects of tax systems.[17] 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.[18] This exercise is useful to capture possible

[16] The appendix describes each PEFA measure in full. Details of the PEFA framework, indicators and assessment method are given in the database codebook at https://pefa.org/sites/default/files/PMFEng-finalSZreprint04-12_1.pdf.

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

[18] Alternatively, we combine measures 1-3 and measures 4-6. The results are similar.

complementarities amongst the different institutional characteristics of the tax system, whereby improvements in one dimension may simultaneously support the others (Besley and Persson, 2011).

Below we estimate an OLS cross-section version of (1), for over forty 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 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 relating to *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 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 a ruler and citizens, at the heart of the construction of a fiscal state (Brautigam et al., 2008), may be facilitated.

[Tables 9-10 about here]

5. Conclusions

This paper investigates whether natural resource rents undermine developing countries' ability to raise revenues. Building on previous studies demonstrating that institutions can create the conditions to neutralise the resource curse, we posit that the effect of resource rents on the ability of states 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 1995-2015 for 62 developing countries, the paper tests this hypothesis and offers three key findings. First, we find that *point-source resources* are negatively associated with fiscal capacity, while *diffuse resources* are not. Second, countries with a high level of executive constraints are able to neutralise the negative effect of *point-*

[19] Although the PEFA dataset is gradually expanding, its structure is such that it covers a relatively small number of developing economies and it does not allow for panel analysis yet. 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 9-10.

source resources. Third, further analysis, based on cross-section estimates and a recent dataset 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 to and transparent for the citizens.

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., Wiens, 2014; Melhum 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 constraining 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 limiting the executive power, can foster fiscal capacity. Recent case studies on Latin America and Africa indicate that, in historical perspective, becoming a resource-rich economy can concurrently promote state building, contingent on the social roots of political coalitions that rule during the boom (Saylor 2014) or on having a stable democracy (Dargent et al. 2017). Future research shall systematically address this question. Finally, in policy terms, our findings indicate that, in polities providing strong checks and balances on the 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 type of political institutions countries have adopted before they became resource-rich.

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Table 1 – Summary Statistics

	Mean	Std. Dev			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
Resource 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

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: The 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.

Table 3 – Marginal effects of resource wealth at different levels of *executive constraints*

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

Table 4 - Fiscal Capacity and different types of resource wealth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agricultural wealth	Forest wealth	Mineral wealth	Coal wealth	Oil wealth	Gas wealth	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*Executive 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)
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: The 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

Table 5 – Marginal effects of resource wealth at different levels of executive constraints

Executive Constraints	Agric. wealth b/se	Forest wealth b/se	Mineral wealth b/se	Coal wealth b/se	Oil wealth b/se	Gas wealth 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.

Table 6 – Robustness checks: using an alternative dependent variable. Marginal effects of resource wealth at different levels of executive constraints.

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

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

The 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

Table 8 – Robustness checks: Marginal effects of resource wealth at different levels of executive constraints

	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: The marginal effects of diffuse and point-source resources are calculated using the estimates from Tables 7, Columns 4 and 8

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

Dep. Variable:	(1) Average of all PEFA measures	(2) Average of *Impartiality* measures	(3) Average of *Effectiveness* measures	(4) Transparency of Taxpayer Obligations	(5) Tax appeals mechanisms	(6) Controls in the taxpayer registration system.	(7) Effectiveness of penalties for non-compliance	(8) Quality of tax audits	(9) 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)
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: The dependent variable is calculated as 2006-2011 average. The explanatory variable are measured as 1995-2005 average (except for *length of statehood*). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10 – Effects of point-source resources on fiscal institutions at different levels of executive constraints

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

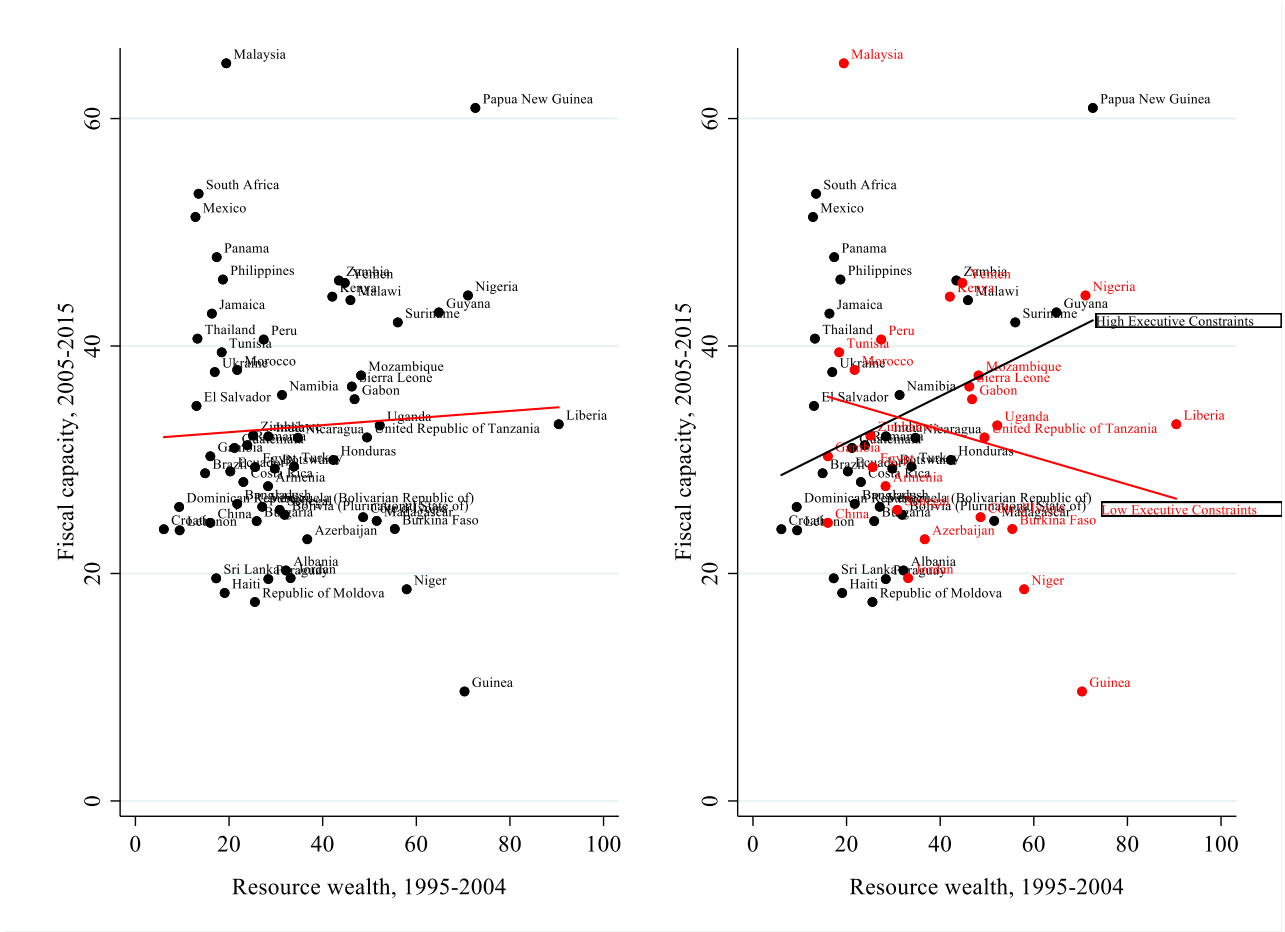

Figure 1 - Relationship between non resource-tax and natural resource rents

Appendix

Table 1A – 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 resource revenue.	Own elaboration based on data from GRD dataset, ICTD/UNU-WIDER (2018)
Non-Resource tax / GDP	Non-resource component of total tax revenue excluding social contributions and natural resource revenue.	GRD dataset, ICTD/UNU-WIDER (2018)
Executive constraints	Institutionalised 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.	Polity IV Project (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 nontimber 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$) per capita.	Own elaboration based on data from World Bank (2018b)
Population density	Population density (people per sq. km of land area).	World Bank (2018b)
External conflicts	The external conflict measure is an assessment both of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade	ICRG (2018)

	restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out war). A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk.	
Internal conflicts	This is an assessment of political violence in the country and its actual or potential impact on governance. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk.	ICRG (2018)
Length of statehood	*State antiquity index*: constructed by observing their state history over the period from 1 to 1950 C.E. For each 50-year period, each country has been allocated a score for the existence of a government above tribal level; whether the government is locally based or foreign; and how much of the territory of the modern country was ruled by this government.	Bockstette, V., A. Chanda and L. Putterman (2002)

Table 2A – 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	Liberia	Paraguay
Burkina Faso	Gabon	Morocco	Senegal
Bangladesh	Ghana	Republic of Moldova	Sierra Leone
Belarus	Guatemala	Madagascar	El Salvador
Bolivia	Honduras	Mali	Togo
Brazil	Haiti	Mozambique	Thailand
Botswana	Indonesia	Malawi	Tunisia
Côte d'Ivoire	India	Niger	Uganda
Congo	Jamaica	Pakistan	Ukraine
Colombia	Jordan	Peru	South Africa
Costa Rica	Kenya	Philippines	Zambia

Table 3A – 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 2006-2011. Scoring method: 3. Taxpayers have easy access to comprehensive, user friendly and up-to-date information tax liabilities and administrative procedures for all major taxes, and the RA 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. Source: variable PI.13(ii), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.
Existence and functioning of tax appeals mechanisms (PEFA PI13(iii))	Definition: Existence and functioning of a tax appeals mechanism. Average score over 2006-2011. 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. Source: variable PI.13(iii), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.
Controls in the taxpayer registration system (PEFA PI14(i))	Definition: quality and maintenance of a taxpayer database. Average score over 2006-2011. 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. Source: variable PI.14(i), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.
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 2006-2011. Scoring method: 3. Penalties for all areas of non-compliance are set sufficiently high to act as deterrence 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). Source: variable PI.14(ii), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.
Quality of tax audits (PEFA PI14(iii))	Definition: Planning and monitoring of tax audits programs. Average score over 2005-2013. 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 program of tax audits and fraud investigations, but audit programs are not based on clear risk assessment criteria ; 0. Tax

	audits and fraud investigations are undertaken on an ad hoc basis if at all. Source: variable PI.14(iii), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.
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 2006-2011. 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 3 months of end of the year; 0. Complete reconciliation of tax assessments, collections, arrears and transfers to Treasury does not take place annually or is done with more than 3 months' delay. Source: variable PI.15(iii), *Public Expenditure and Financial Accountability Performance Measurement Framework*, PEFA (2006), at http://www.pefa.org/en/content/pefa-framework.

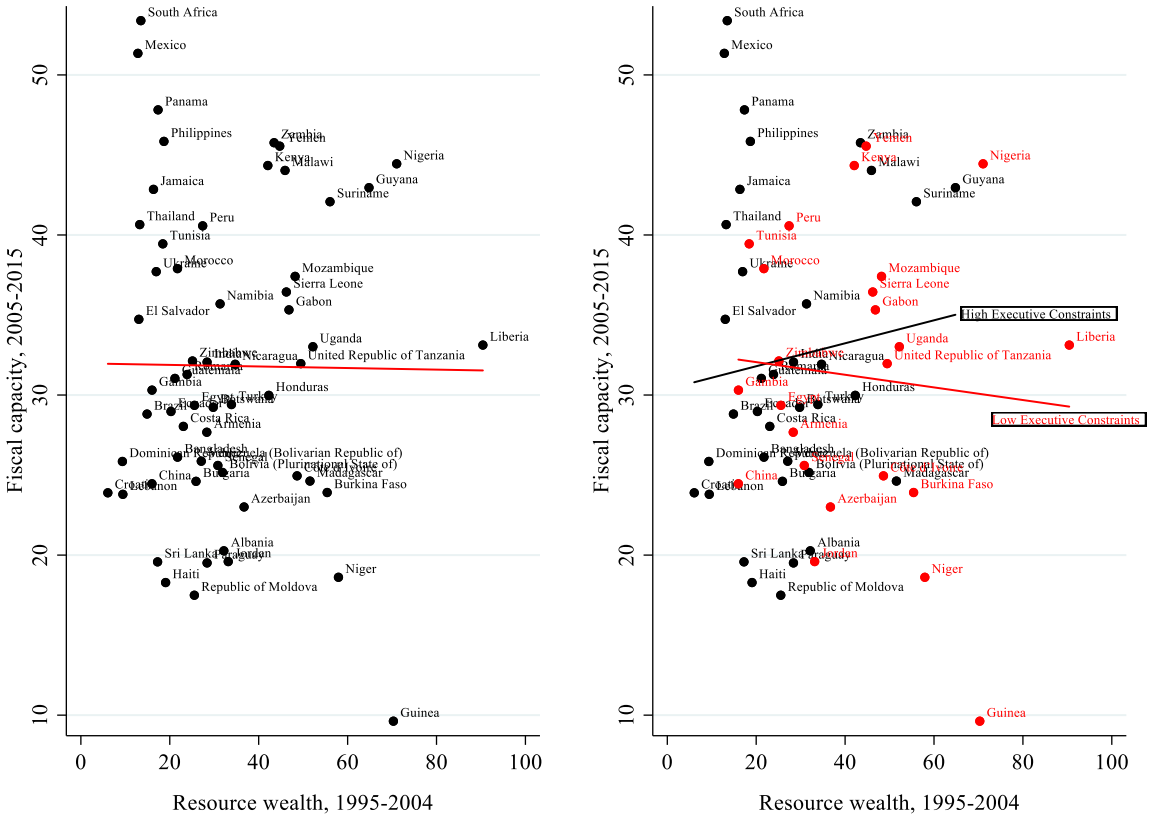

Figure 1A - Relationship between non resource-tax and natural resources rents – Excluding outliers

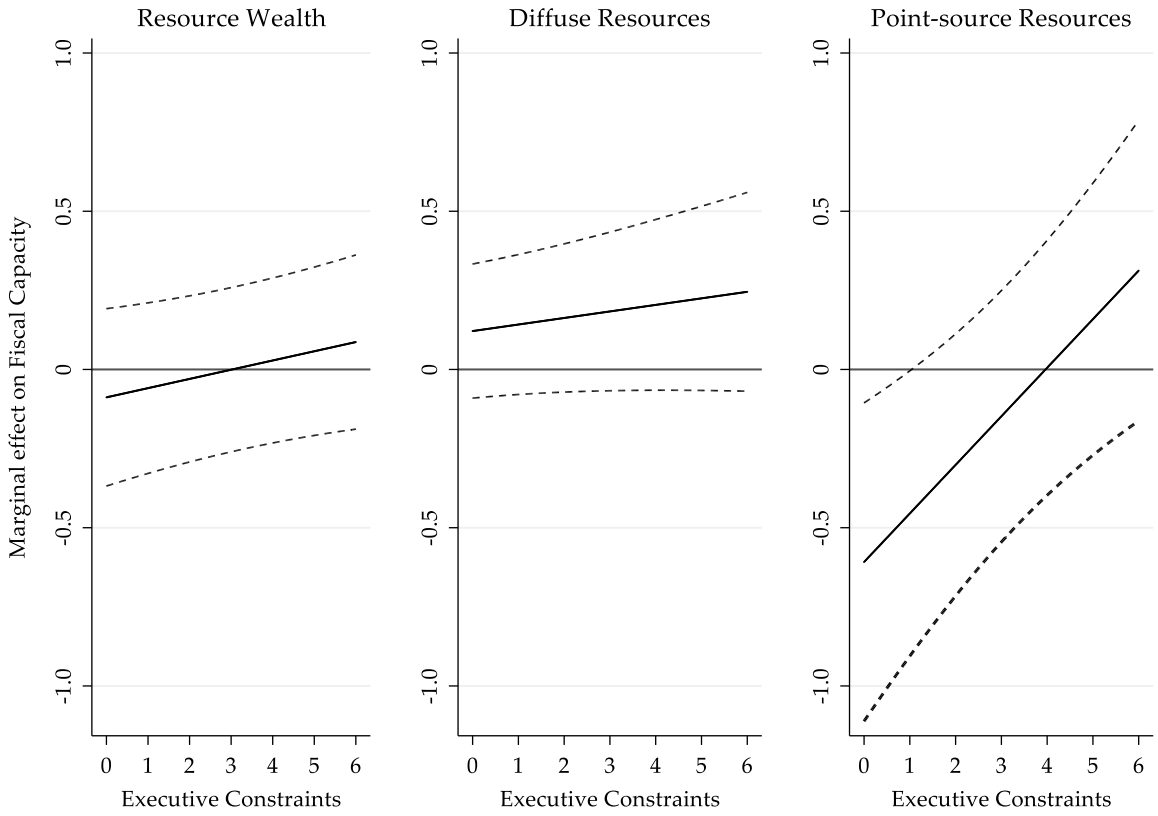

Figure 2A – Marginal effects of Resource wealth on Fiscal Capacity

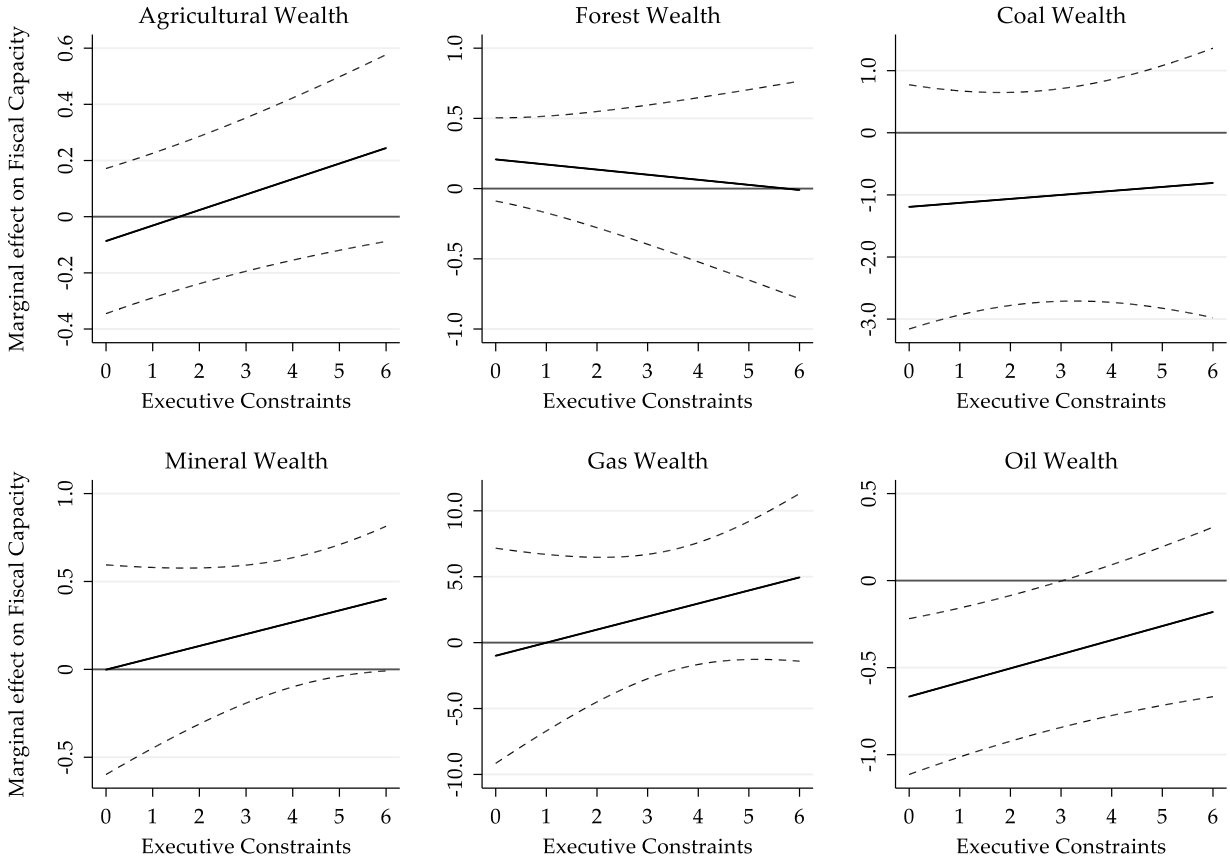

Figure 3A – Marginal effects of different resources on Fiscal Capacity

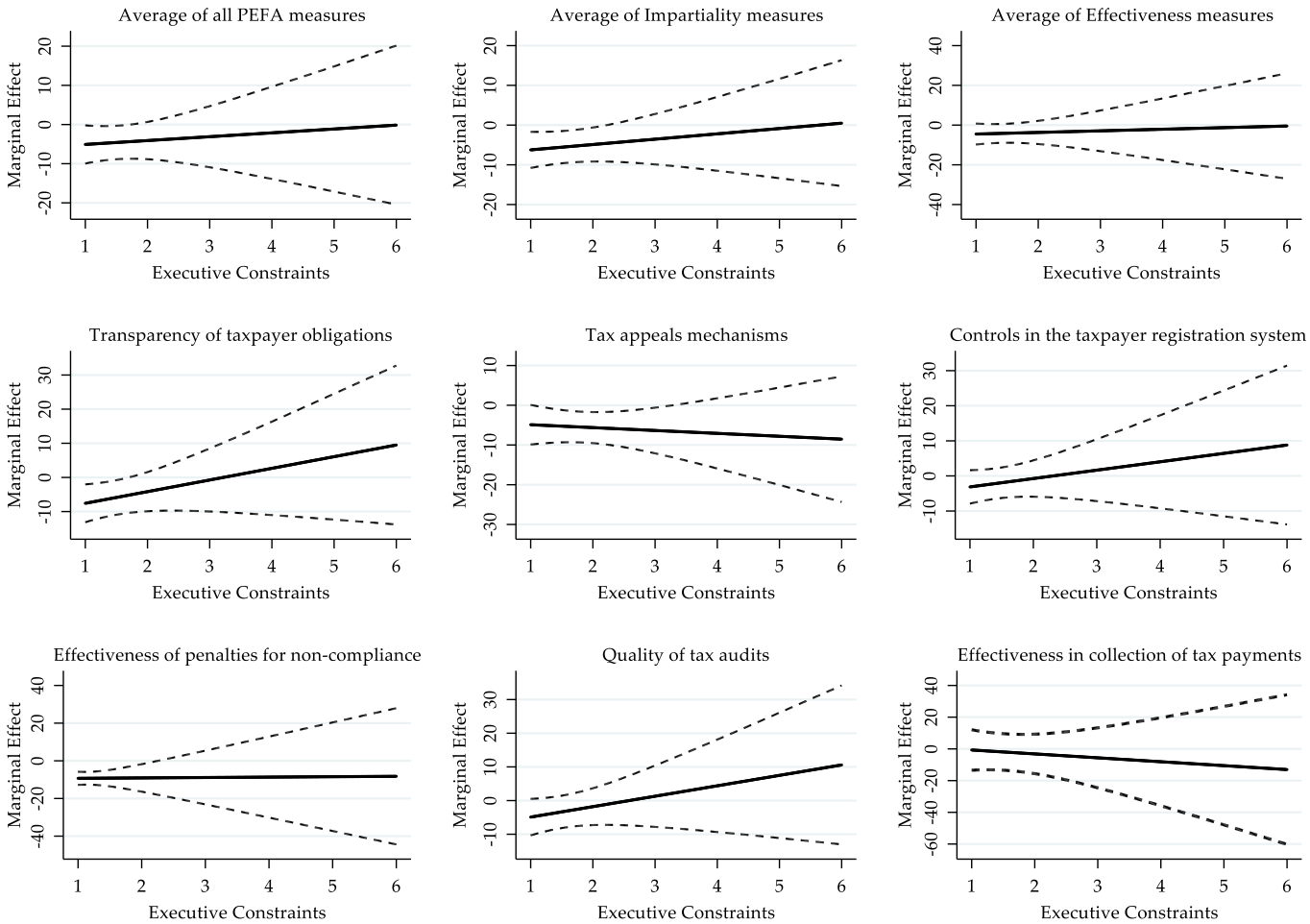

Figure 4A – Effects of point-source resources on fiscal institutions at different levels of executive constraints