

Original article

Why do some natural resource-rich countries adopt prudent fiscal rules? An empirical analysis

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ABSTRACT

What is the relationship between natural resource wealth and the adoption of fiscal rules that may help resource-rich states mitigate the effects of a so-called resource curse? We argue that the adoption of fiscal rules by resource-rich countries is conditional on a number of previously unconnected factors, including whether states receive large amounts of rent from natural resources, have high levels of domestic institutional quality, or face external pressure to adopt such rules. Using panel data on 166 countries during the 1985–2015 period and accounting for current levels of democracy and the quality of domestic institutions, we find that countries deriving rents from natural resources are less likely to adopt prudent fiscal rules in general. However, the negative effect of natural resource wealth on the likelihood of states adopting fiscal rules is largely concentrated in countries with low institutional quality. Furthermore, we find that external pressure in the form of fiscal conditionality from the IMF increases the likelihood of states implementing fiscal rules, suggesting that there are ways that states can mitigate the ‘resource curse.’ These findings are robust to alternative data, model specifications, and estimation strategies, including the instrumental variable approach.

1. Introduction

When oil was first discovered in the Middle East, many experts considered it to be a great boon for the region’s development prospects. Oil revenues would be used to develop infrastructure in many Middle Eastern countries, raising millions of people out of poverty. Indeed, some countries, such as the United Arab Emirates, used its abundance of natural resources to achieve high levels of development viz-a-viz neighbouring countries (Yousef, 2004). However, other countries within the region faced issues of stagnation, rent-seeking, and even inter- and intrastate conflict (Auty, 2002). This, unfortunately, is of no surprise, as the many negative externalities attached to resource wealth have led some to argue that natural resource wealth should be considered a ‘curse.’ This phenomenon, now known as the natural resource curse, has been written about extensively (see Lashitew and Werker, 2020; Badeeb et al., 2017), with many scholars writing on why many resource-rich states¹ have failed to develop (Karl, 2005).

The topics of natural resource wealth and the curse are especially relevant today because of recent events, such as the COVID-19 pandemic and the Russian-Ukrainian war, which have impacted the volatility of natural resource prices globally. The COVID-19 pandemic, for instance, led to a precipitous drop in oil prices soon after COVID-19 was declared a pandemic by the World Health Organization (Outlook, 2020). In contrast, the recent spike in oil prices because of the Russia-Ukraine conflict that began in February 2022 has added billions of dollars to oil-exporting countries’ coffers. This volatility has led some analysts to suggest that for major oil-producing countries, “the temptation to revert to pro-cyclical spending is real” (Saba, 2022). Given this, fiscal rules designed to mitigate the potential negative externalities of the resource curse (Berganza, 2012; Céspedes et al., 2014) are of increasing relevance today.

In this paper, we examine the likelihood of natural resource-rich countries adopting fiscal rules, focusing on previously unexplored factors that may increase or decrease the likelihood of resource-rich

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¹ We utilize a continuous measure of natural resource rents as a percentage of gross domestic product (GDP) to capture the resource wealth of states. Doing so allows us to capture the degree to which states rely on rents from natural resource wealth relative to other economic activities and its impact on fiscal rule adoption.

governments adopting these rules. We argue that the relationship between natural resource wealth and the adoption of fiscal rules is subject to a number of conditions. We suggest that natural resource-rich states are less likely to adopt fiscal rules than states lacking such resources. However, the relationship is conditional on two factors. First, if resource-rich states have a high level of institutional quality, they are just as likely to adopt fiscal rules as non-resource-rich states. This suggests that institutional quality in resource-rich states can act as a mitigating force against the resource curse (Dwumfour and Ntow-Gyamfi, 2018). Moreover, we argue that external pressure, in this case from the International Monetary Fund (IMF), can also lead resource-rich states to adopt fiscal rules that again mitigate the effects of the resource curse. In testing these assertions, we find consistent support for all three of our expectations.

This article proceeds as follows: First, we outline relevant literature on natural resource wealth, followed by literature on fiscal rules and outcomes. Second, we provide a theoretical story on the effect of natural resource wealth on the adoption of fiscal rules. Third, we outline our research design and results and provide some concluding remarks.

2. Literature review

2.1. Mitigating the curse

Much of the recent literature on natural resource abundance has argued that natural resource wealth represents a 'curse' rather than a blessing for states (Badeeb et al., 2017). Many of these studies emphasize how resource booms lead to a squeezing out of non-resource sectors in the domestic economy, a phenomenon commonly referred to as *Dutch Disease* that undermines economic growth by making domestic production uncompetitive internationally (Sachs and Warner, 1997). Other scholars argue that the presence of these resources, combined with relatively unrestrained governments, allows individuals to enrich themselves rather than to spread the wealth to the broader population (Besley and Persson, 2010). This then translates into anaemic growth, weak fiscal capacity, failure to expand tax bases, and other adverse developmental outcomes (Besley and Persson, 2010; Vadlamannati and de Soysa, 2017; Chachu, 2020; Lundstøl, 2022).

Much has also been written on the various strategies resource-rich states can use to avoid these negative externalities. Some studies have focused on the role that institutions play in both creating the conditions of the resource curse and mitigating it. De Rosa and Iooty (2012), for instance, find that states with greater resource dependence have worse institutional effectiveness. Likewise, Qiang and Jian (2020) argue that having poor institutions when resources are initially discovered can trigger the resource curse. Meanwhile, other studies highlight that good institutions can mitigate the resource curse (Dwumfour and Ntow-Gyamfi, 2018). Further, Ruzzante and Sobrinho (2022) demonstrate that the resource curse can be mitigated through prudent fiscal policies. Beyond mitigation, however, others have shown that good institutions can constrain rent-seeking and corruption (Boutillier, 2017), increase economic growth (Destek et al., 2023), and increase financial development (Khan et al., 2020).

Likewise, some scholars have examined the strategies and policies that some governments have used in response to natural resource wealth. One strategy is through the creation of a sovereign wealth fund (SWF).² According to James et al. (2022, 623), when governments experience a windfall, "the first issue facing policy makers is whether it should be spent or saved." As demonstrated earlier, natural resource abundance provides incentives for procyclical, immediate, and haphazard spending coupled with rent-seeking and other related

behaviors. A SWF addresses this tendency by establishing rules and by creating a source of revenue that is based upon an investment of the resource wealth. In effect, an SWF "can smooth resource revenues to make budget allocations more predictable. And it can offer countercyclical resources for the economy following an economic shock (Dixon and Monk, 2011, 4–5).

Governments typically follow two fiscal-spending strategies in establishing SWFs: the permanent income hypothesis (PIH) policy or the bird-in-hand (BIH) policy. These strategies are similar in many ways, with each requiring governments to deposit natural resource wealth into SWFs while following strict fiscal rules. However, the two strategies have major differences also. PIH is a forward-looking strategy, with the spending rule estimating spending based on current resources and income coupled with future income based on natural resource prices (Go et al., 2016). In contrast, the BIH strategy is a more conservative, backward-looking strategy. In this instance, states base spending from the SWF on already liquidated (exploited) resource revenues. According to Iacono (2012), this allows states to avoid issues related to greater future spending commitments not included in estimates of PIH spending strategies.

Norway's Government Pension Fund (GPF) is a popular example of the successful use of SWFs to spur economic development while avoiding the resource curse (Fink and Ducoing, 2022). However, the specific policies utilized in SWFs are also important. For instance, in establishing the GPF, the Norwegian government's mix of BIH and PIH policies did not account for a rapidly greying Norwegian population, which has led to predictions of Norway facing a net asset-GDP deficit by 2060 as a result (Harding and van der Ploeg, 2009). Thus, it is clear from this that the adoption of appropriate policies by resource-rich countries to avoid the resource curse is important.

2.2. Adoption of prudent fiscal rules

There are other related ways that states can mitigate the adverse effects of the natural resource curse also. One prominent way is through strengthening governance, including the adoption of strong fiscal rules. Fiscal rules are a diverse set of rules that governments can use to constrain fiscal policy by prescribing numerical limits to budgetary aggregates to secure fiscal credibility, discipline, and sustainability (Kopits and Symansky, 1998). Fiscal rules can include budget balance rules, debt rules, expenditure rules, and revenue rules. Fiscal rules of these types first emerged as a major policy tool in the 1990s because of the debt crises of the 1970s–1980s (Kopits and Symansky, 1998).

Recent studies have examined the determinants of fiscal rule adoptions by various states. Badinger and Reuter (2017), for instance, explore the determinants of the stringency of fiscal policy rules and find that GDP growth, inflation, membership in a monetary union, government stability, and age/dependency ratio are amongst the factors that are strongly associated with the strictness of fiscal rules. Similarly, one prominent determinant of fiscal rule adoptions is through the process of debt sustainability analysis by the IMF. The IMF is often asked to provide macroeconomic assessments on how sustainable debt generated by resource abundance is in the short- and long-term. Using models such as the Natural Resource Model and Debt, Investment, Growth, and Natural Resources Model, the IMF country teams can then recommend which fiscal policies should be utilized (Melina et al., 2016). Fewer studies, in contrast, assess the effect of natural resource wealth itself on the adoption of fiscal rules, excluding an important element of the story.

2.3. Institutions

The discovery of natural resource wealth allows domestic elites to engage in rent-seeking and corruptive behaviour at the expense of broader economic growth and development. However, such behaviour is present mostly in states with weak institutions, where incumbent governments tend to (re)distribute rents and invest inefficiently in public capital to buy votes (Klomp and de Haan, 2016). Further, incumbent

² A sovereign wealth fund is a state-owned investment fund typically utilizing abundant natural resources to generate short- and long-term profits for a state's economy and citizens.

governments in states with resource wealth and weak institutions may also borrow more in anticipation of future revenues from that resource wealth (Devlin and Lewin, 2005).

This suggests that incumbent governments are not inclined to support or favour institutions that would be more likely to implement fiscal rules. Likewise, it also suggests that an institutional equilibrium that grants little to no power to the larger population in their abilities to hold decision-makers accountable is politically optimal in this scenario, with an inclination to perpetuate procyclical policies becoming especially attractive (da Costa António and Rodríguez-Gil, 2020). In effect, a government that has high resource wealth and weak institutions³ is less likely to adopt or implement policies such as prudent fiscal rules that tie its hands. This leads to our first hypothesis:

Hypothesis 1. *Countries receiving rents from natural resources are less likely to adopt prudent fiscal policy rules compared with countries that do not have natural resources.*

Stronger institutions that ensure checks and balances and constrain an incumbent government should, however, yield the opposite effect. Several studies demonstrate the importance of good institutions allowing states to avoid the resource curse. For instance, Ruzzante and Sobrinho (2022) suggest that the resource curse is more prevalent in states that are characterized as having weak institutions. Similarly, having large extractive industries hinders governments' abilities to effectively build tax infrastructure, hurting economic development. However, other studies show that governments can create 'pockets of effectiveness' in certain instances, which allow them to create regions that can effectively regulate and tax natural resource industries (Kjær et al., 2021). These studies, in essence, highlight the importance of robust institutions in mitigating the resource curse (Boutillier, 2017). Likewise, there appears to be an institutional threshold effect, with institutions failing to mitigate the resource curse until a threshold of institutional quality is met (Destek et al., 2023).

This suggests that institutional quality is an important element when looking at the effect of natural resource wealth on the likelihood of states adopting fiscal rules. As suggested within the literature, strong institutions mitigate, and in some instances constrain, the resource curse. We suggest that the reason why this is the case is that having good institutions provides the conditions under which resource-rich states can adopt prudent fiscal rules. Further, this means the relationship between resource wealth and the likelihood of adopting fiscal practices in resource-rich states is conditional. This leads to our second hypothesis:

Hypothesis 2. *Natural resource wealth does not hinder the adoption of prudent fiscal policy rules in countries with good institutional quality.*

2.4. External pressure

Additionally, there is reason to suggest that external pressure⁴ can influence resource-rich governments' behaviors, including their decisions to adopt prudent fiscal rules. For instance, membership in currency unions or multilateral institutions may confer mutually agreed upon obligations on participants through external pressure. One example is membership in the Extractive Industries Transparency Industry Initiative (EITI), where members face some constraints, albeit weak ones, that mitigate the disincentives they face to mobilize domestic revenue outside the natural resource sector (Lim, 2022). While the EITI process has grown in importance over time, its limitations concerning its administrative and enforcement mechanisms have

limited its impact in comparison to more established external institutions such as the IMF.

The IMF merits special attention here due to its global mandate of ensuring financial stability in the domestic economies of member states. Indeed, Article 1 of its founding charter allows the IMF to provide large-scale loans to states facing poor economic conditions, including balance of payment issues and debt crises. Studies have shown that the IMF is particularly effective in promoting policy reform during these crisis periods (Dreher and Ruppert, 2007). Subsequently, these types of loans almost always include conditionalities related to fiscal responsibility that constrain government spending to restore macroeconomic stability. As a result, fiscal conditionalities can play a mitigating role in limiting fiscal profligacy and setting resource-rich countries on a sustainable fiscal path. Indeed, Goes (2022) suggests that IMF conditionalities can improve natural resource governance in both the short- and long-term. In the short-term, IMF loans help countries avoid the risk of default and in the long-term, "promotes fiscal reform that improves long-term solvency" (25). This suggests that pressure from the IMF, in the form of loan conditionalities, can lead to the adoption of prudent fiscal rules in resource-rich states. This leads to our third hypothesis:

Hypothesis 3. *Natural resource-rich countries are more likely to adopt prudent fiscal policy rules when accompanied with external pressure in the form of fiscal conditionality from the IMF.*

3. Data and methods

3.1. Model specifications

To examine our hypotheses, we utilize data on 166 countries (see Appendix 1 for the countries) during the 1985–2015 period. We estimate:

$$FR_{ct} = \varphi_c + \beta \text{rents}_{ct-1} + \beta Z_{ct-1} + \lambda_c + \delta_{t-1} + \omega_{ct-1} \quad (1)$$

Wherein, FR_{ct} is the *de jure* fiscal policy rules that are successfully adopted by country c during the year $t-1$ developed by the IMF's fiscal rules database. We use three different measures from the IMF database to capture *de jure* fiscal rules. First, we use an aggregated measure of fiscal rules combining the Budget Balance Rule (BBR) and Debt Rule (DR). Accordingly, our aggregated measure of fiscal rules takes the value 1 if country c from the year $t-1$ had adopted either BBR and/or DR, and 0 otherwise. Second, we use a dummy measure capturing the value 1 if country c from the year $t-1$ had adopted BBR, and 0 otherwise. Finally, we use a third dummy measure capturing DR in place in country c from the year $t-1$. According to the IMF database, fiscal rules are institutional mechanisms to rectify distorted incentives and limit (over)spending pressures in favourable times to ensure fiscal responsibility, credibility, and debt sustainability (IMF, 2012). The BBR is stipulated as an overall budget balance, structural or cyclically adjusted balance that influences the debt/GDP ratio. The objective here is to provide operational guidance to ensure that the debt/GDP ratio converges to a finite level. Meanwhile, the DR is defined as a specific target for public debt expressed as a percent of GDP with an objective to ensure convergence to a debt target. Appendix 2 provides details of countries adopting the BBR and DR. As seen, about 79 countries have adopted BBR, while 68 states have DR in place during our study period.

Our main variable of interest is natural resource wealth. We use natural resource rents as a share of GDP lagged by one year (rents_{ct-1}) to capture resource wealth. Previous studies have used resource exports as a share of total exports or resource exports as a share of GDP (e.g., Collier and Hoeffler, 2004). We use natural resource rents data obtained from the World Bank's World Development Indicators (WDI), which presents the data as a share of GDP (World Bank, 2018). Rents are defined as unit price

³ We show the negative relationship between natural resource wealth and institutional quality in Figures A-D of the Online Appendix.

⁴ The term 'external pressure' as used here suggests a form of diplomatic coercion or influence a resource-rich government is subject to because of membership in a formal organization with defined rules and constraints.

minus the cost of production times the quantity produced. In our sample of 155 countries during the 1985–2015 period, the average natural resource rents to GDP are 8.4%, with a maximum of 82.6%.⁵

The vector of control variables (Z_{ct-1}) includes potential determinants of adopting fiscal policy rules gleaned from the existing literature that may explain the effect of resources (Badinger and Reuter, 2017; Schaechter et al., 2012). We avoid the “garbage can” or “kitchen-sink models” approach and limit our control variables (Achen, 2005; Schrodt, 2014). We follow the conservative strategy of accounting only for known factors that may confound the effect of resources, such as income per capita, the level of economic openness, and regime type, which proxy the quality of existing institutions. First, we include per capita GDP (log) in US\$ 2005 constant prices obtained from the WDI as a measure of the level of economic development (World Bank, 2018). We expect economic development to be positively correlated with adopting fiscal rules, but because resource-rich countries also might be marginally richer than resource-poor ones. Indeed, past scholarship shows that richer countries are more likely to adopt fiscal policy rules (Schaechter et al., 2012). Next, we control for regime type. Studies have shown that democracies, due to political stability, strong institutions, and accountability, are more likely to adopt and comply with fiscal rules (Schaechter et al., 2012). Meanwhile, Badinger and Reuter (2017) suggest that democracies have fewer incentives to adopt fiscal rules because of the short-sightedness of being replaced in future elections. We include a measure of democracy using the Marshall and Jaggers’ (2000) Polity IV index⁶ which is coded on a scale of –10 (full autocracy) to +10 (consolidated democracy). Additionally, we include a dummy variable capturing if a country is experiencing a currency, debt, or systematic banking crisis or some combination of the three, sourced from Laeven and Valencia (2013), which is expected to have a negative effect on fiscal policy rules. Previous studies find that economic crises make it harder for governments to comply with fiscal rules (Badinger and Reuter, 2017; Schaechter et al., 2012). Finally, we include a measure of trade openness using total trade as a share of GDP obtained from UNCTAD Statistics (2018) because Kumar et al. (2009) suggest that a deterioration in trade increases the prospect of adopting fiscal rules. The descriptive statistics on all variables are reported in Appendix 3 and the details on definitions and data sources in Appendix 4.

Given the binary nature of our dependent variables, ideally, one would use a logit maximum likelihood estimator. However, a major drawback of non-linear estimations, like the logit estimator, is that including country-fixed effects may be problematic due to the well-known *incidental parameter problem* (Lancaster, 2000). To circumvent this problem, we follow Eichengreen and Leblang (2008) to estimate *linear probability models*, which provide consistent estimates by allowing us to control for both year and country-specific fixed effects. Thus, Eq. (1) is estimated using a linear probability model in which λ_c denotes country-specific dummies and ∂_{t-1} captures year-specific dummies. Note that we use robust standard errors since the ω_{ct-1} in linear probability models are heteroskedastic. We also present regression results using logit estimator controlling for only year-specific fixed effects in our robustness tests.

3.2. Endogeneity

Our natural resource rents measure could be plagued by endogeneity problems if a state, for instance, factors in its heavy reliance on natural resource rents when adopting various types of fiscal policy rules. This issue

is not trivial because those who argue that natural resource wealth affects the state’s ability to adopt fiscal rules also make a causal claim that implementation of a sound fiscal policy framework may not only affect the country’s reliance on resource rents, but might inhibit it from undertaking long-term revenue forecasts to implement large public investment projects (Daniel et al., 2013; IMF, 2012). Furthermore, natural resource rents are affected by other factors, which could also explain the implementation of fiscal policy rules, such as macroeconomic crises. Failing to account for endogeneity might yield biased results. To address the problem of endogeneity, we employ instrumental variables and estimate a two-stage least squares instrumental variable (2SLS-IV) estimator.

We follow Vadlamannati and de Soysa (2020) and Meyersson et al. (2008), wherein we use two instrumental variables affecting natural resource rents. First, we use total world consumption per capita minus the consumption per capita of i^{th} country in question (log) using data taken from the WDI. Secondly, we use the world GDP growth rate minus the rate of growth of GDP of i^{th} country in question sourced from the WDI. As demand for natural resources like oil, gas, and minerals increases due to increases in global demand (reflected in global GDP growth and consumption), countries producing these resources will increase their exports more than countries who do not produce such commodities. In all likelihood, an increase in natural resource exports to the rest of the world (and subsequent increases in resource rents) as a result of a surge in demand will be orthogonal to country i adopting fiscal rules. We believe these two measures drive demand for natural resources and hence are more likely to be exogenous to the dependant variable – fiscal rules in country i .

The validity of our instruments depends on two conditions. The first condition is instrument relevance, which is that the selected instruments must be correlated with the explanatory variable in question. In the case of linear estimations, Bound et al. (1995) suggest examining the joint *F-statistic* on the excluded instrument in the first-stage regression. The selected instrument would be relevant when the first-stage regression model’s joint F-statistics is above 10 (Bound et al., 1995). However, the joint F-test has been criticized in the literature as being insufficient to measure the degree of instrument relevance (Stock et al., 2002). The more powerful tests, namely, the Kleibergen-Paap Wald F-statistic offers reliable statistical inferences in a weak instrument setting (Kleibergen and Paap, 2006). An F-statistic above the critical value (10% maximal test size) indicates the rejection of weak instruments. Second, the selected instrument should not differ systematically from the error term in the second stage of the equation, i.e., $[w_{it} | IV_{it}] = 0$, meaning the selected instrument should not have any direct effect on the outcome variable of interest – likelihood of adopting fiscal rules, but only indirectly via the instrumented variable. At this juncture, we are unaware of any theoretical proposition or empirical test linking global demand for natural resources and the probability of a country adopting fiscal rules. Thus, we employ the Hansen J-test (Hansen 1982) to examine whether the selected instruments satisfy the exclusion restriction.

3.3. Interaction effects

Next, to examine the second and third hypotheses we estimate an interaction model in which we introduce an interaction of natural resource rents with political institutions:

$$FR_{ct} = \varphi_c + \beta (rents \times inst)_{ct-1} + \beta rents_{ct-1} + \beta inst_{ct-1} + \beta Z_{ct-1} + \lambda_c + \partial_{t-1} + \omega_{ct-1} \quad (2)$$

Wherein, $(rents \times inst)_{ct-1}$ captures the interaction between natural resource rents to GDP and political institutions. We utilize a measure of checks and balances in a political system developed by Beck et al. (2001)

⁵ In further robustness tests, we disaggregate rents measure by oil and gas, minerals, coal and forest, respectively. We also use weighted averages of these disaggregated measures based on their contribution in total resource rents.

⁶ Though the Polity index has been criticized (Potrafke, 2012), it captures three important elements of democracy namely, presence of institutions, existence of effective constraints on executives and participation in political processes.

and Keefer and Stasavage (2003) as a proxy for political institutions.⁷ This measure captures the ability of other agents to restrain the government. The index ranges from one (few veto players) to 17 (a high number of veto players), thereby measuring the institutionalized constraints placed on the power of the chief executive's decision-making process.⁸ Using this interaction, we examine if regimes with more checks and balances will increase the likelihood of the adoption of fiscal rules.

Next, we present the interaction of natural resource rents with IMF fiscal conditions:

$$FR_{ct} = \varphi_c + \beta (rents \times imf)_{ct-1} + \beta rents_{ct-1} + \beta imf_{ct-1} + \beta Z_{ct-1} + \lambda_c + \partial_{t-1} + \omega_{ct-1} \quad (3)$$

Wherein, $(rents \times imf)_{ct-1}$ captures the interaction between natural resource rents to GDP and IMF fiscal conditions developed by Kentikelenis et al. (2016) to generate our estimates of the conditional difference in the governments' adoption of fiscal rules between IMF participant and non-participant countries. The dataset developed by Kentikelenis et al. (2016) captures the type and number of IMF fiscal conditions in force for each country in each year. Specifically, we consider conditions related to fiscal, revenue and tax, and external debt issues such as domestic government borrowing or debt, fiscal deficit, budgetary deficit, cash balance, deficit of the central government, government spending, central government primary balance, combined deficit, tax policy, legislation and administration, debt management, public debt, guarantees, and contingent liabilities, sub ceiling on medium and long-term external debt, short-term debt, ceilings on external arrears, amongst others. The advantage of using Kentikelenis et al. (2016) measure is that the number indicates the conditions a country has implemented in that particular year and not anytime an IMF condition is taken. Thus, the conditions data vary by each year a country is under an IMF program with fiscal conditions imposed.

Note that both the interaction effect models in specifications (2) and (3) are estimated using the OLS estimator, allowing us to control for country and year-specific fixed effects and to generate marginal plots to assess the interaction effects.

4. Empirical results

Tables 1–4 present our main results. Table 1 presents results capturing the impact of natural resource dependence without any controls and our various controls added in a stepwise manner. Table 2 provides the results of IV estimations. Table 3 reports the results from interaction models between natural resource dependence and institutions. Finally, Table 4 presents the conditional effects between natural resources and IMF conditions on fiscal policy. We begin our analysis with Table 1. While columns 1–3 present the results of an unconditional effect of natural resource wealth on three measures of dependent variables, the results controlling for other factors are presented in columns 4–6. As seen in column 1, we find a negative and significant effect of natural resource wealth on the likelihood of countries adopting fiscal policy rules. Notice that these results are robust to controlling for both country and year-specific fixed effects. The substantive effects suggest that a standard deviation increase in natural resource rents to GDP decreases the probability of implementing fiscal policy rules by roughly 7%. While moving from mean to a maximum value of natural resource rents to GDP (82.6) is associated with a 28% chance of not adopting fiscal policy rules. Notice that when we replace

fiscal policy rules with that of BBR and DR, our results on natural resource wealth remain robust. As seen from columns 2–3, the effect of resource rents to GDP is negative and statistically significant at the 1% level in both columns, respectively. A standard deviation increase in resource rents to GDP would reduce the chances of adopting BBR and DR by 5%, respectively. Once again, increasing resource rents to a maximum value of 82.6% of GDP is associated with a 22% chance of not adopting both BBR and DR, respectively. Thus, the substantive impact shown for both disaggregated measures of fiscal policy rules is fairly similar and robust. These findings lend support to the argument that countries with a higher amount of natural resource rents are less likely to adopt fiscal policy rules compared with countries that lack natural resources.

Our results on natural resource wealth remain robust to adding other control variables in columns 4–6. As seen, the impact of resource rents to GDP on all three fiscal policy rule measures is negative and significantly different from zero at the 1% level. The substantive effects also remain the same. These results lend further credence to our first hypothesis that natural resource wealth hinders fiscal policy rules adoption, which are intended to promote fiscal discipline and strengthen fiscal frameworks. Our results are similar to those obtained by Vadlamannati and de Soysa (2017) in their study on natural resources dependence and transparency promoting laws and Wehner and Renzio (2013) on the adverse effect on fiscal transparency of dependence on natural resource revenues. It is noteworthy that columns 4–6 also report our results on control variables. Accordingly, we find that per capita income, Polity, and trade openness are significantly different from zero at the conventional levels of statistical significance. Interestingly, we find that while richer countries tend to not adopt fiscal policy rules, democracies are more likely to do so. This suggests that deteriorating economic conditions might trigger a strengthening of fiscal policy rules. Similarly, our results suggest that democracy increases the likelihood of fiscal rule adoption, fitting well with Schmidt-Hebbel and Soto (2017). Likewise, our results on trade are also in line with existing research, where a deterioration in trade has been linked with an increased probability of adopting fiscal rules (Kumar et al., 2009). Contrary to conventional wisdom, we do not find any significant effect of economic crises on fiscal policy rules.

In Table 3, we present the empirical results from the 2SLS-IV estimations. Column 1 reports the results with the fiscal policy rule as the dependant variable. We repeat the same exercise in columns 2–3 by replacing fiscal policy rule measures with BBR and DR, respectively. There are three observations drawn from these results. First, as seen, the IV estimation results reported in columns 1–3 are very similar to those reported in our baseline estimates in Table 1. We find a very strong negative and statistically significant effect of natural resource rents to GDP on the implementation of fiscal policy rules after controlling for endogeneity concerns. Second, as seen from all the columns in Table 2, not only is natural resource rents to GDP statistically significant, but its impact is also large. For instance, holding other controls constant, a standard deviation increase in resource rents to GDP is associated with a decline in adopting fiscal policy rules by roughly 68%, which is significantly different from zero at the 1% level (see column 1). The substantive effect in this instance is at least thrice as large as in the corresponding OLS estimations reported in Table 1. Similarly, a standard deviation increase in resource rents to GDP is associated with a decline in the likelihood of adopting BBR and DR by roughly 60% and 58%, respectively (see columns 2–3), an effect which is three times larger than those estimated in Table 1. Third, notice that the additional statistics provided below in Table 2 suggests that the instruments pass the exclusion criteria. The Hansen *J-statistic* shows that the null of exogeneity cannot be rejected at the conventional level of significance in our 2SLS-IV models. Furthermore, the joint *F-statistic* from the first stage rejects the null that both the instruments selected are not relevant instruments. In fact, we obtained a higher joint *F-statistic* and a Kleibergen-Paap *F-statistic* above 10 on all three estimation models reported in Table 2, respectively, which remain significantly different from zero at the 1% level. Taken together, our results on natural resource rents remain robust to alternative estimation techniques, addressing any

⁷ We use alternative measures of institutional quality in robustness tests in the Online Appendix. Our results remain robust to using various other measures of institutions.

⁸ It is noteworthy that the correlation between checks and balances and Polity index, which is included in the model as a control variable, is moderate at 0.63. Nevertheless, in the robustness test we re-estimate these models by dropping polity index and our results remain robust.

Table 1Impact of natural resource wealth on *de jure* fiscal rules.

	(1) FPR	(2) BBR	(3) DR	(4) FPR	(5) BBR	(6) DR
Natural Resource Rents/GDP t-1	-0.00316*** (0.000609)	-0.00250*** (0.000600)	-0.00236*** (0.000577)	-0.00279*** (0.000868)	-0.00272*** (0.000835)	-0.00170** (0.000826)
Per capita GDP (log) t-1				-0.0537** (0.0226)	-0.0680*** (0.0216)	-0.0753*** (0.0207)
Polity index t-1				0.00577*** (0.00116)	0.00547*** (0.00113)	0.00655*** (0.00112)
Economic crises t-1				-0.0232 (0.0149)	-0.0178 (0.0141)	-0.0185 (0.0139)
Trade/GDP (log) t-1				-0.0574*** (0.0137)	-0.0382*** (0.0123)	-0.0952*** (0.0138)
Constant	-0.292*** (0.0417)	-0.253*** (0.0375)	-0.238*** (0.0357)	0.295** (0.139)	0.321** (0.135)	0.669*** (0.129)
Estimator	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.532	0.519	0.498	0.562	0.546	0.540
Countries	132	132	132	126	126	126
Observations	4113	4113	4113	3611	3611	3611

Notes: Robust standard errors in parenthesis; Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Fiscal Policy Rule (FPR), Budget Balance Rule (BBR), Debt Rule (DR).

Table 2Impact of natural resource wealth on *de jure* fiscal rules: 2SLS-IV estimations.

	(1) FPR	(2) BBR	(3) DR
Natural Resource Rents/GDP t-1	-0.0339*** (0.00656)	-0.0305*** (0.00618)	-0.0291*** (0.00543)
Per capita GDP (log) t-1	-0.198*** (0.0389)	-0.199*** (0.0361)	-0.201*** (0.0348)
Polity index t-1	0.00455*** (0.00144)	0.00445*** (0.00138)	0.00558*** (0.00132)
Economic crises t-1	-0.0116 (0.0182)	-0.00428 (0.0169)	-0.00856 (0.0166)
Trade/GDP (log) t-1	0.0238 (0.0237)	0.0352 (0.0216)	-0.0251 (0.0205)
Constant	1.901*** (0.273)	1.796*** (0.258)	2.062*** (0.242)
Estimator	2SLS-IV	2SLS-IV	2SLS-IV
Year Fixed effects	Yes	Yes	Yes
Country Fixed effects	Yes	Yes	Yes
Joint F-statistic	25.05***	25.05***	25.05***
Cragg-Donald Wald F-statistic	39.51***	39.51***	39.51***
Kleibergen-Paap Wald F-statistic	25.04***	25.04***	25.04***
Hansen J statistic [p-value]	0.3844	0.3651	0.5971
R-squared	0.421	0.423	0.405
Countries	121	121	121
Observations	3499	3499	3499

Notes: Robust standard errors in parenthesis; Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Fiscal Policy Rule (FPR), Budget Balance Rule (BBR), Debt Rule (DR).

endogeneity concerns. The results of control variables are roughly the same as those reported in Table 1.

In Table 3, we introduce interaction terms between natural resource rents to GDP and our measure of political institutions. As seen in columns 1–3, all of our interaction terms are positive but statistically insignificant, with the exception of column 1. Interestingly, political institutions on their own, i.e., when the resource rents measure is 0, remain statistically insignificant. Meanwhile, the individual constituent term of natural resource rents to GDP on its own (when the institutions measure is set to 0) retains its negative sign and is significantly different from zero at the 1% level. However, it is important to note that the interpretation of the interaction terms, even in linear models, is not straightforward. Consequently, a simple *t*-test on the coefficient of the interaction term is not sufficient to examine whether the interaction term is statistically significant or not (Ai and Norton, 2003). The interactive effect is best assessed with a margins plot, which depicts the magnitude of the interaction effect in Figs. 1–2. To calculate the

Table 3

Interaction models of natural resource wealth with political institutions.

	(1) FPR	(2) BBR	(3) DR
Natural Resource Rents/GDP t-1 × Institutions t-1	0.000900** (0.000387)	0.000308 (0.000337)	0.000341 (0.000359)
Natural Resource Rents/GDP t-1	-0.00449*** (0.00106)	-0.00323*** (0.000979)	-0.00231** (0.00100)
Institutions t-1	0.000349 (0.00581)	0.00400 (0.00563)	0.00212 (0.00377)
Per capita GDP (log) t-1	-0.0546** (0.0229)	-0.0699*** (0.0220)	-0.0779*** (0.0210)
Polity index t-1	0.00475*** (0.00128)	0.00461*** (0.00125)	0.00589*** (0.00117)
Economic crises t-1	-0.0239 (0.0148)	-0.0160 (0.0140)	-0.0198 (0.0139)
Trade/GDP (log) t-1	-0.0541*** (0.0135)	-0.0339*** (0.0122)	-0.0910*** (0.0136)
Constant	0.918*** (0.170)	0.907*** (0.166)	1.206*** (0.157)
Estimator	OLS-FE	OLS-FE	OLS-FE
Year Fixed effects	Yes	Yes	Yes
Country Fixed effects	Yes	Yes	Yes
R-squared	0.563	0.549	0.538
Countries	122	122	122
Observations	3528	3528	3528

Notes: Robust standard errors in parenthesis; Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Fiscal Policy Rule (FPR), Budget Balance Rule (BBR), Debt Rule (DR).

marginal effect of resource rents on the three measures of fiscal policy rules, we consider both the conditioning variable (political institutions index) and the interaction term and display graphically the total marginal effect conditional on the political institutions index coded on a 0 to 18 scale. The y-axis of Figs. 1–2 displays the marginal effect of natural resource rents to GDP, and the marginal effect is evaluated on the political institutions index on the x-axis. Note that we include the 90% confidence interval in both Figures.

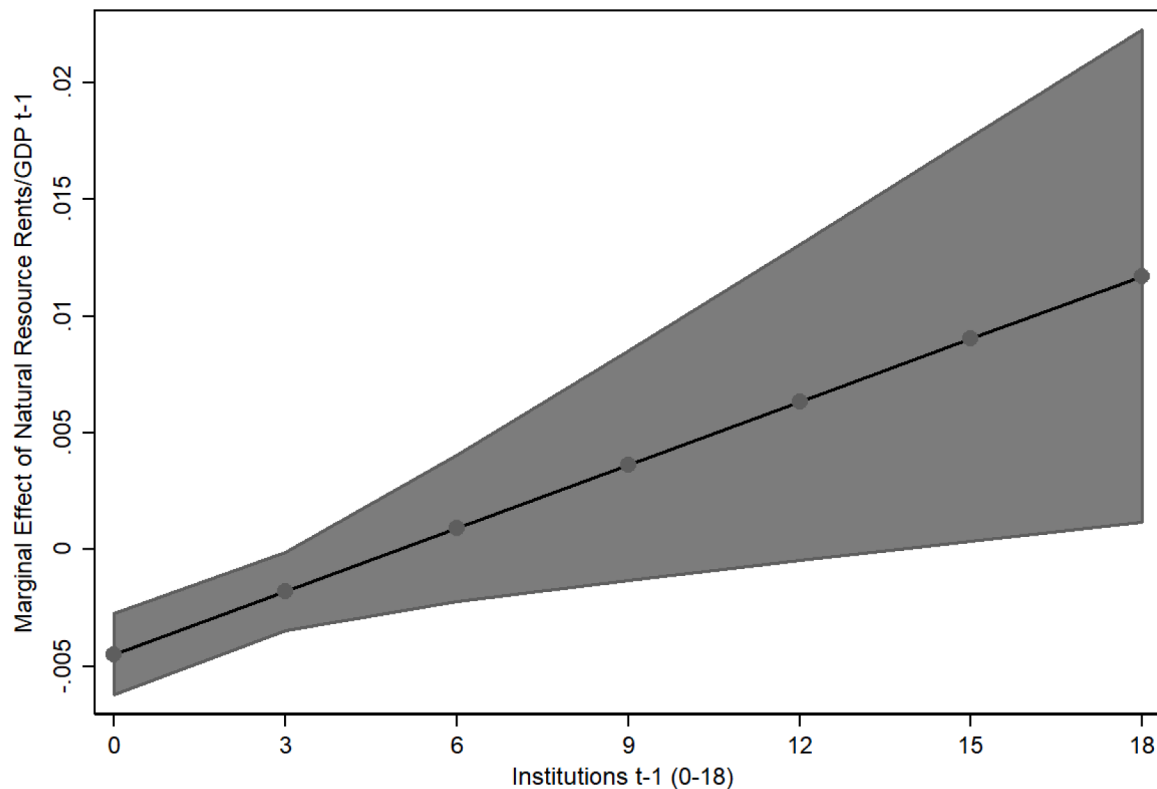
As seen in Figs. 1, 2, and in line with our theoretical expectations, natural resource rents to GDP decrease the probability of adopting fiscal policy rules and balanced budget rules (at the 90% confidence level at least) when the political institutions index is below the score of 6 (on a scale of 0 to 18). However, the margins plot also shows that the effect of resource rents on the successful implementation of fiscal policy rules is statistically insignificant when the political institutions index is above a score of 6. Interestingly, for the aggregated measure of a fiscal policy

Table 4

Interaction models of natural resource wealth with IMF fiscal conditions.

	(1) FPR	(2) BBR	(3) DR
Natural Resource Rents/GDP t-1 × IMF Fiscal policy conditions t-1	0.000202** (8.32e-05)	7.63e-05 (8.22e-05)	0.000201** (8.32e-05)
Natural Resource Rents/GDP t-1	-0.00331*** (0.000889)	-0.00292*** (0.000860)	-0.00216** (0.000845)
IMF Fiscal policy conditions t-1	-0.000594 (0.00116)	-0.000225 (0.00115)	0.000636 (0.00110)
Per capita GDP (log) t-1	-0.0511** (0.0230)	-0.0688*** (0.0220)	-0.0671*** (0.0211)
Polity index t-1	0.00546*** (0.00118)	0.00528*** (0.00115)	0.00612*** (0.00114)
Economic crises t-1	-0.0218 (0.0149)	-0.0168 (0.0141)	-0.0180 (0.0139)
Trade/GDP (log) t-1	-0.0565*** (0.0136)	-0.0376*** (0.0124)	-0.0948*** (0.0135)
Constant	0.932*** (0.169)	0.951*** (0.164)	1.171*** (0.157)
Estimator	OLS-FE	OLS-FE	OLS-FE
Year Fixed effects	Yes	Yes	Yes
Country Fixed effects	Yes	Yes	Yes
R-squared	0.564	0.546	0.543
Countries	126	126	126
Observations	3603	3603	3603

Notes: Robust standard errors in parenthesis; Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Fiscal Policy Rule (FPR), Budget Balance Rule (BBR), Debt Rule (DR).

**Fig. 1.** Natural resource rents, institutions & marginal effect on fiscal policy rule.

rule in Fig. 1, we find that natural resource rents to GDP increase the chances of adoption at the maximum value of the political institutions index, which is significantly different from zero at the 5% level. This is, however, not the case for BBR, as seen in Figure 2.⁹ Our findings suggest

⁹ The same holds true for the DR, although the plot is not shown here due to brevity.

that perhaps institutions are not a prerequisite in resource-rich countries for adopting various types of fiscal rules but not having good institutions certainly takes away incentives to adopt fiscal policy rules. The coefficients on individual constituent terms of interaction variable also highlight this same point. While political institutions on its own remains statistically insignificant, the resource rents variable has a negative and significant effect on fiscal rules.

Next, in Table 4, we present the interaction effects on natural

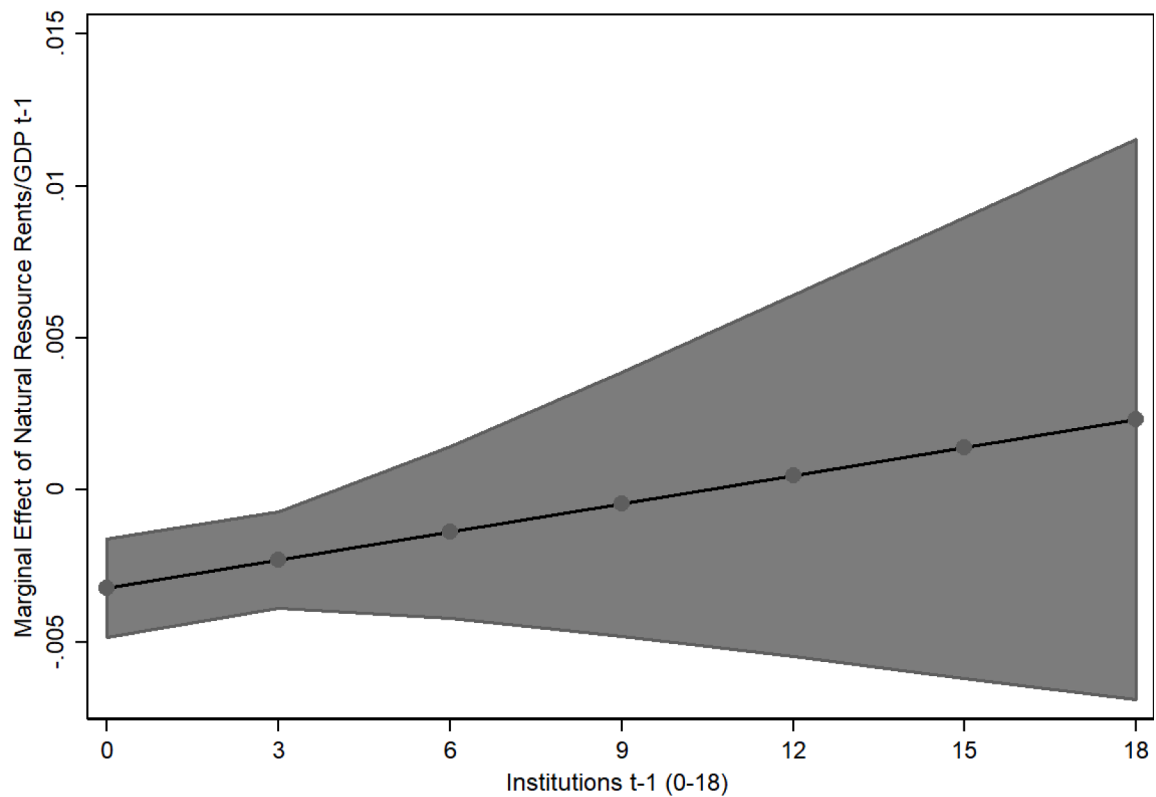


Fig. 2. Natural resource rents, institutions & marginal effect on balance budget rule.

resource wealth and IMF Fiscal policy conditions. As seen, the interaction effects show a positive and statistically significant effect on aggregated measures of fiscal policy rules and DR. Once again, we find that the individual constituent terms, namely, resource rents to GDP, remain

negative and significant at the 1% level, while IMF conditions on its own (i.e., when rents to GDP is set to 0) remains statistically insignificant. Once again, we use marginal plots to provide a graphical interpretation of the magnitude of the interaction effects. On the y-axis of Figs. 3–5, we

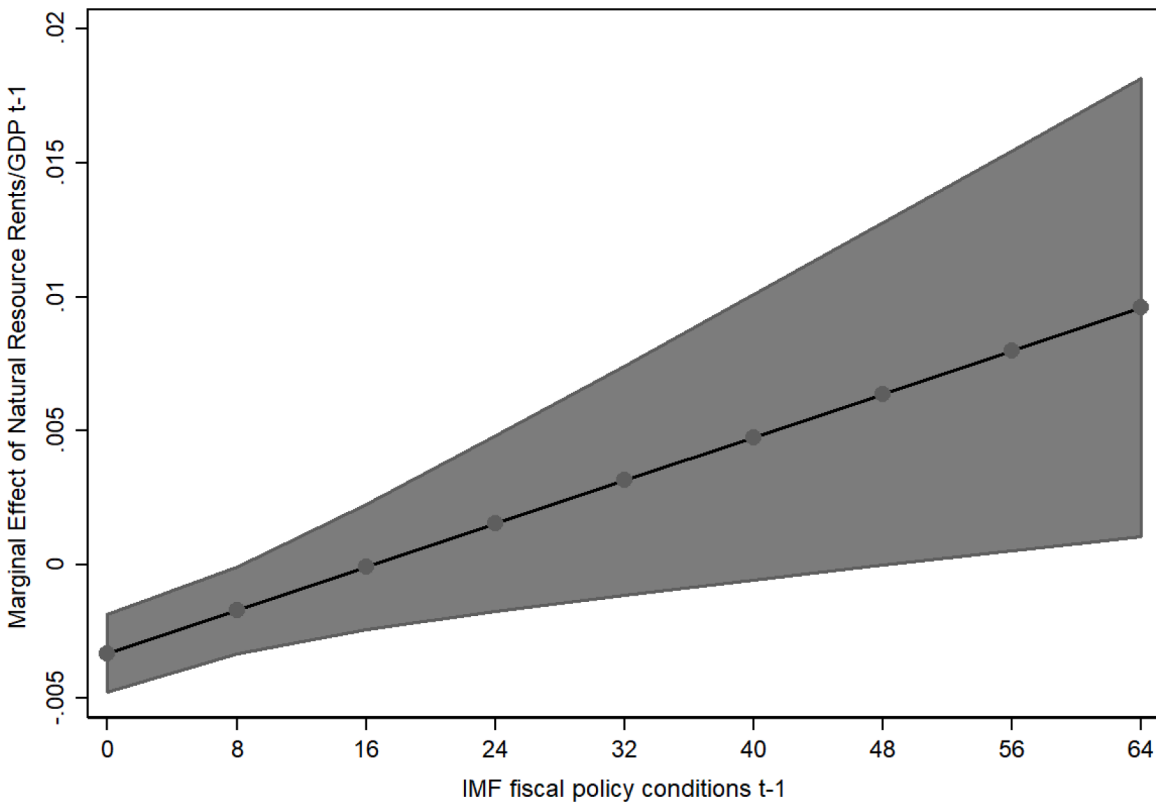


Fig. 3. Natural resource rents, IMF conditions & marginal effect on fiscal policy rule.

show the marginal effect of an additional increase in a unit of natural resource rents to GDP, whereas on the x-axis is IMF fiscal conditions at which the marginal effect is evaluated. As before, we include 90% confidence intervals in Figs. 3–5. The conditional plot in Fig. 3 reveals

that an additional unit increase in resource rents to GDP decreases the likelihood of adopting aggregated fiscal policy rules when IMF fiscal conditions are below 16 (on a scale of 0 to 64). These effects are similar for BBR, as shown in Fig. 4. However, at the higher end of the IMF

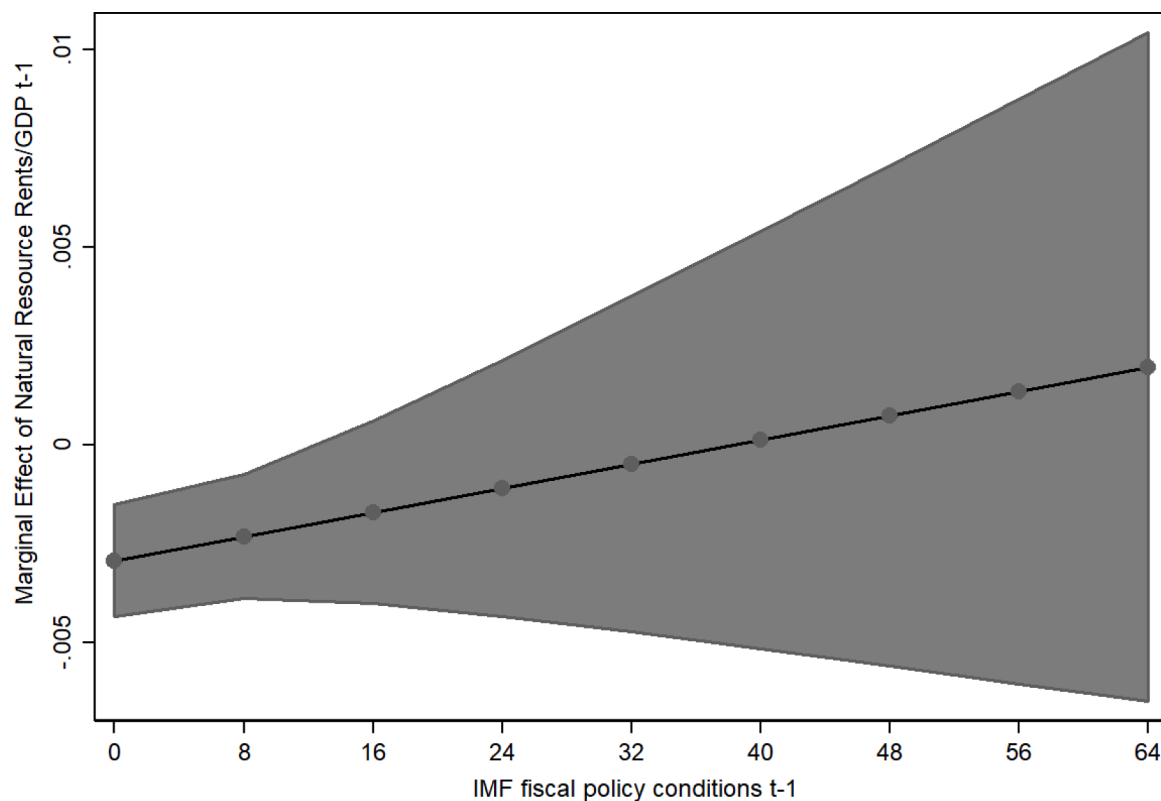


Fig. 4. Natural resource rents, IMF conditions & marginal effect on balance budget rule.

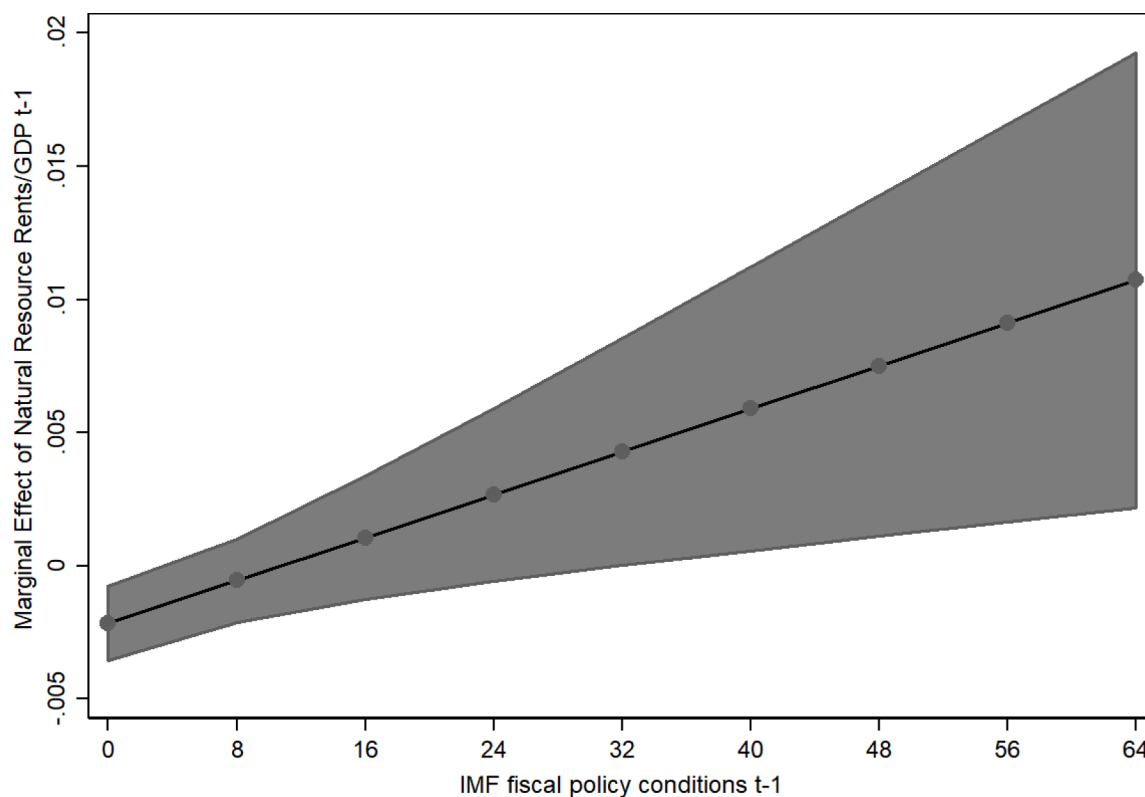


Fig. 5. Natural resource rents, IMF conditions & marginal effect on debt rule.

conditions, we find a positive effect on fiscal policy rules (Fig. 3), which is significantly different from zero at the 1% level. We find similar effects when examining the DR, as shown in Fig. 5 in which the resource rents decrease the chances of adopting DR when IMF fiscal conditions are low but increase the prospects when the same conditions are high. These additional interaction effects provide strong support for the proposition that countries dependant on natural resource wealth are more likely to adopt fiscal policy rules when accompanied by external pressure, such as IMF fiscal conditionality. This is not surprising because many of the IMF fiscal conditions related to fiscal frameworks and fiscal balance, amongst others, fall under the purview of either prior action or performance criteria conditions which are assessed to gauge the progress in meeting the IMF program's objectives in a participant country. To an extent, these results are in line with the findings of Crivelli and Gupta (2018) that IMF fiscal conditions not only facilitate revenue collection efforts but also promote revenue and expenditure reforms.

4.1. Robustness checks

We put our empirical results to a variety of robustness tests. We operationalize our natural resource rents to the GDP hypothesis variable differently. Likewise, we disaggregate our resource rents variable by oil and gas, mineral, coal and forest, respectively. We also assign weights to the disaggregated measures based on their share in total rents. We use alternative measures of institutional quality, and we exclude outlier countries and extreme values from the rents data to test if they drive the results. The robustness check results are not shown here due to brevity but are available in the Online Appendix. In summary, the results taken together are robust to using alternative data, specifications, and testing procedures.

5. Conclusion

The effects of the resource curse remain problematic for many resource-rich countries. However, some resource-rich states have been able to mitigate the curse by adopting prudent fiscal rules that place short- and long-term constraints through measures such as SWFs to ensure credibility, discipline, and sustainability within the resource sector. In this study, we look at the effect that *natural resource wealth* has on the likelihood of states adopting prudent fiscal rules. We argue that resource-rich states should be less likely to adopt prudent fiscal rules. However, resource-rich states with good institutional quality should be more likely to adopt fiscal rules. Finally, we argue that resource-rich states facing external pressure from the IMF are more likely to adopt fiscal rules. We find strong statistical evidence in support of our argument.

Our findings have several implications for future scholarship. For instance, our results suggest that resource-rich states must have high levels of domestic institutional constraint before we can expect them to adopt prudent fiscal rules. Many resource-rich countries, however, lack robust domestic institutions. This suggests that countries most in need of fiscal rule adoption to address the resource curse are the ones that are least likely to adopt them. In contrast to this, external pressure from the IMF suggests a broader solution. Many resource-rich countries engage in excessive foreign borrowing and subsequently experience debt crises. The IMF can and does bail out these types of states and can require the adoption of various fiscal rules as a condition for loans. This suggests that the IMF can act as a broader 'solution' for resource-rich states. However, this solution has downsides, as IMF conditionalities have been linked to significant negative externalities (i.e., Forster et al., 2019). We must also acknowledge that we only looked at a limited set of factors in this study. It is clear from both the literature and our own study that other factors are both important and remain unexplored at this juncture. For instance, a potentially unexplored conditional factor is the type of tax system adopted by resource-rich states. Further exploration of the connection between natural resource wealth and fiscal rule adoption is

needed in future scholarship.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.exis.2023.101234.

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