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# Examining the effect of IMF conditionality on natural resource policy

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## Abstract

Can International Monetary Fund (IMF) lending improve natural resource governance in borrowing countries? While most IMF agreements mandate policy reforms in exchange for financial support, compliance with these reforms is mixed at best. The natural resource sector should be no exception. After all, resource windfalls enable short-term increases in discretionary spending, and office-seeking politicians are often unwilling to forgo this discretion by reforming the oil, gas, or mining sector. I investigate how and when borrowers go against their political interests and establish natural resource funds—a tool often promoted by the IMF—in the wake of a loan agreement. Using text analysis, statistical models, and qualitative evidence from natural resource policy and IMF conditionality for 74 countries between 1980 and 2019, I show that borrowers under an IMF agreement are more likely to create or regulate a resource fund, particularly if the agreement includes binding conditions that highlight the salience of natural resource reforms. This study contributes to extant research by proposing a new method to extract information from IMF conditions, by introducing a novel dataset on country-level natural resource policy, and by identifying under what circumstances international reform efforts can help combat the resource curse.

**KEYWORDS**
IMF, international political economy, international organizations, macroeconomic political economy, microfoundations of political economy, political business cycles, rent-seeking

## 1 | INTRODUCTION

Suppose a country discovers oil or copper in its subsoil and decides to sell these resources in international markets. What should it do with its windfalls? It can use some of this money to invest in human capital and public goods. It can pay external debt obligations or set money aside in a rainy day fund. It can redistribute resource revenues at the subnational level to reduce regional disparities. But if history serves as a guide, most political leaders in resource-rich countries will use their newfound wealth for electoral or personal gain.

Between 1972 and 1974, the price of imported crude oil increased almost sixfold, from 1.84 to 10.77 U.S. dollars per barrel. In the subsequent 4 years, the average oil-exporting country—like Algeria, Iran, or Venezuela—only saved 17.9% of its windfall gain; the rest was used for public sector investments that yielded minimal or even negative rates of return (Talvi & Végh, 2005, p. 164). Nonrenewable natural resources, like oil, natural gas, and minerals, can help developing countries meet their financing needs; but more often than not, these resources encourage fiscal profligacy in the short run and erode the quality of domestic institutions over the long run (Ross, 2015).

To address these issues, the International Monetary Fund (IMF, 2016) provides technical assistance to resource-rich developing countries, which often "fail to realize the full development potential of their natural resources" due to weak fiscal institutions, ineffective laws, and inexperienced bureaucrats who are ill-equipped to negotiate with oil or mining corporations. Given the Fund's mandate to stabilize the global economy and resolve economic crises, its interest in natural resource governance is unsurprising. When a significant share of public revenue comes from natural resources, institutions that smooth out commodity price volatility and set aside monies for rainy days or direct them to public investment can help countries develop economic fundamentals that avert future crises. But do external efforts to promote natural resource governance work? To what extent can international financial institutions like the IMF help mitigate the resource curse?

As the world's de facto lender of last resort, the IMF provides emergency liquidity to meet a country's financing gap, which is why it often has substantial leverage over the policy decisions of its borrowers. Still, there are three reasons for skepticism about the Fund's ability to influence a country's natural resource governance. First, there is a high rate of recidivism in lending: some countries are regular users of IMF credit, suggesting that this credit is not promoting the lasting economic recovery it aims to promote (Bird et al., 2004). Second, compliance with IMF-mandated policy reforms—a condition for loan disbursement—is often mixed at best: between 1980 and 2015, 67% of all loans were suspended due to noncompliance (Reinsberg et al., 2021). Third, domestic leaders are typically unwilling to regulate the natural resource sector, because resource windfalls allow for short-term increases in discretionary spending that can be used for political gain (Ross, 2015). In light of these considerations, I identify the circumstances under which multilateral lending can drive the leaders of resource-rich countries to invest in

extractive governance in one specific manner: by creating and regulating a natural resource fund. Though there are other ways to promote extractive governance, natural resource funds are explicitly recommended by the IMF as tools to "support the implementation of sound fiscal policies" in contexts of resource wealth (Baunsgaard et al., 2012, p. 20). Over the past three decades, more and more countries have adhered to this recommendation, as Figure 1 shows.

I argue that IMF agreements can lead resource-rich countries to pass legislation creating and regulating a fund. While most agreements are conditional on policy reforms, these conditions vary on a case-by-case basis. I use text analysis to classify the conditions included in 402 loan agreements signed with 74 resource-rich developing countries between 1980 and 2019, and subsequently examine the effect of conditionality on the emergence of natural resource funds during the same period. My empirical findings confirm the positive association between IMF program participation and natural resource fund legislation, but also highlight the importance of distinguishing between different types of conditionality as well as different types of funds: legislation on savings and pension funds is more likely to be introduced when binding conditions mention the natural resource sector.

A long line of research has examined how international organizations affect domestic politics and law. The European Union, the United Nations, the World Bank, the IMF, and others have played a prominent role setting best practices for human rights (Simmons, 2009), money laundering (Findley et al., 2015), anticorruption efforts (Kaczmarek & Newman, 2011), climate policy (McLean & Stone, 2012), transparency of elections (Hyde, 2007), and the use of

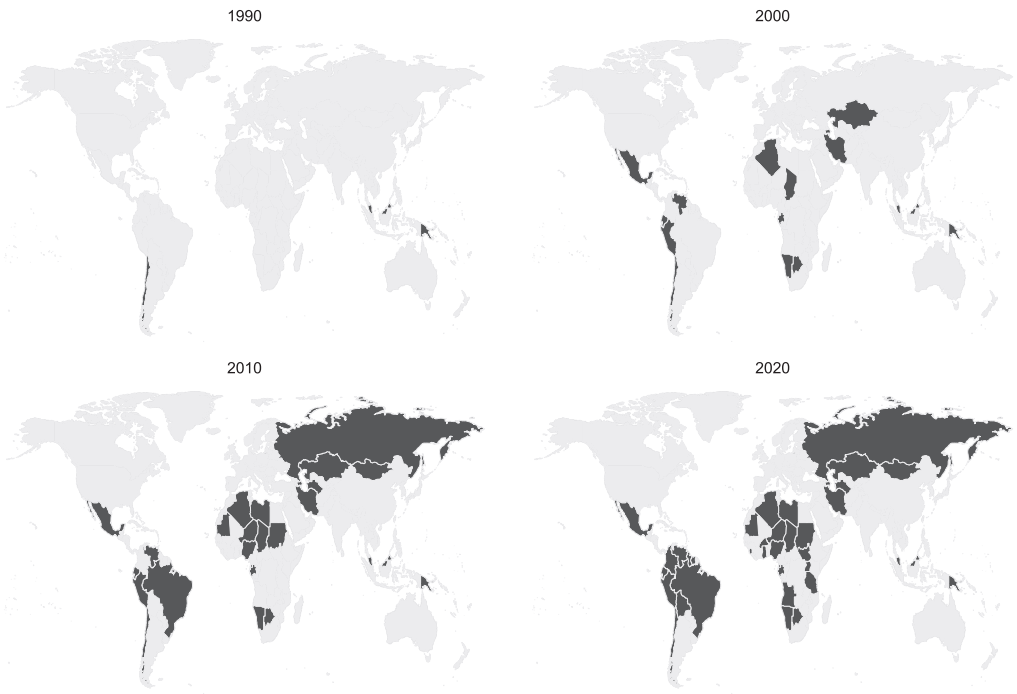


**FIGURE 1** Cumulative creation of natural resource funds, 1980–2019. Depiction of all resource-rich countries in the developing world that have created at least one natural resource fund by the last day of every year. Because the map excludes high-income nations, it does not depict the world's largest fund: Norway's Government Pension Fund Global

military force (Fang et al., 2014). In parallel, a widespread body of evidence finds that natural resource wealth can undermine democratic transitions (Ross, 2001), curb economic growth (Goldberg et al., 2008), decrease the number of women in the labor force (Ross, 2008), and reduce government incentives to collect taxes (Besley & Persson, 2014) or uphold contracts with foreign investors (Jensen & Johnston, 2011). I build a bridge between these two important literatures, which so far have largely neglected each other (with the notable exceptions of Papyrakis et al., 2017 and Sovacool et al., 2016, who examine the role of the Extractive Industries Transparency Initiative in setting global standards for natural resource revenue management). This study contributes to extant research by identifying under what circumstances international reform efforts can lead to changes in domestic legislation, even in a sector that incumbents would prefer not to reform. To my knowledge, it is one of the first studies (along with Clark, 2021 and Kern et al., 2019) to use text analysis to classify IMF conditions. Between 1980 and 2019, IMF agreements included a total of approximately 14,100 conditions, of which about 6,800 were binding. I propose a new method that allows researchers to measure the relative importance of each condition in a much more efficient manner than manual coding.

After reviewing the literature on IMF conditionality, this study develops a theory of why and when multilateral lending can increase the odds of policy reform. I predict that pressure from the IMF will drive impatient politicians to exercise self-restraint in the natural resource sector by creating a natural resource fund. I derive and test my hypotheses, discuss the empirical findings, and conclude with implications for future policy and research.

## 2 | IMF LENDING AND POLICY CONDITIONALITY

### 2.1 | The purpose of policy conditionality

Virtually all IMF programs are conditional: in exchange for financial support, the borrowing government is expected to pass a series of policy reforms on issues like debt management, privatization, fiscal transparency, trade liberalization, and public spending (Rickard & Caraway, 2019). The specific conditions vary from country to country, in response to local circumstances (Stone, 2008) and at the discretion of the Fund's staffers (Chwieroth, 2013), but always under the assumption that the Fund's technical knowledge is transferable across circumstances. Loan conditions align with the Fund's mandate to provide "policy advice and capacity development support to help countries build and maintain strong economies" (IMF, 2021). The purpose of a program is to *build* strong economies by providing immediate liquidity and *maintain* strong economies by conditioning loan disbursement to the implementation of predetermined structural reforms. Compliance with these predetermined reforms may be rewarded with more loans, while noncompliance may be punished with interruption of payments (Babb & Carruthers, 2008).

The threat of punishment is important because politicians are impatient and value immediate electoral benefits over future policy investments (Jacobs & Matthews, 2012). This impatience mirrors the behavior of voters, who have more confidence in concrete short-term benefits than in longer-term policy promises, and thus have well-established short-term preferences: high real income, high growth, low inflation, and low unemployment (Schultz, 1995). IMF programs, which often go against these preferences, are unpopular with the general public. Incumbents would rather increase current expenditure to improve their re-election

prospects than comply with the terms of an IMF agreement, particularly ahead of elections (Dreher, 2003). When the Fund threatens to interrupt payments in case of noncompliance, it attempts to force incumbents to do something they would prefer not to do. Absent such conditions, incumbents would not feel compelled to follow through with the necessary policy reforms (Dreher, 2009). Even incumbents who *want* to adopt painful austerity measures would not have the political capital to do so if they could not claim that these reforms are "imposed" by the IMF (Vreeland, 2003). In sum, politicians are more likely to commit to credible policy reforms and timely loan repayment when the threat of punishment prevents them from changing policies in the future.

The logic outlined above assumes that compliance can be attained and enforced. To be fair, compliance with IMF conditions is relatively low. Between 1980 and 2015, only 33% of all 763 loans were disbursed without interruption; the remaining 67% were suspended at least once—if not permanently—due to noncompliance (Reinsberg et al., 2021; see also Bird, 2001 and Stone, 2011). Noncompliance may be a function of low state capacity: some governments lack a trained bureaucracy capable of creating and maintaining transparent fiscal institutions. Others might fail to comply due to ethnic divisions, too many parties in the ruling coalition, or the existence of a divided government (Steinwand & Stone, 2008). Yet, noncompliance may also be a deliberate political choice: given that the IMF is less likely to enforce compliance when the borrower has strong political relationships with the United States (Copelovitch, 2010; Dreher & Jensen, 2007; Stone, 2011), some incumbents might not want to comply with an agreement and risk losing popular support if punishment is unlikely in the first place. Either way, these low compliance rates suggest that IMF conditionality might not have a meaningful or lasting influence on domestic policies.

Still, compliance is "a spectrum, not a binary variable" (Babb & Carruthers, 2008, p. 21). Borrowers may comply with some conditions, if not with others. Just as full compliance is not equivalent to absolute success, failing to complete an arrangement is not indicative of absolute failure. It is difficult to assess when IMF programs succeed and when they fail, as countries choosing to enter an agreement tend to have worse economic indicators to begin with (Bas & Stone, 2014). IMF lending has different effects on different issue areas: it can worsen labor rights (Lee & Woo, 2020), exacerbate poverty and inequality (Nooruddin & Simmons, 2006; Oberdabernig, 2013), reduce public sector spending (Rickard & Caraway, 2019), decrease bureaucratic capacity (Reinsberg et al., 2019b), raise tax revenue (Crivelli & Gupta, 2016), increase trade openness (Wei & Zhang, 2010), promote Central Bank independence (Kern et al., 2019), increase capital inflows and reduce the risk of default (Bauer et al., 2012), to name only a few issue areas (see Stubbs et al., 2020 for an overview). One way to quantify success is by observing whether countries pass laws reforming fiscal practices in response to IMF programs. After signing an agreement with the Fund, resource-rich countries might commit to domestic reforms that—at least on paper—ameliorate the negative consequences of the resource curse. Policymakers may find creative ways to evade these reforms, but passing a law makes it harder to behave in a completely unfettered manner. Even if the IMF cannot enforce compliance or set rules of its own, it can propel a deeper institutional change that outlasts one credit line or one term of office.

## 2.2 | Why IMF lending matters for resource-rich countries

It is not immediately clear why resource-rich countries enter IMF programs in the first place. Why would a country agree to the terms of a loan, revealing unfavorable information about the state of its economy and committing to costly policy reforms, when it can simply sell natural

resources in global markets and accumulate international reserves instead? Indeed, there is some evidence that commodity producers borrow less from capital markets than nonproducers because they can use resource rents to cover their financing needs (Brooks et al., 2015; Campello, 2015). However, this does not mean that commodity producers can eschew external funding altogether.

Commodity producers still need external funding because the prices of oil, nickel, silver, copper, zinc, aluminum, gold, and other natural resources are volatile. During a price boom, resource exports might be sufficient to cover domestic financing needs, but most countries do not use these windfall gains to save for times of price bust. Rather, most rulers respond to price booms by going on a public sector spending spree associated with low returns (Talvi & Végh, 2005). After all, rulers are impatient and driven by short-term political incentives: they want to maximize their political capital today, instead of waiting for some uncertain tomorrow, when they might no longer be in power, oil prices might go down, and natural resources might be depleted. Resource windfalls enable immediate consumption; these windfalls can be used to lower taxes, increase spending, distribute spoils, and co-opt the opposition, thereby broadening the ruler's basis of support.

In the absence of a far-sighted natural resource policy, resource producers do not tend to save windfalls for difficult times. Because these countries tend to specialize in natural resources at the expense of other sectors, no other segment of the economy is competitive enough to offset the volatility of prices. As a result, they cut public spending and issue sovereign debt during a commodity price bust. Because resource producers have limited access to bond markets in times of economic downturn (Wibbels, 2006), they frequently turn to the IMF, the world's lender of last resort. IMF loans are meant to complement—not replace—extant sources of revenue. Even if these loans are small relative to the financial needs of a country (Steinwand & Stone, 2008), the Fund's "seal of approval" can help secure additional capital flows and improve the investment climate, at least under some circumstances (Bauer et al., 2012; Chapman et al., 2017; Saravia & Mody, 2003). Given that the resource sector has the potential to help governments overcome fiscal imbalances and meet their financing gap, the IMF is interested in outlining loan conditions that maximize this potential. Thus, resource-rich countries—like resource-poor countries—might still agree to IMF conditions in exchange for financial support.

## 2.3 | The role of natural resource funds

When the sources of public revenue are predictable, it is easier to set yearly spending goals and reconcile short-term spending with long-term planning. Governments know that they will always have a population to tax and can design the budget accordingly. However, when a significant part of the budget comes from natural resources, planning ahead is much harder, as public revenue is a function of many factors beyond most governments' control. Political actors do not know exactly how much money they will make off natural resources in the next year. They may be surprised by high prices in 1 given year, only to see these profits dwindle in the following year. To drive this point home, Figure 2 shows the average yearly price for a barrel of crude oil, in 2021 U.S. dollars, from 1974 until 2020. In light of this persistent price volatility, the IMF encourages resource-rich countries to adopt numeric fiscal targets that insulate public spending from public revenue, avoiding stop-go cycles in public investment. These fiscal targets can limit the size of the public debt, impose a limit to public spending, or require that spending equals revenue, for example.

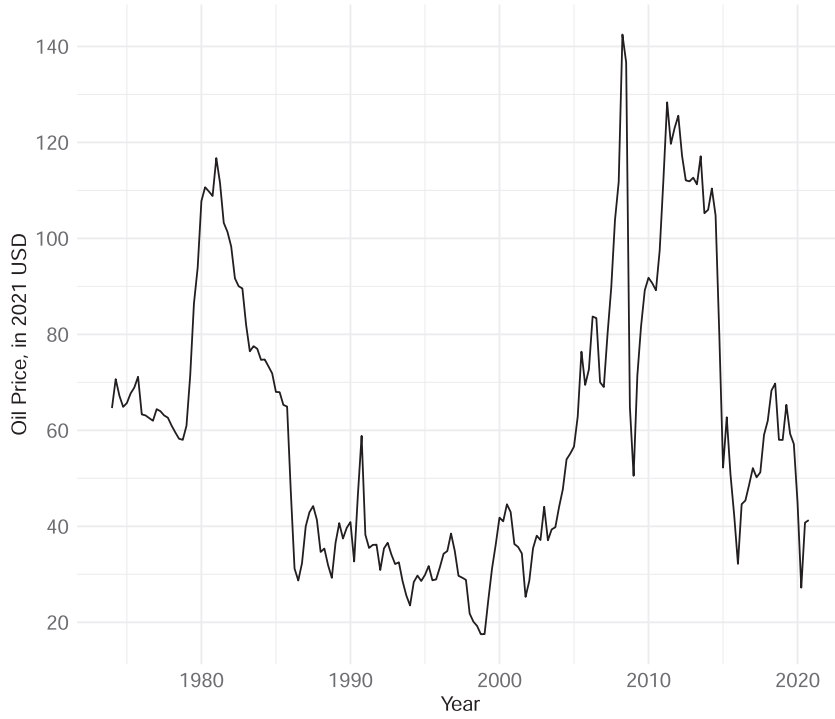


**FIGURE 2** Real imported crude oil prices, in 2021 U.S. Dollars, 1974–2020. The refiner average imported crude oil acquisition cost is shown, in constant 2021 U.S. dollars, as reported by the U.S. Energy Information Administration

One tool to pursue these fiscal targets is a natural resource fund, which can "support the implementation of sound fiscal policies" and "enhance the transparency and credibility of fiscal policy" (Baunsgaard et al., 2012, p. 20). Resource funds are a type of sovereign wealth fund: they are state-owned investment accounts that use revenue from the extractive sector to purchase international assets like private equity and real estate. These funds, which have gained in popularity since the late 1990s (as indicated by Figure 1 and discussed extensively by Chwieroth, 2014), serve as a precommitment mechanism that constrains incumbents' discretion over resource revenue by putting this revenue beyond their immediate reach.

The IMF (2008) identifies five types of funds with five nonexclusive mandates. First, stabilization accounts mitigate budget volatility caused by unexpected fluctuations in resource prices. When revenue declines, countries can draw from their stabilization accounts to sustain current expenditures, instead of borrowing from international capital markets. Second, reserve investment corporations increase the return on foreign exchange reserves, which in turn serve to manage exchange rates and reduce the risk of Dutch disease. These "parking funds" (Venables, 2016) work as a temporary storage unit for economies that cannot absorb the unexpected influx of foreign currency all at once. Third, development funds finance socioeconomic projects, including durable physical assets like public infrastructure. Fourth, savings accounts benefit future generations. Because oil, natural gas, and minerals are not renewable, saving resource revenue can prolong the financial benefits of resource extraction. Finally, contingent pension reserve funds help finance pensions and social welfare liabilities. Because these funds have different time horizons, they pursue different investment strategies:

stabilization funds have a short-term, low-risk investment profile, whereas savings or pension accounts have a long-term, high-risk investment profile due to their low liquidity needs.

Though nearly all extant natural resource funds are enshrined in legislation, they are institutionalized to different degrees: some are subject to public scrutiny, regular audits, and legislative oversight, while others are not (Wang & Li, 2016). The IMF has taken an active role in promoting and endorsing this institutionalization process. Timor-Leste's Petroleum Fund Law, passed on August 3, 2005, was drafted with the support of a resident advisor from the IMF Fiscal Affairs Department; according to an IMF staff report, "the creation of a Norwegian-style petroleum fund and the adoption of a cautious saving policy are major steps in the right direction" (IMF, 2005). Similarly, a 2007 staff report urged Angola to consider the creation of "an oil fund that is based on well-defined flexible rules and fully integrated into the budget process and buttressed by stringent procedures to ensure transparency" (IMF, 2007). Unsurprisingly, the number of developing countries with at least one natural resource fund has soared over the past three decades, as Figure 1 shows.

When policymakers in Timor-Leste or Angola craft natural resource legislation, they face an intertemporal trade-off: they must balance short-term pain with long-term gain, enacting policies that impose political costs in the short term, but ensure that future generations will benefit from resource wealth—long after oil, gas, or mining reserves are depleted. As a rule, incumbents have little incentive to engage in such behavior; they "discount the future too much" (Robinson et al., 2006, p. 466), for two reasons. First, in the wake of a resource discovery (particularly oil), citizens tend to develop "a bias towards exaggeration of the likely revenues" (Collier, 2017, p. 223), pressuring rulers to increase consumption. Indeed, oil windfalls are directly associated with an increase in public goods spending (Caselli & Michaels, 2013); running budget surpluses instead of increasing current expenditure is politically costly (Talvi & Végh, 2005). This means that policymakers who create a natural resource fund—especially a fund with longer time horizons—risk losing political support. Second, institutional upgrades are costly: when incumbents craft and enact natural resource legislation, they also make a public commitment to estimate the size of available reserves, hire qualified personnel to negotiate concession agreements, save a share of resource rents, and establish regulatory bodies to enforce compliance, to name only a few tasks that are exceptionally costly for developing countries with weak institutions. Policymakers would prefer not to pass any natural resource policy, instead maintaining full discretion over who benefits from resource windfalls, and when. Along these lines, Wiens (2014, p. 196) shows that when institutional mechanisms constraining incumbent behavior are absent "*prior to the onset of resource dependence*, resource revenues undermine any impetus to establish 'good' institutions in their wake and serve to stabilize 'bad' institutions" (emphasis in the original).

## 3 | POLICY CONDITIONALITY AND NATURAL RESOURCE FUNDS: TWO TESTABLE HYPOTHESES

### 3.1 | Main hypotheses

There is a tension between domestic interests and international commitments; ruling parties need to respond to voters to win elections and stay in power, but they also need to meet the demands of international creditors (Ezrow & Hellwig, 2014). Therefore, incumbents who enter an IMF program face a dilemma: they want to retain full control over the allocation of resource

windfalls to maximize political support, minimize institutional costs, and respond to unforeseen circumstances, but they also need to comply with the terms of the program to ensure that the funds are disbursed. First, I seek to establish whether or not participation in a program matters; after all, there is reason to suspect that program participation does not always result in reform. Hypothesis 1 predicts that incumbents will be more likely to pass legislation related to a natural resource fund when they have an outstanding IMF program—even if doing so goes against their political interests.

Hypothesis 1 (Program Participation): *When countries are under an IMF program, they are more likely to pass natural resource policy*.

Going beyond program participation, I propose a second hypothesis to test for the effect of specific program conditions. Several IMF programs include a targeted condition related to natural resources. For instance, a 2009–2012 loan agreement with Angola mandated the "submission to the cabinet of the approval documents of the Angola Sovereign Wealth Fund" (see Kentikelenis et al., 2016 for this and subsequent direct citations). In line with this condition, president José Eduardo dos Santos signed a decree creating an oil fund in March 2011. More recently, following a 2013–2016 loan mandating the "establish[ment of] a Natural Resource Revenue Fund with legal and procedural characteristics," the government of Sierra Leone created the Transformational Development Stabilization Fund in 2016. Angola and Sierra Leone were each explicitly instructed to create a natural resource fund, and these instructions were written in a way that made noncompliance easily observable—and punishable. Having agreed to enter IMF programs, these countries did not have the leeway to develop alternative policies and would not have been able to deviate from their respective loan conditions without jeopardizing the disbursement of additional funds.

Conditions might also request changes to an extant fund, as in Ecuador's 2000–2001 agreement ("submission to congress of legislation that includes agreed reforms of the oil stabilization fund") or Chad's 2005–2008 agreement ("adoption by the Council of Ministers of the investment strategy for oil revenue allocated to the Fund for Future Generations"). The cases of Angola, Sierra Leone, Ecuador, and Chad suggest that borrowers might be more likely to pass natural resource policy in response to conditions that highlight the salience of natural resources and the need to reform the extractive sector. This is what Hypothesis 2 predicts.

Hypothesis 2 (Resource Conditionality): *The more an IMF program emphasizes the importance of the natural resource sector, the greater the likelihood that the borrowing country will pass natural resource policy*.

Admittedly, several conditions address the extractive sector without explicitly urging borrowers to create a natural resource fund. Recent agreements signed with Mozambique (2009–2010), Iraq (2010–2012), Gabon (2017–2020), Equatorial Guinea (2019–2022), and others require these governments to join the Extractive Industries Transparency Initiative (EITI), a multistakeholder initiative promoting transparency along the extractive industry value chain. When the borrower is already a member of EITI, conditions often request that the country in question "demonstrate[s] progress in implementing the EITI Standard" (Afghanistan, 2016–2019)—for instance, by publishing an EITI audit report (Nigeria, 2005–2007). Countless conditions also require governments to cut fossil fuel subsidies, thereby allowing domestic prices to respond to fluctuations in international commodity prices, though this measure is exceedingly unpopular and often politically impracticable. Lastly, a number of conditions require governments to "strengthen the governance of the mining industry"

(Afghanistan 2016–2019), in a multitude of ways. Though these conditions do not necessarily foresee the creation or regulation of a natural resource fund, they have one aspect in common: they request that states deepen their commitment to good governance in the extractive sector. Natural resource funds are an efficient—if sometimes painful—way to signal such commitment to the IMF.

# 4 | DATA AND DESCRIPTIVE ANALYSIS

## 4.1 | Dependent variable: Natural resource policy

I introduce original data on natural resource policy for 74 developing countries between 1980 and 2019 (see appendix for full country list). This corresponds to all developing countries classified as resource-rich by the IMF (Venables, 2016), the Natural Resource Governance Institute (2017), or both. The dependent variable is a binary indicator of whether each country-year pair passed a legal document (i.e., a law, statute, act, code, or executive decree) creating or regulating a natural resource fund. This indicator takes the value of one in years of document passage, and zero otherwise. To collect these data, I first use the Natural Resource Governance Institute (2017) and the IMF Fiscal Rules at a Glance Dataset (Yoon et al., 2017) to identify the precise country-year in which a legal document was passed. I then locate each legal document in its country's Official Gazette, available in the Foreign Official Gazette Database and the Global Legal Information Network (two initiatives sponsored by the U.S. Library of Congress). During the period under study, 40 of the 74 countries passed a total of 86 legal documents pertaining to 63 distinct natural resource funds. The remaining 34 countries have not passed any natural resource policy. Figure 3 shows the number of legal documents passed at the national level between 1980 and 2019, indicating that the vast majority was passed after 1995.

Angola illustrates the content of such legal documents. On March 9, 2011, president José Eduardo dos Santos signed Executive Decree Number 48 creating the Sovereign Wealth Fund of Angola. According to Article 1, Paragraph 3 of this Executive Decree, the purpose of the fund is to "encourage and support, in the Republic of Angola and abroad, investment in the development of projects in the energy and water sectors and in other sectors considered strategic, including, in particular, infrastructure projects." Under the Santos administration, the 2011 Budget Law (passed on December 28, 2010) also earmarked oil revenue for regional development and infrastructure, with budget projections based on an oil price of 68 USD per barrel; all revenue exceeding this projection should enter the treasury reserve. Both Executive Decree Number 48 and the 2011 Budget Law count as natural resource policy. These two documents also show that passing natural resource policy is not a terminal event: even after creating a natural resource fund, governments can pass additional laws to introduce new regulations, update the purpose of the fund, or create an additional fund for different purposes.

Recall the IMF (2008) taxonomy of natural resource funds. At one extreme, stabilization funds have low-risk, fixed-income portfolios meant to provide immediate liquidity that offsets the losses caused by unexpected fluctuation in commodity prices. Reserve investment corporations and development funds have similarly short horizons, serving as temporary storage units until the domestic economy can absorb resource rents and use them to invest in socio-economic projects. At the other extreme, savings and pension funds have diversified portfolios and can finance riskier investments due to their long time horizons and low liquidity needs. As a consequence of these different time horizons, incumbents have more discretion over stabilization, investment, and development funds than over savings or pension funds. Chile has two

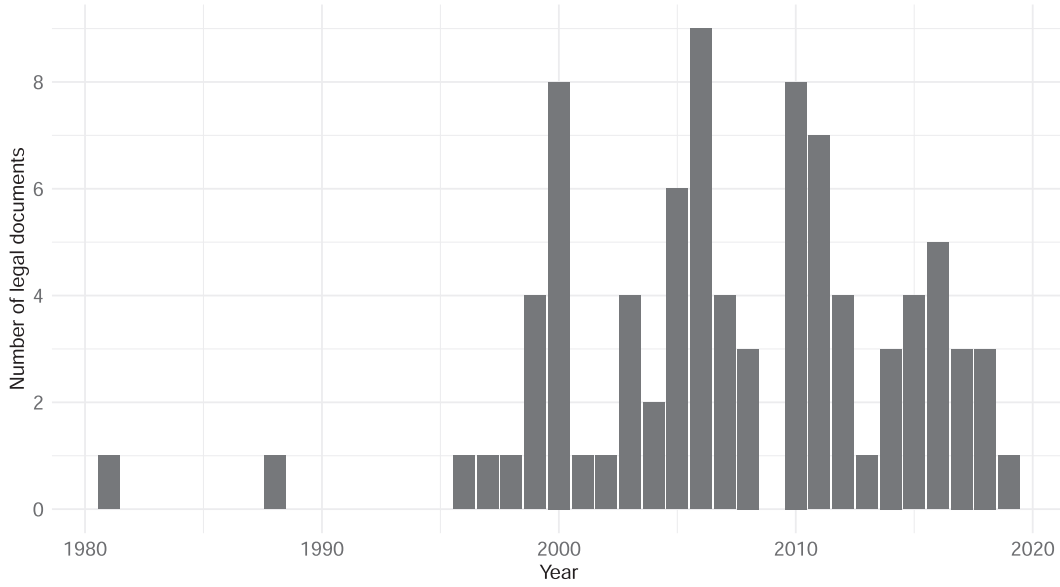


**FIGURE 3** Number of legal documents passed every year, 1980–2019. Depiction of the temporal distribution of 86 legal documents creating and regulating natural resource funds in 40 countries during the period covered in the analysis

funds, both created in 2006; the Economic and Social Stabilization Fund was made immediately available to cover current expenditures, while the Pension Reserve Fund—earmarked for old-age and disability benefits—was off-limits to public officials for the first 10 years after its creation. Both funds represent precommitment mechanisms, but the degree of precommitment is different. I generate two binary variables to account for this distinction: *Short-Term Policy* measures the passage of legal documents related to stabilization, investment, or development funds, whereas *Long-Term Policy* indicates the passage of documents related to savings or pension funds.

Table 1 shows the number of funds, legal documents, and countries by type of policy. The numbers in this table do not add up to the totals (63 funds, 86 legal documents, 40 countries) because one fund can fulfill multiple purposes. For example, in a Letter of Intent submitted to the IMF in November 2009, the government of Angola states: "we would welcome technical assistance from the IMF on the setting up [of] the Sovereign Wealth Fund *which will be both a stabilization and a savings fund*" (emphasis added). Thus, Executive Decree Number 48 and the 2011 Budget Law, which create and regulate the Sovereign Wealth Fund of Angola, are coded as both *Short-Term Policy* and *Long-Term Policy*. The same applies to legal documents pertaining to Colombia's Savings and Stabilization Fund or Trinidad and Tobago's Heritage and Stabilization Fund, among others.

I focus on written legal documents because they are easier to enforce and harder to revoke than unwritten norms. These documents are often aspirational, rather than normatively binding; in Latin America, for instance, governments often bend or evade formal rules (Weyland, 2002), which could suggest that natural resource policy is not a credible precommitment mechanism. Indeed, during the period under study, Ecuador passed a total of six legal documents pertaining to five different funds, indicating that initial commitments often need to be amended. Still, it is useful to understand when and why de jure policy is enacted because this is a necessary first step toward explaining the effects of law on behavior. Even where formal rules are bent or evaded, they still approximate political

TABLE 1 Natural resource funds and corresponding legal documents, by type

| | Short-term policy | | | Long-term policy | |
|---|---|---|---|---|---|
| | Stabilization | Investment | Development | Savings | Pension |
| No. of funds | 34 | 11 | 16 | 18 | 1 |
| No. of legal documents | 53 | 16 | 18 | 23 | 1 |
| No. of countries | 25 | 9 | 15 | 17 | 1 |

behavior. For example, Amick et al. (2020) find that both constitutional and statutory rules mandating a balanced budget are associated with higher fiscal discipline, even in Latin American countries where formal rules are frequently disregarded. There is value in examining what states aspire to do and what they are willing to commit to on paper, regardless of their ability to actually comply with such aspirations.

Of course, there is considerable variation in what states aspire to do, even within the short- and long-term categories. Some legal documents stipulate that the fund in question should be managed by a supervisory board (Azerbaijan), while others delegate this responsibility to the Central Bank (Botswana) or the Minister of Finance (Chile). With few exceptions (like Russia), most documents mandate the creation of an independent oversight body to monitor the fund's management and investment decisions, but there is variation in the size and composition of such body: oversight committees in Ghana, Guyana, and Nigeria incorporate civil society representatives, suggesting a stronger commitment to transparency and public accountability. Additionally, while Angola's laws make budget projections based on a fixed oil price (68 USD per barrel), others allow the president or the National Assembly to set a new reference price every year, giving authorities important discretion over how much natural resource revenue can enter the budget (as opposed to being saved in a fund). And these regulations are not set in stone: governments may pass subsequent legal documents that modify previous commitments. However, because there are only 86 such legal documents, I am not able to quantitatively explore this variation in depth and scope. This is why I examine the dichotomy between short-term and long-term policy, reducing these legal documents to their common denominator.

Table 2 reports the average of selected variables for countries with and without natural resource funds in place in 2019, using World Bank data from the same year (or from the most recent year available). In that year, countries with natural resource funds tended to have a higher GDP per capita and a higher GDP share of natural resource rents than countries without such funds. In the previous four decades, states with funds also tended to be under an IMF agreement for fewer years: 13.98, as opposed to a mean of 15.53 years for countries without funds. This suggests that there is something qualitatively different about states that are able and willing to adopt precommitment mechanisms in the extractive sector.

## 4.2 | Independent variables: IMF program participation and conditionality

Using data from Kentikelenis et al. (2016) (for 1980–2014) and the IMF MONA Database (for 2003–2019), I examine the content of 402 IMF programs signed with 64 of the 74 developing countries identified as resource-rich. The remaining 10 countries (Botswana, Eritrea, Iran,

**TABLE 2** Characteristics of countries with and without natural resource funds, 2019

| | Natural resource fund | |
|---|---|---|
| **Attribute** | **Yes** | **No** |
| No. of years under IMF program, 1980–2019 | 13.98 | 15.53 |
| GDP per capita (in constant 2010 USD) | 5221.80 | 2861.97 |
| Resource rents (% GDP) | 16.75 | 10.58 |
| *N* | 40 | 34 |

Libya, Malaysia, Namibia, South Sudan, Syria, Timor-Leste, and Turkmenistan), while included in the analysis, signed no agreement in the period under study. The terms of each agreement, including the conditions for loan disbursement, are stipulated in its Letter of Intent. Like Copelovitch (2010), Woo (2013), Forster et al. (2019), and several others, I restrict the analysis to conditions categorized as Prior Actions (PA) or Performance Criteria (PC). These two kinds of conditions are binding, which means that loan disbursement is conditional on their implementation. To the extent that countries create natural resource funds in response to IMF conditionality, they should do so in response to *binding* conditions; after all, failure to comply with *nonbinding* conditions is unlikely to jeopardize the disbursement of loans (Copelovitch, 2010). On average, each agreement lasts for two years and includes 17.5 binding conditions, with a standard deviation of 17.9, adding up to 6849 binding conditions (out of 14,100 total conditions).

Extant research on the relationship between IMF conditionality and public policy tends to focus on the *number* of conditions pertaining to a specific issue area (e.g., Dreher & Jensen, 2007; Stubbs et al., 2020; Woo, 2013). However, the number of conditions is an imperfect proxy for the stringency of an agreement, as it does not tell us anything about the denominator. The relative importance of one single condition covering one specific issue area is contingent on the total number of conditions covering all issue areas. Alternatively, Stone (2008) captures the stringency of agreements by counting the number of issue areas subject to test in every program review, but again, this measure does not reflect the weight of issue areas included in the review *relative to all possible issue areas*. Other researchers use a binary variable to indicate the presence or absence of a specific kind of condition—for example, a trade condition (Wei & Zhang, 2010) or a labor condition (Rickard & Caraway, 2019)—but one single condition can address multiple issue areas, and a binary indicator might not capture this nuance. Given the limitations of extant tools, I use automated text analysis to classify the conditions into different categories of interest.

Though there is no single best method for automated text analysis, dictionary methods are the most intuitive approach (Grimmer & Stewart, 2013). Dictionaries use the frequency of keywords to measure the presence or absence of each category in a text. A *natural resource dictionary*, for example, counts how frequently words like *oil*, *mining*, and *hydrocarbon* appear across IMF conditions. Researchers often adopt a weighting scheme, called term frequency–inverse document frequency (TF–IDF), that gives more weight to less frequent words. The main advantage of dictionary methods is the ease of interpretation, while the main disadvantage is the low design efficiency: before conducting any analysis, researchers must spend a significant amount of time designing a classification scheme, by compiling an exhaustive list of keywords that belong to each category (Osnabrügge et al., 2021).

A second method for automated text analysis is probabilistic topic modeling. This type of Bayesian generative modeling uncovers similarities between documents by identifying the proportion of each document (in this case, an IMF condition) that addresses a specific topic. A topic is a distribution over a fixed vocabulary (Blei, 2012); for example, the topic *natural resources* has a fixed vocabulary that includes words like *oil*, *mining*, and *hydrocarbon*. Topic models have high design efficiency (Osnabrügge et al., 2021), because they do not require training sets and are suitable for new discoveries: they can parse the data to identify hidden patterns that are not immediately evident to the human eye (like the unobservable influence of IMF conditionality on domestic legislation).

Dictionary methods and topic models have complementary strengths. The former approach requires researchers to develop a priori expectations about the vocabulary and the topics contained in the documents under study, while the latter can identify hidden patterns that are not immediately evident to the human eye (like the unobservable influence of IMF conditionality on domestic legislation). Dictionary methods have high interpretability and specificity: the resulting classification scheme can be easily interpreted and used to answer specific questions or explore particular data features (Osnabrügge et al., 2021). In contrast, topic models have moderate to low interpretability and specificity, because they require researchers to specify the number of desired topics, label each topic, and interpret the results, all of which are subjective decisions (Wilkerson & Casas, 2017). Topic models tend to generate multiple topics with similar content, which means they might not be helpful in answering specific questions, and the results are typically sensitive to the starting values of the estimation algorithm.

As a compromise between both methods, I use the dynamic keyword-assisted topic model developed by Eshima et al. (2020), which allows me to specify a short dictionary to label the topic of interest ahead of estimation. The keywords included in this dictionary incorporate knowledge from previous research on IMF conditionality (e.g., Kentikelenis et al., 2016), from interviews I conducted with IMF officials in the Fiscal Affairs Department, and from nonbinding recommendations that these officials issue to governments on a yearly basis (in the form of Article IV Consultations). At the same time, this keyword list does not need to be exhaustive, because the model still learns from the data about the extent to which each keyword matters for each topic. This specification yields more interpretable topics and increases the stability of topic proportions across different specifications, enabling me to investigate how topic proportions change over time.

Using a dynamic keyword-assisted topic model, I identify the share of each condition that uses words related to natural resources. Table 3 displays the ten most frequent terms for this topic; the prespecified keywords appear in bold. I instruct the model to identify 13 additional topics, based on the 13 categories identified by Kentikelenis et al. (2016), and presented in more detail in the appendix. Because preprocessing decisions can be arbitrary and misleading (Denny & Spirling, 2018), I deliberately undertake as little preprocessing as possible. I remove stopwords, punctuation, numbers, and symbols, but do not stem words and do not remove infrequent terms.

As the 10 most common words suggest, natural resource conditionality frequently mandates an increase in the price of oil products and electricity tariffs. For example, a condition-issued to Burkina Faso in 1999 stipulated the "introduction of an automatic domestic price-setting mechanism of petroleum products reflecting movements in international prices," reflecting the broader IMF stance against energy subsidies (e.g., Coady et al., 2019).

Figure 4 presents the time trend for this topic, based on the year in which an IMF program was initiated. For each year in the *x*-axis, the *y*-axis represents the average proportion of words associated with natural resources. In 1990, for instance, the IMF initiated six loan arrangements

**TABLE 3** Ten most common words related to natural resources, sorted by frequency

| Rank | Word |
|---|---|
| 1 | prices |
| 2 | percent |
| 3 | **oil** |
| 4 | **petroleum** |
| 5 | price |
| 6 | increase |
| 7 | products |
| 8 | **gas** |
| 9 | **electricity** |
| 10 | tariffs |

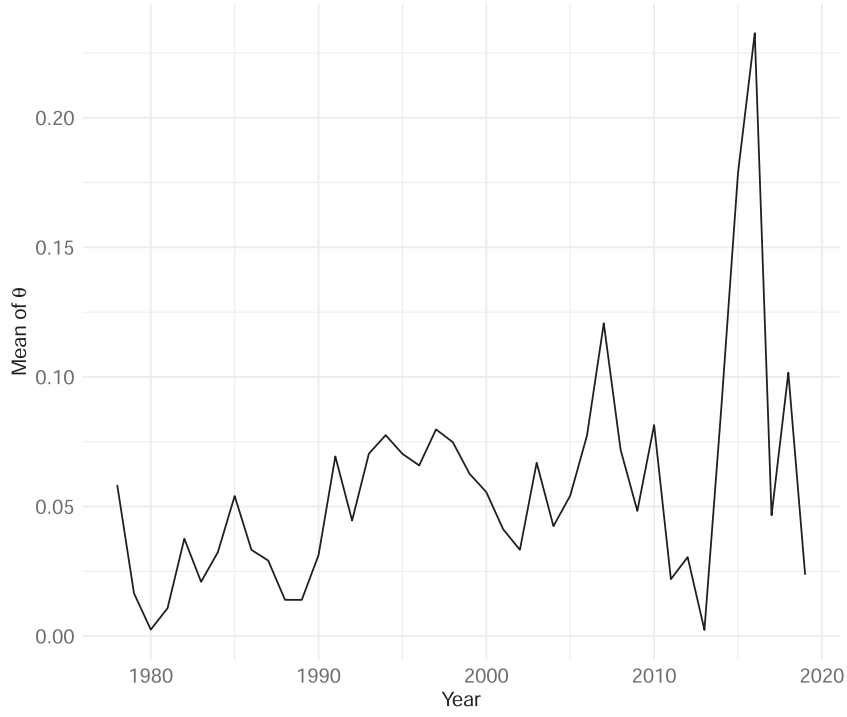


**FIGURE 4** Topic prevalence over time, 1980–2019. This plot displays the prevalence of the natural resource topic over time, among all binding conditions, based on the year of program initiation (as indicated by the *x*-axis). The *y*-axis represents the relative proportion $\theta$ of this topic in each condition, averaged for all conditions over a year

with a total of 94 binding conditions; on average, just 3% of the words included in these conditions related to natural resources. In contrast, natural resources corresponded to about 23.3% of the vocabulary used in the six agreements signed in 2016. This is—at least in part—because natural resource topic proportions in any given year are highly correlated with oil

prices in the previous year (see appendix for a discussion of factors predicting topic proportions).

This does not mean that all agreements signed within a year cover this topic to the same extent. Topic proportions vary not only over time, but also across countries. For example, 49.7% of the vocabulary in Uganda's 2006 agreement and 34.3% of the vocabulary in Russia's 1995 arrangement relate to natural resources—a figure that drops to 0.1% for Togo's 2017 agreement. These differences are more than just semantics. They suggest that the IMF does not pursue an undifferentiated "one-size-fits-all" approach to reform in resource-rich countries, instead tailoring the conditions of each agreement to the different political and economic realities of countries like Uganda, Russia, or Togo. Some countries receive a diverse set of conditions related to other categories identified by the topic model (like monetary or trade policy), while others are explicitly instructed to promote changes in the natural resource sector. Borrowers exposed to different kinds of conditionality are likely to respond differently, which is why the effect of IMF programs on natural resource policy should differ across countries. The advantage of examining the *proportion* of natural resource conditionality—rather than a dichotomous count for its presence or absence—is that I can measure the *degree* of commitment to natural resource sector reform. Because resource funds are costly, countries are only likely to pass policy related to such measures when the degree of natural resource conditionality is comparatively high.

To test Hypothesis 1, the binary independent variable *Program Participation* indicates whether a loan agreement was in place for each country and year. After all, program participation has effects of its own: it increases technical assistance and policy advice, catalyzes foreign aid, and can undermine or improve perceived creditworthiness, depending on the context (Chapman et al., 2017; Lee & Woo, 2020; Stubbs et al., 2016, 2020). If *Program Participation* equals one, an additional independent variable, *Resource Conditionality*, indicates the prevalence of said topic among the program's conditions, as reflected by the keyword assisted topic model. This variable, reported as a percentage for ease of interpretation, is used to test Hypothesis 2 and takes the value of zero for country-years without programs. To validate the results of the topic model, I also test Hypothesis 2 using an alternative measure of *Resource Conditionality* that consists of the TF–IDF value for natural resource-related words.

## 4.3 | Control variables

Models include a measure of whether countries have passed a short-term or long-term policy in the past, in addition to several economic variables that are correlated with the timing of natural resource policy. *GDP per Capita* (in constant 2015 U.S. dollars, logged), *GDP Growth* (in percent), *Resource Rents* (as a percentage of the GDP), and *Working Age Population* (the percentage of the total population aged 15–64) are all reported by the World Bank. *Field Discovery* indicates the discovery of a giant, supergiant, or mega giant oil and gas field (i.e., a field with over 500 million recoverable barrels of oil or over 3 trillion cubic feet of gas) in a given country and year (Horn, 2014). *Oil Price* is the refiner average imported crude oil acquisition cost, in constant 2021 U.S. dollars, as reported by the U.S. Energy Information Administration, logged to account for extreme values. *Crisis* is coded one in years of banking, debt, or currency crisis and zero otherwise (Laeven & Valencia, 2020), whereas *WB Extractive Project* (drawn from the World Bank Project Database) indicates whether there was any ongoing World Bank project in the extractive sector for each country-year pair.

To control for the effect of regime type, I use the Polity 2 index, which ranges from –10 to +10, from hereditary monarchy to consolidated democracy. I further examine the ideology of the executive (a dichotomous variable, where left executive equals one, as coded by the Dataset of Political Institutions) as well as the occurrence of any election, presidential or parliamentary, using V-Dem data. Finally, I include three dichotomous variables indicating whether the country in question established a national oil company this year (Mahdavi, 2020); whether it is undergoing a civil, independent, international, or ethnic war (following the Major Episodes of Political Violence dataset); and whether it is a member of EITI. All independent variables are lagged by 1 year to avoid simultaneity bias, because passing a legal document is typically a lengthy process.

# 5 | THE ORIGINS OF NATURAL RESOURCE POLICY

## 5.1 | Modeling endogenous policy adoption

Participation in an IMF program is not randomly distributed: it is a function of unobservable nonfactors that might also predict a government's willingness to reform its economy. Many countries entering IMF programs already need economic reforms and would likely pursue such reforms even in the absence of a loan. Furthermore, loan agreements are the product of month-long negotiations between government officials and the IMF staff. The negotiating government might opt for greater degrees of conditionality, or specific kinds of conditionality, depending on domestic constraints and political willingness to reform. For example, some governments might be able to negotiate more favorable conditions ahead of a democratic election (Rickard & Caraway, 2014). Democracies tend to receive fewer conditions, suggesting that the IMF is aware that democratic institutions constrain a borrower's ability to reform (Stone, 2008). U.S. allies tend to receive loans with fewer conditions (Dreher & Jensen, 2007). Policymakers might *want* to include certain kinds of conditions in the agreement, so as to have a credible excuse to push through unpopular economic reforms that they were already planning to implement anyway (Vreeland, 2003). Finally, borrowers might withhold information about their future intentions, instead pushing for conditions that they know in advance they will be able to meet, securing the future disbursement of funds.

To some extent, these endogeneity concerns can be assuaged by extant research. Few conditions explicitly mention the natural resource sector, suggesting that few—if any—governments are actively selecting into this kind of conditionality. In addition, Chapman et al. (2017), Dreher et al. (2015), Nelson (2014), Rickard and Caraway (2019), and others have shown that IMF conditionality is not significantly more prevalent in contexts where reform implementation is most likely to succeed. For example, Rickard and Caraway (2019) show that left-leaning governments receive *more* conditions requiring public sector reforms, even though one would expect these governments to be *less* willing to cut the public sector wage bill than their fiscally conservative counterparts.

Similarly, I find that the IMF does not assign more or less natural resource conditionality depending on the borrower's perceived ability to implement macroeconomic reforms. The appendix reports the results of panel regressions with fixed effects, using both natural resource topic proportions and TF–IDF values as the outcomes of interest. These models show that there is no significant relationship between GDP per capita and the share of natural resource conditionality. Given that GDP per capita is a robust predictor of administrative capacity

(Hendrix, 2010), this means that the IMF is *not* assigning a significantly larger share of natural resource conditions to countries that are more able to reform. Borrowers that follow the voting patterns of the United States in the United Nations General Assembly (Bailey et al., 2015) do not receive a significantly lower share of natural resource conditionality, indicating that U.S. allies are not exempt from such conditions. There are no significant differences in the proportion of natural resource conditions across regime types, in years of economic crisis, or during wars; in fact, the most notable predictor of variation in topic proportions or TF–IDF values is the price of crude oil, which evidently does not vary across countries. In sum, it appears that common observable proxies for the ability to reform are not related to the prevalence of natural resources in IMF loan conditions.

### 5.1.1 | Instrumental variables

I address endogeneity concerns not only theoretically, but also empirically. To study the consequences of IMF program participation while accounting for self-selection, a widespread approach is to use instrumental variables (see Stubbs et al., 2020 for a comprehensive review).

To treat selection into program *participation*, common instruments include temporary membership on the United Nations Security Council (Dreher et al., 2009); the share of a country's nationals among the Fund's professional staff (Barro & Lee, 2005; Casper, 2017); the budget constraints faced by the Fund each year (Barro & Lee, 2005); and an interaction between the IMF liquidity ratio and a country-specific proportion of years under an IMF agreement (Stubbs et al., 2020). As for program *conditionality*, common instruments include the total annual IMF disbursement (Beazer & Woo, 2016); the number of countries under an agreement in a given year (Chapman et al., 2017); and interaction between the IMF liquidity ratio and a country-specific average of conditions covering the issue area of interest (Stubbs et al., 2020). In the appendix, I discuss each instrument in more detail.

The aforementioned studies are interested in explaining a myriad of outcomes, like bond yields (Chapman et al., 2017), coup attempts (Casper, 2017), progress in implementing economic reforms (Beazer & Woo, 2016), public education spending (Stubbs et al., 2020), GDP growth (Barro & Lee, 2005), and inequality (Lang, 2020). Each of these studies makes a compelling case for why the chosen instruments have no independent effect on the outcome of interest. However, my outcome of interest is different. When it comes to natural resource policy, there are reasons to be skeptical about the exogeneity of these instruments: they are likely to affect policy passage even in the absence of a loan agreement, thereby violating the exclusion restriction. For example, during the period under study, the IMF liquidity ratio is significantly correlated with oil prices, as is the number of countries under an agreement in a any given year. One of the countries included in my analysis (Russia) is a permanent member of the UNSC, raising questions about the validity of such an instrument. And a higher share of nationals among the IMF professional staff might predict the odds of program participation, but it might also simply reflect the prevalence of neoliberal beliefs among a country's technocratic elite (Nelson, 2014). Despite these theoretical concerns about violation of the exclusion restriction, I estimate two-stage least square (2SLS) models using these instruments for participation and conditionality, reporting the results in the appendix. The instruments appear to be weak (as indicated by low $F$ statistics), which indicates that the estimates are inconsistent (Sovey & Green, 2011). In sum, there are both theoretical and empirical reasons to believe that

existing instruments are not appropriate for my study. Given these limitations, I pursue an alternative approach below.

## 5.2 | Modeling rare events

Extant research on IMF program participation and conditionality tends to deal with a continuous dependent variable, like inequality (Forster et al., 2019; Lang, 2020), labor rights (Lee & Woo, 2020; Reinsberg et al., 2019a), foreign aid (Stubbs et al., 2016), foreign direct investment (Woo, 2013), public spending (Rickard & Caraway, 2019), bond yields (Chapman et al., 2017), and economic reform (Beazer & Woo, 2016). To my knowledge, only Casper (2017) examines this effect on a binary dependent variable: the occurrence of an attempted coup d'état. To account both for the endogeneity and for the binary nature of the outcome of interest, the author uses a recursive bivariate probit model (RBPM), which simultaneously estimates a selection equation and an outcome equation via maximum-likelihood. But this strategy also requires a variable that satisfies the exclusion restriction and is inadequate to model rare events. Passing natural resource policy is a rare event that did not occur every single year between 1980 and 2019, and in fact never occurred in 34 of the 74 countries under study. These 34 countries are what Beck (2020) calls "homogeneous groups": they are perfect predictors of event nonoccurrence, because they show no variation in the dependent variable (which consists of all zeros). Models estimated with maximum likelihood would drop these "homogeneous groups" altogether, which is undesirable. In the following analysis, I use logistic regressions with country fixed effects and cubic polynomials (Carter & Signorino, 2010), estimated with penalized maximum-likelihood to retain the complete sample (Cook et al., 2020). Still, I am realistic about the limitations of this method and view my results as corroboratory—not conclusive—evidence.

## 5.3 | Results

Table 4 provides support for Hypothesis 1. As Model 1 shows, country-years under an IMF agreement are nearly two times more likely to pass *Short-Term Policy* ($e^{0.670} = 1.954$), that is, to create and regulate stabilization, investment, and development funds, which are suited for short- to medium-term crisis mitigation. Model 4 indicates that program participation has an even larger effect on *Long-Term Policy* ($e^{0.966} = 2.627$), which entails the creation and regulation of savings or pension funds. These results can be framed in terms of the Fund's two self-declared mandates: first, provide immediate liquidity to *build* strong economies; second, impose loan conditionality to *maintain* strong economies. Put together, Models 1 and 4 suggest that IMF agreements signed with resource-rich countries have the potential to serve both mandates: they promote short- to medium-term fiscal anchors in addition to long-term fiscal sustainability. Passing natural resource policy of any kind is a rare event, but participation in IMF programs makes such an event significantly less rare.

How, concretely, does the content of IMF programs influence policy passage in resource-rich countries? To test Hypothesis 2 and isolate the potential consequences of program participation (including technical assistance, policy advice, and foreign aid catalysis) from the effects of conditionality, Table 4 employs two different measures. The first measure, employed in Models 2 and 5, is the relative prevalence of the natural resource topic among all binding conditions for all active IMF programs in a given country-year: this is the variable *Resource Conditionality (Topic %)*. The second measure, employed in Models 3 and 6, is the TF–IDF

**TABLE 4** The effect of IMF program participation and conditionality on natural resource policy, 1980–2019

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Program participation = 1 | 0.670** | 0.740** | 0.709** | 0.966*** | 0.893*** | 0.924*** |
| | (0.288) | (0.303) | (0.295) | (0.225) | (0.243) | (0.232) |
| Resource conditionality (%) | | −0.011 | | | 0.039*** | |
| | | (0.016) | | | (0.013) | |
| Resource conditionality (TF–IDF) | | | −0.133 | | | 0.805*** |
| | | | (0.257) | | | (0.238) |
| Previous short-term policy | −1.817*** | −1.822*** | −1.828*** | 1.841*** | 1.992*** | 2.022*** |
| | (0.600) | (0.596) | (0.597) | (0.456) | (0.453) | (0.469) |
| Previous long-term policy | −0.954 | −0.938 | −0.943 | −4.354*** | −4.483*** | −4.479*** |
| | (0.665) | (0.657) | (0.663) | (0.715) | (0.725) | (0.714) |
| GDP per capita (Log) | −0.732 | −0.767* | −0.755* | 3.832*** | 3.926*** | 3.928*** |
| | (0.452) | (0.439) | (0.446) | (0.507) | (0.497) | (0.507) |
| GDP growth (%) | 0.007 | 0.007 | 0.007 | 0.024*** | 0.025*** | 0.025*** |
| | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) |
| Resource rents (% GDP) | 0.001 | 0.001 | 0.001 | 0.023** | 0.024** | 0.023** |
| | (0.013) | (0.013) | (0.013) | (0.011) | (0.011) | (0.011) |
| Working age population (%) | −0.042 | −0.041 | −0.044 | −0.346*** | −0.358*** | −0.347*** |
| | (0.058) | (0.058) | (0.058) | (0.051) | (0.052) | (0.052) |
| Field discovery = 1 | 0.618* | 0.603* | 0.613* | 0.490 | 0.453 | 0.465 |
| | (0.324) | (0.323) | (0.323) | (0.380) | (0.384) | (0.383) |
| Oil price (USD) | −0.032*** | −0.032*** | −0.032*** | −0.013*** | −0.013*** | −0.013*** |
| | (0.006) | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) |
| Crisis = 1 | −0.683 | −0.677 | −0.680 | −0.635*** | −0.717*** | −0.674*** |
| | (0.463) | (0.461) | (0.462) | (0.214) | (0.220) | (0.215) |
| WB extractive project | −0.152 | −0.168 | −0.175 | 0.479** | 0.498** | 0.521** |
| | (0.248) | (0.245) | (0.243) | (0.237) | (0.239) | (0.240) |
| Democracy (Polity2) | −0.027 | −0.025 | −0.025 | −0.167*** | −0.189*** | −0.180*** |
| | (0.047) | (0.047) | (0.047) | (0.026) | (0.027) | (0.026) |
| Left executive = 1 | −0.257 | −0.258 | −0.253 | 0.321 | 0.367 | 0.313 |
| | (0.364) | (0.363) | (0.364) | (0.231) | (0.238) | (0.226) |
| Election year = 1 | −0.061 | −0.061 | −0.061 | −0.261 | −0.234 | −0.260 |
| | (0.197) | (0.197) | (0.197) | (0.177) | (0.176) | (0.176) |

**TABLE 4** (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Oil company nationalization = 1 | 1.321** | 1.278** | 1.277** | −0.454 | −0.488 | −0.483 |
| | (0.594) | (0.606) | (0.608) | (0.572) | (0.584) | (0.587) |
| War = 1 | 0.294 | 0.272 | 0.290 | 2.749*** | 2.870*** | 2.847*** |
| | (0.606) | (0.611) | (0.609) | (0.565) | (0.571) | (0.569) |
| EITI member = 1 | 0.463 | 0.497 | 0.485 | −0.703** | −0.729*** | −0.755*** |
| | (0.352) | (0.349) | (0.347) | (0.280) | (0.280) | (0.279) |
| Constant | 0.994 | 0.960 | 1.064 | 8.455*** | 8.754*** | 8.403*** |
| | (3.046) | (3.028) | (3.047) | (2.276) | (2.309) | (2.292) |
| Observations | 2169 | 2169 | 2169 | 2169 | 2169 | 2169 |
| Log-likelihood | −201.342 | −201.292 | −201.315 | −85.572 | −85.626 | −85.593 |
| Akaike Inf. Crit. | 580.684 | 582.585 | 582.630 | 349.145 | 351.251 | 351.186 |

*Note*: The results of penalized likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

statistic, which indicates the weighted prevalence of natural resource words: this is the variable *Resource Conditionality (TF–IDF)*.

Regardless of how resource conditionality is operationalized, increased coverage of natural resources has little effect on *Short-Term Policy*, as Models 2 and 3 show. Still, the content of IMF programs has a positive and significant effect on *Long-Term Policy*. According to Model 5, a 1% increase in *Resource Conditionality (Topic %)* is associated with a 3% increase in the odds of passing long-term policy. The second measure of resource conditionality, based on dictionary methods, corroborates this finding: a one-point increase in the TF–IDF statistic more than doubles the odds of observing long-term policy (Model 6).

Overall, natural resources generate well-known perverse incentives when it comes to fiscal governance, and IMF agreements can remediate this by making specific demands related to the natural resource sector. Table 4 suggests that these specific demands are more effective at promoting savings or pension funds than stabilization, investment, or development funds. Why might this be the case? Tying one's hands is costly, but to different degrees. Savings and pension funds are long-term tools: states will reap the benefits of such policies in a more distant future, when the incumbent committing to such policy will likely no longer be in power. In political terms, savings and pension funds are particularly costly, which is why these two types of funds are more responsive to binding IMF conditionality: were it not for the IMF, rulers would likely be less able or willing to embrace such measures. In contrast, stabilization, development, and investment funds are associated with a lower political cost, given their comparatively short time horizons. They are a cheaper signal that borrowing countries are more predisposed to send, even if the specific terms of the loan agreement are not attached to the creation or regulation of

such funds. Put simply, the role of IMF conditionality is more significant the higher the hurdle that self-interested incumbents must overcome to reform the natural resource sector.

All else equal, governments that have already passed short- or long-term policy are less likely to pass any additional policy of the same kind. But previous short-term policy is a positive and significant predictor of subsequent long-term policy, suggesting that more immediate commitments (in the form of stabilization, investment, and development funds) might pave the way for more durable commitments (like savings and pension funds).

Models 1–3 also show that governments tend to pass *Long-Term Policy* when they discover oil or gas fields, following the nationalization of private oil companies, or when oil prices are low. Concretely, a one-dollar increase in the price of crude oil per barrel is associated with a 1.3% *decrease* in the odds of policy passage, suggesting that the average government likes to maintain its discretion over resource revenue in times of commodity price boom, instead of tying its hands in the form of a natural resource fund. As to *Long-Term Policy*, Models 4–6 suggest that increases in *Resource Rents*, *GDP per Capita*, and *GDP Growth* are associated with significant increases in the outcome variable: wealthier or fast-growing economies can afford to save for the future in a way that poorer or slow-growing economies cannot. Even after controlling for wealth, countries with a larger working-age population are less likely to establish savings and pension funds, which is intuitive: when children and retirees account for a small share of the population, there is less pressure to save resource revenues for the future or for retirement.

## 5.4 | Robustness: Alternative measures of conditionality

The two measures of *Resource Conditionality* in Table 4 are the result of automated text analysis: one measure corresponds to the TF–IDF statistic and the other one is drawn from a probabilistic topic model. The reasoning is that automated text analysis allows researchers to capture the importance of one issue area *relative to all other issue areas*, leading to a more nuanced analysis that is less susceptible to subjective decisions. Nonetheless, there are many other ways to extract the meaning of IMF conditionality. I employ extant approaches as a robustness check, reporting the results in Table 5. To do so, I read all 6,849 binding conditions, taking note of those that reference the natural resource sector (a process discussed in more detail in the appendix). Following Wei and Zhang (2010) and Rickard and Caraway (2019), I then generate a binary variable that takes the value of one for country-years with *any* natural resource condition and zero otherwise (*Natural Resource Condition*). This is the variable used in Models 1 and 4 of Table 5. In addition, following Stubbs et al. (2020) and others, I generate a count variable to indicate the number of natural resource conditions per agreement (*Natural Resource Conditions, Count*), using this variable in Models 2 and 5. Lastly, I divide the number of natural resource conditions by the number of total conditions included in each agreement (*Natural Resource Conditions, % Conditions*), using this variable in Models 4 and 6.

Table 5 validates the main results. In particular, Model 4 suggests that the mere *inclusion* of natural resource conditionality in an IMF program can already encourage long-term reform (but not short-term reform, as Model 1 shows). Models 5 and 6 identify one meaningful distinction: the *absolute* count of natural resource conditions has no effect on long-term policy passage, but the *relative* count does. If the IMF aims to promote long-term natural resource policy, then, it must not only *emphasize* the importance of such policy, but also *de-emphasize* other potential policy reforms. Given that IMF programs require a series of policy reforms in different sectors, governments might not be

**TABLE 5** The effect of IMF program participation and conditionality on natural resource policy: Alternative measures of conditionality, 1980–2019

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Program participation = 1 | 0.645** | 0.706** | 0.634** | 0.833*** | 0.973*** | 0.887*** |
| | (0.304) | (0.297) | (0.297) | (0.214) | (0.226) | (0.218) |
| Natural resource condition = 1 | 0.108 | | | 0.710*** | | |
| | (0.330) | | | (0.233) | | |
| Natural resource conditions, count | | −0.025 | | | 0.045 | |
| | | (0.043) | | | (0.030) | |
| Natural resource conditions, % all conditions | | | 0.009 | | | 0.038*** |
| | | | (0.016) | | | (0.011) |
| Previous short-term policy | −1.804*** | −1.801*** | −1.811*** | 2.014*** | 1.828*** | 1.953*** |
| | (0.598) | (0.596) | (0.597) | (0.460) | (0.448) | (0.458) |
| Previous long-term policy | −0.959 | −0.947 | −0.964 | −4.431*** | −4.334*** | −4.429*** |
| | (0.654) | (0.657) | (0.659) | (0.705) | (0.708) | (0.713) |
| GDP per capita (Log) | −0.704 | −0.797* | −0.697 | 3.853*** | 3.757*** | 3.816*** |
| | (0.460) | (0.443) | (0.460) | (0.507) | (0.501) | (0.506) |
| GDP growth (%) | 0.007 | 0.006 | 0.007 | 0.025*** | 0.024*** | 0.024*** |
| | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) |
| Resource rents (% GDP) | 0.002 | 0.001 | 0.001 | 0.022* | 0.023** | 0.023** |
| | (0.013) | (0.013) | (0.013) | (0.012) | (0.011) | (0.011) |
| Working age population (%) | −0.041 | −0.044 | −0.041 | −0.361*** | −0.348*** | −0.356*** |
| | (0.058) | (0.058) | (0.058) | (0.053) | (0.051) | (0.053) |
| Field discovery = 1 | 0.629* | 0.587* | 0.628* | 0.392 | 0.474 | 0.412 |
| | (0.324) | (0.320) | (0.322) | (0.387) | (0.381) | (0.387) |
| Oil price (USD) | −0.033*** | −0.032*** | −0.032*** | −0.013*** | −0.013*** | −0.012*** |
| | (0.006) | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) |
| Crisis = 1 | −0.683 | −0.700 | −0.689 | −0.769*** | −0.699*** | −0.752*** |
| | (0.459) | (0.465) | (0.460) | (0.219) | (0.214) | (0.219) |
| WB extractive project | −0.151 | −0.146 | −0.154 | 0.541** | 0.505** | 0.520** |
| | (0.246) | (0.246) | (0.246) | (0.239) | (0.238) | (0.244) |
| Democracy (Polity2) | −0.027 | −0.029 | −0.027 | −0.183*** | −0.169*** | −0.185*** |
| | (0.046) | (0.046) | (0.046) | (0.027) | (0.026) | (0.027) |

(Continues)

TABLE 5 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Left executive = 1 | −0.264 | −0.248 | −0.263 | 0.214 | 0.285 | 0.215 |
| | (0.363) | (0.361) | (0.363) | (0.219) | (0.229) | (0.221) |
| Election year = 1 | −0.061 | −0.055 | −0.065 | −0.290 | −0.257 | −0.265 |
| | (0.197) | (0.196) | (0.197) | (0.180) | (0.176) | (0.178) |
| Oil company nationalization = 1 | 1.316** | 1.314** | 1.327** | −0.423 | −0.461 | −0.461 |
| | (0.593) | (0.594) | (0.590) | (0.562) | (0.574) | (0.577) |
| War = 1 | 0.299 | 0.280 | 0.295 | 2.997*** | 2.778*** | 2.896*** |
| | (0.605) | (0.604) | (0.603) | (0.575) | (0.561) | (0.568) |
| EITI member = 1 | 0.457 | 0.478 | 0.444 | −0.738*** | −0.679** | −0.726*** |
| | (0.351) | (0.352) | (0.351) | (0.276) | (0.277) | (0.276) |
| Constant | 0.883 | 1.124 | 0.899 | 8.985*** | 8.651*** | 8.873*** |
| | (3.037) | (3.053) | (3.042) | (2.336) | (2.269) | (2.332) |
| Observations | 2169 | 2169 | 2169 | 2169 | 2169 | 2169 |
| Log-likelihood | −201.539 | −201.405 | −201.497 | −85.445 | −86.060 | −85.559 |
| Akaike Inf. Crit. | 583.078 | 582.809 | 582.995 | 350.891 | 352.120 | 351.118 |

*Note*: The results of penalized-likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

able to implement *all* reforms; rather, they are likely to follow through with reforms in sectors that the written agreement seems to prioritize most.

As Chwieroth (2014) shows, sovereign wealth funds are not a recent innovation, but became particularly fashionable in the late 1990s. This coincides with an increase in the prevalence of natural resource conditionality, as indicated by Figure 4. To account for the possibility of time trends, alternative estimations (reported in the appendix) exclude all years before 1995, leading to similar conclusions. In the appendix, I also control for external debt stocks, because larger foreign debt obligations might decrease a country's ability to save natural resource revenue for future generations. Debt data are fully missing for 10 of the 74 countries, so there is a significant reduction in the sample size, but results are largely robust to the inclusion of this variable. Lastly, the IMF Executive Board waived 1100 of the 6849 binding conditions after agreements were underway; thus, borrowing countries only actually had to comply with 5749 conditions to secure the disbursement of funds. Stone (2011) and Nelson (2017) show that these waivers are discretionary in nature, which is why I also calculate the value of *Resource Conditionality* when excluding waived conditions. I report the corresponding analysis in the appendix; the results are the same, both substantively and statistically.

Put together, Tables 4 and 5, and the additional robustness checks indicate that the content of IMF conditionality has the potential to promote long-term fiscal sustainability in the natural

resource sector. When loan disbursement is conditional upon the implementation of natural resource sector reforms, countries are more willing to promote in-depth institutional updates than they would otherwise.

## 6 | CONCLUSION

This study identifies under what circumstances the IMF can improve natural resource governance among developing nations, leveraging its influence as the world's lender of last resort to set standards for natural resource revenue management. IMF loans pursue two complementary goals: they provide immediate liquidity that reduces the short-term risk of default (what Chapman et al., 2017 call the *liquidity effect*) and promote fiscal reforms that improve long-term solvency (the *conditionality effect*). Among resource-rich borrowers, I identify both a liquidity effect and a conditionality effect. Borrowers are more likely to set short-term fiscal anchors or adopt long-term fiscal sustainability mechanisms when they enter a loan agreement with the IMF. A loan agreement increases the odds that a borrowing country will create stabilization, investment, or development funds, but also savings or pensions funds. Under these circumstances, governments have incentives to model "good behavior" by adopting policy reforms that the IMF generally approves of, thereby securing loan disbursement.

In particular, savings or pensions funds are more likely to emerge the more loan disbursement is conditional on natural resource reform, that is, the higher the share of binding conditions urging borrowers to reform the natural resource sector. This means that IMF loans can promote patience by reducing the extent to which incumbents discount the future. Overall, borrowers are most likely to reshape the allocation of natural resource revenue (creating institutions that smooth out commodity price volatility or setting aside monies for rainy days) when made aware of this revenue's potential to secure future money.

To be clear, this study does not seek to normatively distinguish between "good" or "bad" advice, or between what is "right" and "wrong" for the natural resource sector. IMF conditionality is contentious and international bureaucrats are frequently accused of promoting capital market liberalization at the expense of institutional regulations (Stiglitz, 2002). In fact, Reinsberg et al. (2019b) show that more pervasive IMF conditionality (in the form of so-called structural conditions) might even *undermine* state capacity, increasing bribery by public officials and reducing states' ability to attract and retain bureaucrats. My assumption is not that natural resource funds are objectively appropriate for every single borrowing country, only that they fit a global understanding of what good governance in the natural resource sector should entail. At the same time, given the widespread consensus that oil, gas, and minerals are associated with corruption and generate perverse incentives to engage in fiscal profligacy, international institutions like the IMF can motivate domestic actors to adopt mechanisms that prolong the benefits of natural resource wealth. Ultimately, there is substantial variation in the conditions associated with an agreement, suggesting that the IMF tailors its advice to what it considers most appropriate for each resource-rich country.

Future work might examine whether international organizations other than the IMF similarly influence natural resource policy. There is anecdotal support for this argument: as a condition to finance the Chad-Cameroon pipeline and the Doba oil field developments, the World Bank required Chad to create a Fund for Future Generations (Humphreys et al., 2007, p. 195). Additionally, it is worth investigating how and if the Fund's influence over natural resource governance extends to resource-rich countries that are *not* under an agreement. After all, the IMF provides advice to each of its 189 member countries, in the form of yearly Article IV consultations. Admittedly, the IMF has less leverage over nonborrowers; because these countries cannot be punished through loan interruption,

they face fewer incentives to behave in line with IMF advice. In this sense, Article IV consultations are not hard conditions as much as soft suggestions. Still, a study of nonborrowers might reveal a country's true motivation to pass natural resource policy, by elucidating what drives policymakers to regulate the natural resource sector when they are not in need of immediate liquidity and are not urged by international organizations to do so.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in the Harvard Dataverse at https://doi.org/10.7910/DVN/9RURWP.

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## APPENDIX A: COUNTRIES INCLUDED IN THE ANALYSIS

Afghanistan, Albania, Algeria, Angola, Argentina, Azerbaijan, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Congo, Democratic Republic of the Congo, Ecuador, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Guatemala, Guinea, Guyana, India, Indonesia, Iran, Iraq, Ivory Coast, Kazakhstan, Kyrgyz Republic, Laos, Liberia, Libya, Malaysia, Mali, Mauritania, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Niger, Nigeria, Papua New Guinea, Peru, Philippines, Russia, São Tomé e Príncipe, Sierra Leone, South Africa, South Sudan, Sudan, Suriname, Syria, Tanzania, Timor Leste, Togo, Trinidad and Tobago, Tunisia, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, and Zimbabwe.

## APPENDIX B: LEGISLATION INCLUDED IN THE ANALYSIS

Table B1 lists all country-years of law passage; these observations are used to generate the dependent variable.

**TABLE B1** Countries that adopted natural resource legislation at the national level, with years of passage

| Country | Year |
|---|---|
| Algeria | 2000, 2003, 2006, 2016 |
| Angola | 2010, 2011 |
| Azerbaijan | 1999, 2000 |
| Bolivia | 2015 |
| Botswana | 1997 |
| Brazil | 2010 |
| Burkina Faso | 2015 |
| Chad | 1999, 2003, 2006 |
| Chile | 1981, 2006 |
| Colombia | 2011, 2012 |
| Ecuador | 2000, 2002, 2005, 2006, 2008, 2018 |
| Equatorial Guinea | 2006 |
| Gabon | 1998, 2010, 2011 |
| Ghana | 2011, 2016, 2018 |
| Guinea | 2011, 2012 |
| Guyana | 2019 |
| Iran | 2000, 2010 |
| Kazakhstan | 2000, 2005, 2010 |
| Libya | 2006, 2010 |

TABLE B1 (Continued)

| Country | Year |
|---|---|
| Malaysia | 1988 |
| Mauritania | 2006, 2008 |
| Mexico | 2000, 2001, 2007, 2013, 2014 |
| Mongolia | 2010, 2016 |
| Namibia | 1996 |
| Niger | 2010 |
| Nigeria | 2011, 2017 |
| Papua New Guinea | 2000, 2012, 2014 |
| Peru | 1999, 2003 |
| Russia | 2003, 2006, 2007, 2008, 2017 |
| São Tomé and Príncipe | 2004 |
| Sierra Leone | 2016 |
| South Sudan | 2011, 2012 |
| Sudan | 2004, 2005 |
| Suriname | 2017 |
| Tanzania | 2015 |
| Timor-Leste | 2005 |
| Trinidad and Tobago | 2000, 2007 |
| Turkmenistan | 2014, 2018 |
| Uganda | 2015, 2016 |
| Venezuela | 1999, 2005 |

## APPENDIX C: SUMMARY STATISTICS

Table C1 and Figure C1.

TABLE C1 Summary statistics

| Statistic | *N* | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Year | 2879 | 1999.628 | 11.713 | 1979 | 2019 |
| Short-term policy | 2879 | 0.025 | 0.157 | 0 | 1 |
| Long-term policy | 2879 | 0.008 | 0.091 | 0 | 1 |
| Program participation | 2879 | 0.378 | 0.485 | 0 | 1 |

(Continues)

TABLE C1 (Continued)

| Statistic | *N* | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Resource conditionality (%) | 2879 | 1.842 | 5.695 | 0 | 78 |
| Resource conditionality (TF–IDF) | 2879 | 0.068 | 0.258 | 0 | 4 |
| Natural resource condition | 2879 | 0.146 | 0.353 | 0 | 1 |
| Natural resource conditions (Count) | 2879 | 0.444 | 1.707 | 0 | 23 |
| Natural resource condition (% all conditions) | 2879 | 1.707 | 5.463 | 0 | 50 |
| GDP per capita (USD, Log) | 2622 | 0.645 | 1.025 | −1.828 | 2.919 |
| GDP growth (%) | 2701 | 3.823 | 7.585 | −64.047 | 149.973 |
| Resource rents (% GDP) | 2595 | 13.502 | 12.266 | 0.0003 | 86.453 |
| External debt stocks (% GNI, log) | 2209 | 3.803 | 0.913 | −1.433 | 6.831 |
| Working age population (%) | 2871 | 57.152 | 6.307 | 45.896 | 73.266 |
| Field discovery | 2879 | 0.067 | 0.250 | 0 | 1 |
| Oil price (USD) | 2879 | 42.755 | 26.562 | 14.388 | 99.568 |
| Crisis | 2879 | 0.074 | 0.262 | 0 | 1 |
| WB extractive project | 2879 | 0.341 | 0.474 | 0 | 1 |
| Democracy (Polity2) | 2734 | −0.215 | 6.381 | −9.000 | 10.000 |
| Left executive | 2628 | 0.338 | 0.473 | 0 | 1 |
| Election year | 2744 | 0.262 | 0.440 | 0 | 1 |
| Oil company nationalization | 2486 | 0.010 | 0.100 | 0 | 1 |
| War | 2879 | 0.011 | 0.106 | 0 | 1 |
| EITI member | 2879 | 0.136 | 0.343 | 0 | 1 |

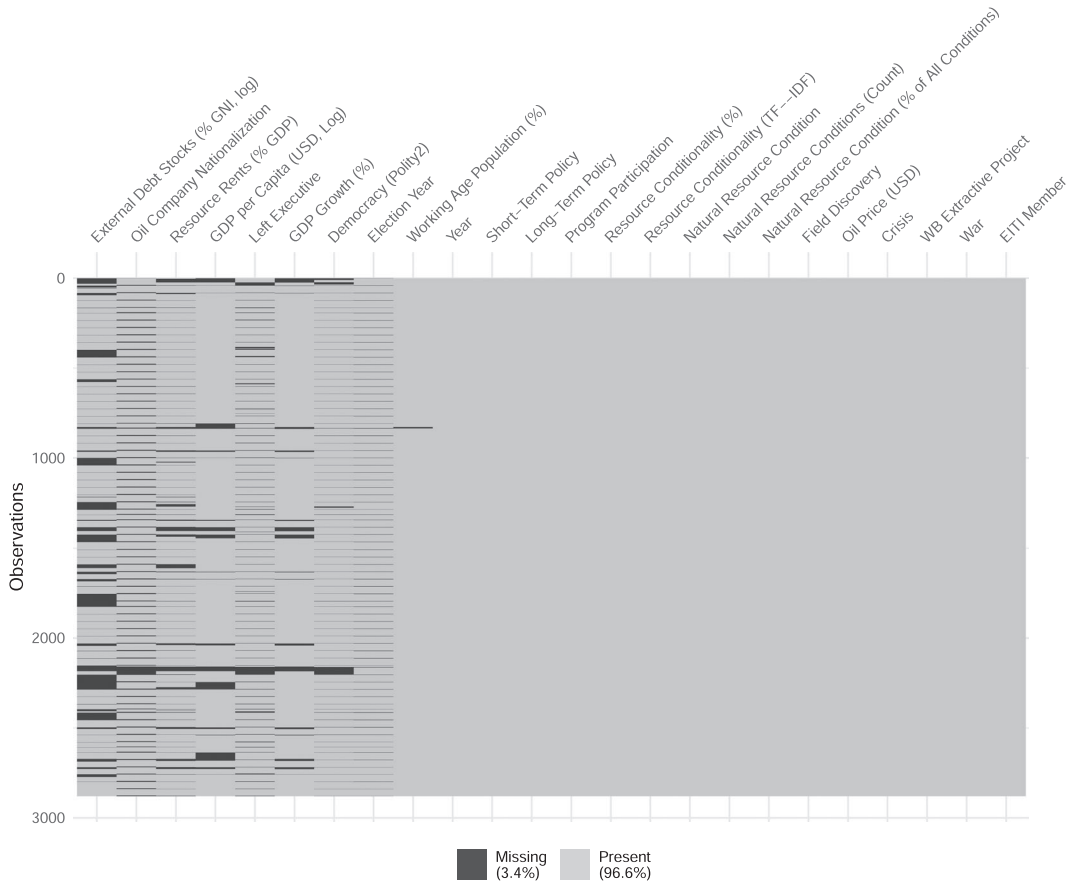


**FIGURE C1** Missingness map. As this figure shows, about 3.4% of all 2,879 observations are missing. The variable *External Debt Stocks* has the highest number of missing observations, followed by the variable *Oil Company Nationalization*

## APPENDIX D: TOPIC MODELS

This appendix presents a brief overview of topic models, based on Blei et al. (2003) and Eshima et al. (2020). The simplest kind of topic model is a Latent Dirichlet Allocation (LDA), which treats every document $d$ (out of $D$ total documents) as a random mixture over $K$ topics. Each topic $z_n$ is distributed as follows:

$$z_n \mid \theta \sim \text{Multinomial}(\theta) \tag{D1}$$

with

$$\theta \mid \alpha \sim \text{Dirichlet}(\alpha), \tag{D2}$$

where $\theta$ is the topic proportion for a given document and follows a Dirichlet distribution with parameter $\alpha$, a $K$-dimensional vector with $\alpha_i > 0$. The value of $\theta$ is the main outcome of interest, as it indicates how much a topic $z_n$ contributes to any given document. (Figure 4, e.g., shows the average value of $\theta$ for all documents passed in a single year).

Each document $d$ is composed of $d = \{w_1, w_2, ..., w_N\}$ words (like those in Table 3), with $N$ denoting the total number of words and $V$ the number of unique words. These $N$ words follow a Poisson distribution with parameter $\xi$:

$$N|\xi \sim \text{Poisson}(\xi), \tag{D3}$$

where $\xi \in (0, \infty)$.

Each of the $N$ words, $w_n$, has the multinomial probability $p(w_n|z_n, \beta)$ of belonging to a topic $z_n$ (Blei et al., 2003), $\beta$ being a $K \times V$ matrix $\beta_{ij} = p(w^j = 1|z^i = 1)$. A single term $w_n$ can belong to multiple topics, because topics are not strictly independent from one another. Only $w_1, w_2, ..., w_N$ are observed; all other variables are latent, hence the model's name.

In this study, I use Eshima, Imai and Sasaki's (2020) keyword assisted topic model (keyATM), which outperforms the LDA both qualitatively and quantitatively. The logic behind the keyATM is similar to that of the LDA, in that it also assumes that documents are a random mixture over topics. However, the keyATM is based on a mixture of two distributions: one distribution with positive probabilities for keywords and another with positive probabilities for all words. Out of a total of $K$ topics, researchers use their expertise to identify $\tilde{K}$ so-called keyword topics and provide a list of $L_k$ keywords, $V_k = \{v_{k1}, v_{k2}, ..., v_{kL_k}\}$, corresponding to these topics. The remaining $K - \tilde{K}$ no-keyword topics are "residual" topics that the model identifies on its own.

For each document $d$, the topic $z_n$ now follows a categorical distribution:

$$z_n|\theta \sim \text{Categorical}(\theta), \tag{D4}$$

where, again, $\theta$ is the topic proportion for a given document and follows a Dirichlet distribution with parameter $\alpha$. If the sampled topic $z_n$ is a no-keyword topic, then each word $w_n$ is distributed as follows:

$$w_n|z_n \sim \text{Categorical}(\phi_{z_n}) \text{ for } z_n \in \{\tilde{K} + 1, \tilde{K} + 2, ..., K\}, \tag{D5}$$

where $\phi_{z_n}$ is a $V$-dimensional vector representing the relative frequency of each word within topic $z_n$ (Eshima et al., 2020, p. 4).

If the sampled topic $z_n$ is a keyword topic, then the distribution of each word $w_n$ is a little more complex. First, we draw the random variable

$$s_n|z_n \sim \text{Bernoulli}(\pi_{z_n}) \text{ for } z_n \in \{1, 2, ..., \tilde{K}\}, \tag{D6}$$

where $\pi_{z_n}$ is the success probability for word $w_n$ (i.e., the probability that this word will be sampled). If $s_n$ equals 0, then the word $w_n$ is distributed as follows:

$$w_n|s_n, z_n \sim \text{Categorical}(\phi_{z_n}) \text{ for } z_n \in \{1, 2, ..., \tilde{K}\}. \tag{D7}$$

If, however, $s_n$ equals 1, then $w_n$ follows a different categorical distribution:

$$w_n|s_n, z_n \sim \text{Categorical}(\tilde{\phi}_{z_n}) \text{ for } z_n \in \{1, 2, ..., \tilde{K}\}. \tag{D8}$$

where $\tilde{\phi}_{z_n}$ is a $V$-dimensional vector of probabilities for the keyword list $V_k$. This means that $L_k$ elements (the keywords) have positive values, and the remaining elements in $V$ are 0.

The `R` package `keyATM`, developed by Eshima et al. (2020) and employed in this study, uses the following default prior distributions and hyper parameters:

$$\pi_{z_n} \sim \text{Beta}(1, 1) \text{ for } z_n = \{1, 2, ..., \tilde{K}\} \tag{D9}$$

$$\phi_{z_n} \sim \text{Dirichlet}(0.01) \text{ for } z_n = \{1, 2, ..., \tilde{K}\} \tag{D10}$$

$$\tilde{\phi}_{z_n} \sim \text{Dirichlet}(0.1) \text{ for } z_n = \{1, 2, ..., \tilde{K}\} \tag{D11}$$

$$\theta_d \sim \text{Dirichlet}(\alpha) \text{ for } d = \{1, 2, ..., D\} \tag{D12}$$

$$\alpha_{z_n} \sim \begin{cases} \text{Gamma}(1, 1) & \text{for } z_n = \{1, 2, ..., \tilde{K}\} \\ \text{Gamma}(1, 2) & \text{for } z_n = \{\tilde{K} + 1, \tilde{K} + 2, ..., K\} \end{cases} \tag{D13}$$

As long as the sample size is large, Eshima et al. (2020, p. 5) note that the choice of hyperparameters is not important. The only exception is $\pi_{z_n}$, which controls the weight of keywords and for which they assume a noninformative prior, $\text{Beta}(1, 1)$ as indicated above.

In my case, the following keywords were used to generate the natural resource topic: *natural, extractive, oil, petroleum, crude, gas, gasoline, diesel, electricity, fuel, fuels, energy, refinery, hydrocarbon, mineral, mining, mine, copper, gold, diamond, iron, steel, phosphate, EITI*. Additionally, I read all 14,100 conditions—even those that are not binding—and compiled an exhaustive list of every national oil or mining company mentioned at least once: Sonelgaz (Algeria), Sonangol (Angola), SOCAR (Azerbaijan), Azerigas (sometimes spelled Azerigaz, Azerbaijan), SONABEL (Burkina Faso), SONABHY (Burkina Faso), SNH (Cameroon), SONARA (Cameroon), PETROCA (Central African Republic), SNPC (Congo), SOGARA (Gabon), PETROCI (Ivory Coast), SOMAGAZ (Mauritania), SONIDEP (Niger), NNPC (Nigeria), Gazprom (Russia), Ukrgazprom (Ukraine), OTP (Togo), Naftogaz (sometimes spelled Naftogas, Ukraine), and PDVSA (Venezuela). The names of these companies (including their different spellings) are also included as keywords.

According to Roberts et al. (2019), there is no recommended number of topics that is appropriate for a given corpus. Grimmer and Stewart (2013) similarly write that "recent studies show that the estimated number of clusters is strongly model dependent" and that "there is often a negative relationship between the best-fitting model and the substantive information provided," which is why they recommend that "model selection should be recast as a problem of measuring *substantive fit*" (emphasis in the original) rather than statistical fit. In sum, most authors do not recommend a specific number of topics, but rather advise researchers to make this choice based on what is substantively meaningful. To identify a number of topics that is substantively meaningful, I resort to Kentikelenis et al. (2016). In addition to collecting all IMF conditions between 1980 and 2014, these authors manually code all conditions into 13 different categories: (1) fiscal issues; (2) revenue and tax issues; (3) labor issues; (4) state-owned enterprise reform and pricing; (5) state-owned enterprise privatization; (6) external debt issues; (7) financial sector, monetary policy, and central bank issues; (8) redistributive policies; (9) social policy; (10) external sector (trade and exchange system); (11) institutional reforms; (12) land and environment; and (13) a residual category. Thus, in addition to the natural resource category, my topic model includes 13 other categories that—according to prior research—are substantively meaningful. Still, one of the advantages of Eshima et al.'s (2020) keyATM over other types of topic model—like Roberts et al.'s (2019) structural topic model, or STM—is that the results are not sensitive to the number of topics stipulated in advance.

## APPENDIX E: MODELING ENDOGENOUS POLICY ADOPTION

### Predictors of topic proportions

One potential source of endogeneity is that countries might select into both IMF program participation and natural resource conditionality according to their ex ante ability and willingness to reform the natural resource sector. Conversely, the Fund might assign a higher share of natural resource conditions to countries where reform implementation is expected to succeed to begin with. To address these concerns, I estimate linear models using (1) topic proportions and (2) TF–IDF values as the outcomes of interest, with all independent variables lagged by one year.

In addition to several independent variables already discussed in the main text, these models include the variable *Voting with US*. As the largest IMF shareholder, the United States tends to push for less rigorous conditionality enforcement among its allies; thus, U.S. allies might receive a smaller share of natural resource conditionality. To account for this possibility, I employ an ideal point score computed by Bailey et al. (2015), who use voting patterns in the United Nations General Assembly to calculate the absolute distance between the ideal points of two states. Many extant studies (e.g., Chapman et al., 2017; Dreher & Jensen, 2007; Stone, 2004) use equivalent measures to examine how each country relates to the ideal point of the United States. Like Bailey et al. (2015), I multiply the ideal point distance by −1 for ease of interpretation, such that larger values of the resulting variable *Voting with U.S.* represent closer positions.

In country-years under an agreement, the most significant predictor of natural resource topic proportions (Model 1) is the price of crude oil, as Table E1 shows. Oil prices vary over time, but not across countries, providing initial evidence that borrowers are not selecting into this type of conditionality: whatever leads to a higher value of *Resource Conditionality (Topic %)* is exogenous to the borrower's preferences. The results are virtually identical when the outcome of interest is *Resource Conditionality (TF–IDF)*, as Model 2 shows. Moreover, GDP growth is associated with a significant *decrease* in the proportion of natural resource conditions, while GDP per capita has no significant effect. As Hendrix (2010) shows, GDP per capita is highly correlated with bureaucratic and administrative capacity, which means that these results indicate the opposite of what potential endogeneity patterns would reflect: to the extent that countries can select into natural resource conditionality, they are not doing so based on their bureaucratic or administrative ability to comply with such conditions, not even in times of economic growth. Left executives tend to receive a higher share of natural resource conditionality (however it is measured). This mirrors Rickard and Caraway's (2019) finding that left executives tend to receive more conditions requiring public sector reforms, even though one would expect these governments to be *less* willing to promote IMF-mandated policies in the first place. Finally, an increase in *Voting with US* has no significant effect on the share of natural resource conditionality, suggesting that borrowers who are U.S. allies and borrowers who are not U.S. allies tend to receive an equivalent proportion of natural resource conditionality. Overall, as reported in the main text, common observable proxies for the ability to reform are not related to the prevalence of natural resources in IMF loan conditions.

### Instrumental variables estimation

Instrumental variables generate consistent estimates under two conditions. First, the instrument must satisfy the exclusion restriction: it must affect the outcome (in my case, natural resource policy) exclusively through the treatment (program participation or conditionality),

**TABLE E1** Predictors of natural resource conditionality, country-years of IMF program onset, 1980–2019 (OLS)

| | Dependent variable | |
|---|---|---|
| | Resource conditionality (Topic %) (1) | Resource conditionality (TF–IDF) (2) |
| GDP per capita (Log) | 3.726 | −0.016 |
| | (2.294) | (0.103) |
| GDP growth (%) | −0.156** | −0.007*** |
| | (0.066) | (0.003) |
| Resource rents (% GDP) | 0.136* | 0.008** |
| | (0.082) | (0.003) |
| Working age population (%) | −0.234 | −0.015 |
| | (0.203) | (0.011) |
| Field discovery = 1 | −2.742 | 0.061 |
| | (1.799) | (0.074) |
| Oil price (USD) | 3.787*** | 0.132*** |
| | (1.095) | (0.045) |
| Crisis = 1 | −1.114 | −0.028 |
| | (0.859) | (0.031) |
| WB extractive project | 0.369 | 0.040 |
| | (0.884) | (0.035) |
| Democracy (Polity2) | 0.058 | −0.006 |
| | (0.100) | (0.004) |
| Left executive = 1 | 2.346* | 0.098* |
| | (1.259) | (0.058) |
| Election year = 1 | 0.230 | 0.017 |
| | (0.761) | (0.030) |
| Oil company nationalization = 1 | −3.517 | −0.533* |
| | (5.026) | (0.307) |
| War = 1 | 1.390 | 0.107 |
| | (2.224) | (0.077) |
| EITI member = 1 | 5.564** | −0.171 |
| | (2.407) | (0.148) |
| Voting with US | −0.600 | −0.052 |
| | (1.501) | (0.068) |

(Continues)

TABLE E1 (Continued)

| | Dependent variable | |
|---|---|---|
| | Resource conditionality (Topic %) (1) | Resource conditionality (TF–IDF) (2) |
| Constant | −139.415*** | −4.968*** |
| | (37.411) | (1.526) |
| Observations | 334 | 334 |
| $R^2$ | 0.576 | 0.512 |
| $F$ Statistic ($df = 107; 226$) | 2.866*** | 2.219*** |

*Note*: The results of OLS with year and country fixed effects, and standard errors clustered by country, are reported.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

without being correlated with the error term. The validity of the exclusion restriction cannot be justified empirically (Sovey & Green, 2011), but on theoretical grounds.

One common predictor of program participation is the share of a country's nationals among the Fund's professional staff (Barro & Lee, 2005; Casper, 2017). Though staff members are not allowed to work on programs related to their home country, countries with more representation within the IMF ranks might enjoy a substantial informational advantage: they have easier access to inside information about the lending process. Consequently, these countries should be better able to secure a loan and to negotiate more favorable conditions.

Another instrument for program participation is temporary membership on the United Nations Security Council (Dreher et al., 2009). In providing loans to the 10 elected temporary members, major World Bank and IMF shareholders (particularly the United States, but also France, Germany, Japan, and the United Kingdom) can increase their influence over decisions made by the UNSC, which usually pertain to economic sanctions or military action.

Other researchers use the budget constraints faced by the Fund as an instrument to predict participation because these constraints condition how much money the institution can lend each year. Barro and Lee (2005) examine the size of loans, operationalized as the average ratio of approved loans to GDP for each 5-year period. Relatedly, Stubbs et al. (2020) construct a compound instrument that relies on a measure developed by Lang (2020): the natural logarithm of the IMF liquidity ratio, that is, the amount of liquid resources divided by liquid liabilities. To instrument for program participation, Stubbs et al. (2020) interact the liquidity ratio with a country-specific proportion of years under IMF agreement. Prior program participation should be a good predictor of present participation because the Fund tends to have a regular clientele: many countries are recidivist borrowers (Bird et al., 2004).

These four instruments treat selection into program *participation*. Indeed, Woo (2013), Stubbs et al. (2017), and Rickard and Caraway (2019) only treat selection into program participation, not conditionality, whereas Wei and Zhang (2010), Chapman et al. (2017), and others only treat selection into conditionality, not participation. But Stubbs et al. (2020) highlight the importance of treating selection into both participation *and* conditionality simultaneously, which is why I now turn to instruments for program conditionality.

To treat selection into program *conditionality*, Beazer and Woo (2016) examine the total annual IMF disbursement as well as the number of years left until the next internal quota review by the IMF board of governors (when a country's borrowing quota might increase). Chapman et al. (2017) examine both the number of countries under an agreement in a given year and the ratio of prior commitments of IMF financing to IMF quota. Stubbs et al. (2020) interact the IMF liquidity ratio with a country-specific average of conditions covering the issue area of interest.

These instruments arguably fulfill the exclusion restriction for several country-specific outcomes, like income inequality (Forster et al., 2019), labor rights (Lee & Woo, 2020), bond yields (Chapman et al., 2017), or education spending (Stubbs et al., 2020), but it is less clear whether this holds for natural resource policy, for reasons outlined in the main text. For example, during the period under study, the IMF liquidity ratio is significantly correlated with oil prices ($\rho = 0.768$, $p = .000$), as is the number of countries under an agreement in any given year ($\rho = -0.597$, $p = .000$). Temporary UNSC membership is allocated by region, and regional hegemons like Brazil tend to be elected far more frequently than smaller nations like Guyana (Dreher et al., 2015, p. 125); besides, one of the countries included in my analysis (Russia) is a permanent member of the UNSC, raising questions about the validity of such instrument. And a higher share of nationals among the IMF professional staff might predict the odds of program participation, but it might also simply reflect the prevalence of neoliberal beliefs among a country's technocratic elite (Nelson, 2014).

Even assuming that the exclusion restriction holds for the instruments discussed above, the second condition to obtain consistent estimates is that said instrument is strongly correlated with the treatment variable in the first-stage equation, conditional on other covariates. As a rule of thumb, the first-stage for each instrument should have an $F$ statistic of at least 10 (though this is contingent on sample size, as Sovey & Green, 2011 show).

Tables E2 and E3 estimate the effect of IMF programs on short-term and long-term policy, respectively. In each table, Model 1 instruments for both participation and conditionality, Models 2 and 3 instruments only for conditionality, and Models 4 and 5 instruments only for participation. Specifically, I use the following variables: (1) to instrument for participation, an interaction between the yearly IMF liquidity ratio and a country-specific proportion of years under IMF agreement; to instrument for conditionality, an interaction between the yearly IMF liquidity ratio and a country-specific average of conditions (Stubbs et al., 2020); (2) to instrument for conditionality, the number of countries participating in a program each year (Chapman et al., 2017); (3) to instrument for conditionality, the total IMF disbursement in a given year (Beazer & Woo, 2016); (4) to instrument for participation, a dichotomous indicator of temporary membership on the United Nations Security Council (Dreher et al., 2009); and (5) to instrument for participation, the share of a country's nationals among the Fund's professional staff (Barro & Lee, 2005; Casper, 2017). Table E4 also shows the first-stage models corresponding to each instrument.

As Tables E2 and E3 both show, nearly all instruments have an $F$ statistic below 10. The exception is the compound instrument for resource conditionality (Model 1), with an $F$ statistic of 15.707, but the instrument for participation in the same model has an $F$ statistic of just 1.515. To obtain $F$ statistics over 10, I could exclude country fixed effects, but this would introduce other potential issues with omitted variable bias. Thus, the potential weakness of instruments might lead to inconsistent estimates, indicating that this estimation strategy is not suitable for my study. Lastly, Wu-Hausman tests indicate that 2SLS is just as consistent as OLS, but these test results are not very meaningful, because the instruments are weak and the precision of the

**TABLE E2** The effect of IMF program participation and conditionality on short-term natural resource policy, 1980–2019 (2SLS)

| | **Dependent variable** | | | | |
|---|---|---|---|---|---|
| | **Short-term policy (Models 1–6)** | | | | |
| | **IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio (1)** | **IV 1: None, IV 2: Year specific number of countries under a program (2)** | **IV 1: None, IV 2: Year specific total IMF loan disbursement (3)** | **IV 1: UNSC temporary member = 1, IV 2: None (4)** | **IV 1: Country specific % IMF staff, IV 2: None (5)** |
| Program participation = 1 | −0.385 | 0.074 | 0.917 | 0.313 | −0.036 |
| | (0.432) | (0.130) | (6.008) | (0.344) | (0.684) |
| Resource conditionality (%) | 0.001 | −0.016 | −0.204 | −0.010 | 0.0001 |
| | (0.011) | (0.030) | (1.343) | (0.010) | (0.020) |
| Previous short-term policy | −0.029 | 0.010 | −0.002 | 0.039 | 0.020 |
| | (0.071) | (0.031) | (0.156) | (0.042) | (0.079) |
| Previous long-term policy | −0.021 | −0.043 | −0.162 | −0.026 | −0.043 |
| | (0.041) | (0.035) | (0.815) | (0.032) | (0.058) |
| GDP per capita (Log) | −0.034 | −0.026 | −0.166 | −0.014 | −0.021 |
| | (0.040) | (0.027) | (1.049) | (0.018) | (0.059) |
| GDP growth (%) | −0.001 | −0.0004 | −0.006 | 0.0003 | −0.0001 |
| | (0.001) | (0.001) | (0.041) | (0.001) | (0.001) |
| Resource rents (% GDP) | −0.001 | −0.0001 | 0.002 | 0.00004 | −0.001 |
| | (0.001) | (0.001) | (0.013) | (0.001) | (0.001) |
| Working age population (%) | −0.005 | 0.001 | −0.008 | 0.006 | 0.001 |
| | (0.008) | (0.003) | (0.064) | (0.006) | (0.012) |
| Field discovery = 1 | 0.043 | 0.018 | −0.042 | 0.007 | 0.025 |
| | (0.031) | (0.023) | (0.457) | (0.034) | (0.042) |
| Oil price (USD) | −0.001* | −0.001* | −0.004 | −0.001** | −0.001** |
| | (0.001) | (0.001) | (0.022) | (0.0004) | (0.0004) |
| Crisis = 1 | 0.023 | −0.013 | −0.006 | −0.035 | −0.007 |
| | (0.047) | (0.010) | (0.083) | (0.031) | (0.058) |
| WB extractive project | 0.038 | −0.003 | −0.020 | −0.028 | 0.007 |
| | (0.046) | (0.010) | (0.145) | (0.034) | (0.052) |
| Democracy (Polity2) | 0.001 | −0.001 | 0.006 | −0.003 | −0.001 |
| | (0.004) | (0.002) | (0.042) | (0.002) | (0.001) |

**TABLE E2** (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Short-term policy (Models 1–6) | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio (1) | IV 1: None, IV 2: Year specific number of countries under a program (2) | IV 1: None, IV 2: Year specific total IMF loan disbursement (3) | IV 1: UNSC temporary member = 1, IV 2: None (4) | IV 1: Country specific % IMF staff, IV 2: None (5) |
| Left executive = 1 | −0.088 | 0.002 | 0.059 | 0.059 | −0.015 |
| | (0.099) | (0.018) | (0.380) | (0.072) | (0.116) |
| Election year = 1 | −0.001 | −0.002 | 0.024 | −0.00004 | −0.005 |
| | (0.012) | (0.010) | (0.197) | (0.010) | (0.009) |
| Oil company nationalization = 1 | 0.056 | 0.063 | 0.087 | 0.040 | 0.026 |
| | (0.067) | (0.060) | (0.324) | (0.058) | (0.069) |
| War = 1 | −0.003 | −0.029 | −0.136 | −0.042 | −0.023 |
| | (0.043) | (0.026) | (0.747) | (0.047) | (0.027) |
| EITI member = 1 | 0.013 | 0.025 | 0.107 | 0.029 | 0.009 |
| | (0.028) | (0.027) | (0.613) | (0.028) | (0.027) |
| Constant | 0.540 | 0.093 | 0.713 | −0.280 | 0.108 |
| | (0.631) | (0.167) | (4.534) | (0.397) | (0.714) |
| *F* statistic for IV 1 | 1.515 | – | – | 3.098* | 0.334 |
| *F* statistic for IV 2 | 15.707*** | 1.162 | 0.022 | – | – |
| Wu-Hausman Test | 1.890 | 0.189 | 0.682 | 1.534 | 0.004 |
| Observations | 2169 | 2169 | 2030 | 2094 | 2021 |

*Note*: The results of 2SLS with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. IV 1 is an instrument for program participation. IV 2 is an instrument for resource conditionality.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

**TABLE E3** The effect of IMF program participation and conditionality on long-term natural resource policy, 1980–2019 (2SLS)

| | **Dependent variable** | | | | |
|---|---|---|---|---|---|
| | **Long-term policy (Models 1–6)** | | | | |
| | **IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio (1)** | **IV 1: None, IV 2: Year specific number of countries under a program (2)** | **IV 1: None, IV 2: Year specific total IMF loan disbursement (3)** | **IV 1: UNSC temporary member = 1, IV 2: None (4)** | **IV 1: Country specific % IMF staff, IV 2: None (5)** |
| Program participation = 1 | 0.065 | 0.132 | −0.401 | 0.290 | 0.061 |
| | (0.432) | (0.135) | (2.805) | (0.271) | (0.427) |
| Resource conditionality (%) | 0.007 | −0.029 | 0.091 | −0.009 | −0.002 |
| | (0.011) | (0.031) | (0.627) | (0.008) | (0.012) |
| Previous short-term policy | 0.037 | 0.014 | 0.034 | 0.045* | 0.033 |
| | (0.071) | (0.018) | (0.072) | (0.027) | (0.040) |
| Previous long-term policy | −0.062 | −0.073** | −0.014 | −0.074** | −0.071 |
| | (0.041) | (0.034) | (0.383) | (0.032) | (0.044) |
| GDP per capita (Log) | 0.043 | 0.007 | 0.105 | 0.042** | 0.031 |
| | (0.040) | (0.029) | (0.489) | (0.020) | (0.036) |
| GDP growth (%) | 0.0002 | −0.001 | 0.003 | 0.0001 | 0.0003 |
| | (0.001) | (0.001) | (0.019) | (0.0004) | (0.001) |
| Resource rents (% GDP) | 0.001 | 0.001 | −0.0002 | 0.001 | 0.001 |
| | (0.001) | (0.001) | (0.006) | (0.001) | (0.0005) |
| Working age population (%) | −0.001 | −0.005* | 0.0004 | 0.001 | −0.003 |
| | (0.008) | (0.002) | (0.030) | (0.004) | (0.007) |
| Field discovery = 1 | 0.004 | −0.005 | 0.036 | −0.016 | 0.003 |
| | (0.031) | (0.019) | (0.213) | (0.025) | (0.029) |
| Oil price (USD) | −0.00000 | −0.001 | 0.001 | −0.0003 | −0.0002 |
| | (0.001) | (0.001) | (0.010) | (0.0003) | (0.0002) |
| Crisis = 1 | −0.015 | −0.006 | −0.009 | −0.029 | −0.010 |
| | (0.047) | (0.011) | (0.037) | (0.024) | (0.035) |
| WB extractive project | −0.003 | −0.001 | 0.013 | −0.019 | 0.001 |
| | (0.046) | (0.011) | (0.067) | (0.028) | (0.031) |
| Democracy (Polity2) | −0.001 | 0.001 | −0.003 | −0.002 | −0.001 |
| | (0.004) | (0.002) | (0.020) | (0.002) | (0.001) |
| Left executive = 1 | 0.019 | 0.014 | −0.024 | 0.060 | 0.012 |
| | (0.099) | (0.018) | (0.178) | (0.055) | (0.074) |

**TABLE E3** (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Long-term policy (Models 1–6) | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio (1) | IV 1: None, IV 2: Year specific number of countries under a program (2) | IV 1: None, IV 2: Year specific total IMF loan disbursement (3) | IV 1: UNSC temporary member = 1, IV 2: None (4) | IV 1: Country specific % IMF staff, IV 2: None (5) |
| Election year = 1 | −0.005 | −0.001 | −0.016 | −0.004 | −0.004 |
| | (0.012) | (0.009) | (0.091) | (0.007) | (0.005) |
| Oil company nationalization = 1 | −0.014 | −0.006 | −0.027 | 0.008 | −0.023 |
| | (0.067) | (0.036) | (0.148) | (0.029) | (0.018) |
| War = 1 | −0.003 | −0.020 | 0.050 | −0.005 | −0.007 |
| | (0.043) | (0.022) | (0.349) | (0.034) | (0.011) |
| EITI member = 1 | −0.011 | 0.008 | −0.049 | 0.004 | −0.008 |
| | (0.028) | (0.024) | (0.287) | (0.017) | (0.016) |
| Constant | 0.033 | 0.282* | −0.094 | −0.124 | 0.140 |
| | (0.631) | (0.154) | (2.097) | (0.299) | (0.435) |
| *F* statistic for IV 1 | 1.515 | – | – | 3.098* | 0.334 |
| *F* statistic for IV 2 | 15.707*** | 1.162 | 0.022 | – | – |
| Wu-Hausman Test | 2.054 | 2.220 | 0.412 | 4.406 | 0.014 |
| Observations | 2169 | 2169 | 2030 | 2094 | 2021 |

*Note*: The results of 2SLS with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. IV 1 is an instrument for program participation. IV 2 is an instrument for resource conditionality.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

**TABLE E4** First-stage models for effect of IMF program participation and conditionality, 1980–2019

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Program participation = 1 | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio | IV 1: None, IV 2: Year specific number of countries under a program | IV 1: None, IV 2: Year specific total IMF loan disbursement | IV 1: UNSC temporary member = 1, IV 2: None | IV 1: Country specific % IMF staff, IV 2: None |
| | (1) | (2) | (3) | (4) | (5) |
| IV 1: Participation instrument | −0.068* | | | 0.057* | −0.018 |
| | (0.039) | | | (0.032) | (0.031) |
| Resource conditionality (%) | | | | 0.029*** | 0.029*** |
| | | | | (0.004) | (0.003) |
| Previous short-term policy | −0.117*** | | | −0.089*** | −0.091** |
| | (0.035) | | | (0.034) | (0.035) |
| Previous long-term policy | 0.034 | | | 0.052 | 0.057* |
| | (0.039) | | | (0.038) | (0.035) |
| GDP per capita (Log) | −0.059* | | | −0.028 | 0.094** |
| | (0.033) | | | (0.034) | (0.044) |
| GDP growth (%) | −0.002* | | | −0.002 | −0.001 |
| | (0.001) | | | (0.001) | (0.001) |
| Resource rents (% GDP) | −0.002* | | | −0.002* | −0.001 |
| | (0.001) | | | (0.001) | (0.001) |
| Working age population (%) | −0.020*** | | | −0.014*** | −0.017*** |
| | (0.005) | | | (0.004) | (0.005) |

TABLE E4 (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Program participation = 1 | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio | IV 1: None, IV 2: Year specific number of countries under a program | IV 1: None, IV 2: Year specific total IMF loan disbursement | IV 1: UNSC temporary member = 1, IV 2: None | IV 1: Country specific % IMF staff, IV 2: None |
| | (1) | (2) | (3) | (4) | (5) |
| Field discovery = 1 | 0.051 | | | 0.065* | 0.053* |
| | (0.035) | | | (0.035) | (0.031) |
| Oil price (USD) | −0.00002 | | | 0.0003 | −0.0001 |
| | (0.001) | | | (0.001) | (0.001) |
| Crisis = 1 | 0.092*** | | | 0.082*** | 0.082** |
| | (0.033) | | | (0.031) | (0.032) |
| WB extractive project | 0.098*** | | | 0.091*** | 0.077*** |
| | (0.023) | | | (0.023) | (0.023) |
| Democracy (Polity2) | 0.007** | | | 0.004 | 0.001 |
| | (0.003) | | | (0.003) | (0.003) |
| Left executive = 1 | −0.215*** | | | −0.203*** | −0.169*** |
| | (0.035) | | | (0.032) | (0.034) |
| Election year = 1 | 0.007 | | | 0.002 | −0.005 |
| | (0.019) | | | (0.018) | (0.019) |
| Oil company nationalization = 1 | −0.006 | | | −0.032 | 0.024 |
| | (0.084) | | | (0.085) | (0.089) |

(Continues)

TABLE E4 (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Program participation = 1 | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio | IV 1: None, IV 2: Year specific number of countries under a program | IV 1: None, IV 2: Year specific total IMF loan disbursement | IV 1: UNSC temporary member = 1, IV 2: None | IV 1: Country specific % IMF staff, IV 2: None |
| | (1) | (2) | (3) | (4) | (5) |
| War = 1 | 0.044 | | | 0.053 | 0.022 |
| | (0.084) | | | (0.107) | (0.098) |
| EITI member = 1 | 0.001 | | | −0.025 | −0.021 |
| | (0.041) | | | (0.037) | (0.037) |
| Constant | 1.469*** | | | 1.048*** | 1.042*** |
| | (0.248) | | | (0.221) | (0.227) |
| IV 2: Conditionality instrument | 0.316** | 0.035 | 0.002 | | |
| | (0.128) | (0.034) | (0.014) | | |
| Program participation = 1 | | 4.306*** | 4.470*** | | |
| | | (0.264) | (0.274) | | |
| Previous short-term policy | −0.596 | −0.312 | −0.104 | | |
| | (0.342) | (0.328) | (0.330) | | |
| Previous long-term policy | −0.203 | −0.407 | −0.604 | | |
| | (0.519) | (0.468) | (0.482) | | |
| GDP per capita (Log) | −0.918** | −0.834** | −0.779** | | |
| | (0.363) | (0.350) | (0.987) | | |

TABLE E4 (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Program participation = 1 | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio | IV 1: None, IV 2: Year specific number of countries under a program | IV 1: None, IV 2: Year specific total IMF loan disbursement | IV 1: UNSC temporary member = 1, IV 2: None | IV 1: Country specific % IMF staff, IV 2: None |
| | (1) | (2) | (3) | (4) | (5) |
| GDP growth (%) | −0.031** | −0.024** | −0.031** | | |
| | (0.013) | (0.012) | (0.013) | | |
| Resource rents (% GDP) | −0.002 | 0.008 | 0.010 | | |
| | (0.013) | (0.012) | (0.013) | | |
| Working age population (%) | −0.063 | −0.046 | −0.045 | | |
| | (0.048) | (0.050) | (0.056) | | |
| Field discovery = 1 | −0.236 | −0.387 | −0.334 | | |
| | (0.404) | (0.353) | (0.371) | | |
| Oil price (USD) | −0.026* | −0.016 | −0.016 | | |
| | (0.015) | (0.013) | (0.014) | | |
| Crisis = 1 | 0.365 | −0.031 | 0.022 | | |
| | (0.379) | (0.351) | (0.369) | | |
| WB extractive project | 0.239 | −0.193 | −0.098 | | |
| | (0.266) | (0.255) | (0.270) | | |
| Democracy (Polity2) | 0.056 | 0.042 | 0.031 | | |
| | (0.037) | (0.035) | (0.042) | | |

(Continues)

TABLE E4 (Continued)

| | Dependent variable | | | | |
|---|---|---|---|---|---|
| | Program participation = 1 | | | | |
| | IV 1: Country-specific % years under a program × Liquidity ratio, IV2: Country-specific % resource conditionality × Liquidity ratio | IV 1: None, IV 2: Year specific number of countries under a program | IV 1: None, IV 2: Year specific total IMF loan disbursement | IV 1: UNSC temporary member = 1, IV 2: None | IV 1: Country specific % IMF staff, IV 2: None |
| | (1) | (2) | (3) | (4) | (5) |
| Left executive = 1 | −0.649 | 0.384 | 0.280 | | |
| | (0.421) | (0.362) | (0.398) | | |
| Election year = 1 | 0.104 | 0.105 | 0.131 | | |
| | (0.261) | (0.249) | (0.264) | | |
| Oil Company Nationalization = 1 | 0.338 | 0.250 | 03093 | | |
| | (1.330) | (1.207) | (1.482) | | |
| War = 1 | −0.530 | −0.606 | −0.560 | | |
| | (0.412) | (0.411) | (0.433) | | |
| EITI Member = 1 | 0.312 | 0.484 | 0.439 | | |
| | (0.553) | (0.518) | (0.529) | | |
| Constant | 6.383*** | 2.517 | 3.237 | | |
| | (2.305) | (2.849) | (2.881) | | |
| Observations | 2169 | 2169 | 2030 | 2094 | 2021 |

*Note*: The results of the first-stage models corresponding to Tables E2 and E3, with third-order polynomials, country fixed effects, and standard errors clustered by country are reported.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

IV estimator is poor. Given these limitations, I opted to present logistic regressions as the main results (see Table 4), acknowledging that this modeling strategy does not allow me to make causal statements.

## APPENDIX F: SURVIVAL MODELS

Rather than use logistic regressions, one alternative way to model natural resource policy passage would be through survival analysis. Survival models assume that once a country experiences the event in question (i.e., once it adopts some type of natural resource policy), it is no longer at risk of experiencing this event again, and thus exits the sample. However, this modeling strategy would not be appropriate for the present study, because passing natural resource policy is not a terminal event. For example, between 2000 and 2018, Ecuador passed a total of six legal documents creating and regulating five different funds. Ecuador and others are constantly "at risk" of experiencing such event: passing one legal document does not preclude them from doing so again. Logistic regressions are the most appropriate way to answer the question posed by this study: what explains natural resource policy passage? In contrast, survival models would answer a different—if valid—question: what explains passage of the *first* natural resource policy? Table F1 uses Cox proportional hazards models to answer the latter question. The variables *Crisis*, *Oil Company Nationalization*, and *War* drop out due to issues of complete separation.

As Models 1–3 show, the factors predicting the passage of the *first* short-term policy are similar to those predicting the passage of *any* short-term policy. However, when it comes to passing the *first* long-term policy, Models 4–6 indicate that the influence of the IMF is mostly absent. Instead, GDP per capita is the best predictor of whether a country will pass its first legal document related to savings or pension funds. When it comes to the long-term allocation of

**TABLE F1** The effect of IMF program participation and conditionality on natural resource policy: cox proportional hazards models, 1980–2019

| | **Dependent variable** | | | | | |
|---|---|---|---|---|---|---|
| | **Time to short-term policy (Models 1–3)** | | | **Time to long-term policy (Models 4–6)** | | |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| Program participation = 1 | 0.837* | 1.056** | 1.018** | 0.148 | 0.099 | 0.209 |
| | (0.455) | (0.493) | (0.490) | (0.630) | (0.689) | (0.687) |
| Resource conditionality (%) | | −0.042 | | | 0.007 | |
| | | (0.043) | | | (0.037) | |
| Resource conditionality (TF–IDF) | | | −0.887 | | | −0.255 |
| | | | (1.027) | | | (1.240) |
| GDP per capita (Log) | 0.619** | 0.645** | 0.618** | 1.143*** | 1.143*** | 1.141*** |
| | (0.305) | (0.302) | (0.301) | (0.429) | (0.431) | (0.427) |
| GDP growth (%) | 0.057 | 0.053 | 0.054 | 0.007 | 0.007 | 0.006 |
| | (0.040) | (0.040) | (0.040) | (0.025) | (0.025) | (0.025) |

(Continues)

TABLE F1 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Time to short-term policy (Models 1–3) | | | Time to long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Resource rents (% GDP) | 0.027* | 0.028** | 0.029** | 0.032 | 0.032 | 0.033 |
| | (0.014) | (0.014) | (0.014) | (0.022) | (0.022) | (0.022) |
| Working age population (%) | 0.010 | 0.011 | 0.010 | −0.116* | −0.115* | −0.116* |
| | (0.046) | (0.045) | (0.045) | (0.068) | (0.068) | (0.067) |
| Field discovery = 1 | 0.961* | 0.963* | 0.927* | 0.849 | 0.850 | 0.837 |
| | (0.500) | (0.496) | (0.502) | (0.843) | (0.844) | (0.845) |
| Oil price (USD) | 0.012 | 0.012 | 0.012 | −0.086 | −0.087 | −0.086 |
| | (0.014) | (0.015) | (0.015) | (0.143) | (0.143) | (0.144) |
| WB extractive project | −0.268 | −0.233 | −0.229 | −0.636 | −0.646 | −0.630 |
| | (0.494) | (0.494) | (0.495) | (0.754) | (0.759) | (0.754) |
| Democracy (Polity2) | 0.022 | 0.023 | 0.021 | 0.095 | 0.095 | 0.094 |
| | (0.041) | (0.041) | (0.041) | (0.073) | (0.073) | (0.073) |
| Left executive = 1 | 0.263 | 0.286 | 0.277 | −0.744 | −0.740 | −0.741 |
| | (0.400) | (0.400) | (0.400) | (0.605) | (0.605) | (0.606) |
| Election year = 1 | −0.074 | −0.079 | −0.072 | 0.640 | 0.640 | 0.643 |
| | (0.438) | (0.438) | (0.438) | (0.531) | (0.531) | (0.531) |
| EITI member = 1 | 0.470 | 0.509 | 0.485 | 0.469 | 0.479 | 0.467 |
| | (0.722) | (0.725) | (0.732) | (0.932) | (0.937) | (0.932) |
| Observations | 1947 | 1947 | 1947 | 2132 | 2132 | 2132 |
| $R^2$ | 0.013 | 0.014 | 0.014 | 0.011 | 0.011 | 0.011 |
| Log-likelihood | −99.898 | −99.306 | −99.440 | −51.637 | −51.622 | −51.613 |
| Wald test | 25.950** ($df = 12$) | 26.530** ($df = 13$) | 26.850** ($df = 13$) | 18.790* ($df = 12$) | 18.740 ($df = 13$) | 18.800 ($df = 13$) |
| LR test | 26.016** ($df = 12$) | 27.200** ($df = 13$) | 26.933** ($df = 13$) | 22.543** ($df = 12$) | 22.575** ($df = 13$) | 22.593** ($df = 13$) |
| Score (Logrank) test | 30.127*** ($df = 12$) | 30.761*** ($df = 13$) | 30.916*** ($df = 13$) | 22.356** ($df = 12$) | 22.361* ($df = 13$) | 22.477** ($df = 13$) |

*Note*: The results of Cox proportional hazards models are shown.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

natural resource revenue, the main contribution of IMF agreements is not to jump-start natural resource funds as much as it is to guide countries through subsequent reforms.

## APPENDIX G: ADDITIONAL ROBUSTNESS CHECKS

### Restricting the period of analysis: 1995–2019

Table G1

### Additional control variables

During the period under study, some countries experienced either extreme economic expansion or extreme economic contraction. For example, according to the World Bank, Equatorial Guinea's GDP grew 149.97% in 1997, while Iraq's GDP shrank 64.05% in 1991. To account for these outliers (which may or may not be a function of misreported data), I generate two dichotomous variables. For every country-year, if *GDP Growth* is above 10%, the variable *Extreme Expansion* takes the value of one (and zero otherwise). Conversely, if yearly *GDP Growth* is below −10%, the variable *Extreme Contraction* takes the value of one (and zero otherwise). Table G2 suggests that neither variable has a significant effect on the outcomes of interest, and that the effects of IMF program participation and conditionality are robust to their inclusion.

In Table G3, I control for a country's sovereign debt, measured as *External Debt Stocks* (in percent of the GNI, logged, using World Bank data). The reasoning is that highly indebted countries might be less able—or willing—to set money aside in a natural resource fund, instead using resource revenue to repay their debt commitments. Though results are largely robust to the inclusion of this variable, this inclusion substantially reduces the sample size, from 2169 observations (in the main analysis) to 1851 observations (in Table G3), and models do not converge. This is because debt data are only sparsely available for the sets of countries and years I examine here. In fact, data on *External Debt Stocks* are fully missing for ten of the 74 countries of interest: Chile, Equatorial Guinea, Iraq, Libya, Malaysia, Namibia, South Sudan, Sudan, Syria, and Trinidad and Tobago. Other common sovereign debt indicators—like *Central Government Debt* (in percent of the GDP), *Total Debt Service* (in percent of the GNI), or *Total Debt Service* (in percent of exports of goods, services and primary income), all reported by the World Bank and the IMF—have even worse coverage for these 74 countries between 1980 and 2019, as Figure G1 shows. Thus, the models reported in Table G3 are not directly comparable to the main results in Table 4.

### Excluding waived conditions

The variable *Resource Conditionality* reflects the content of 6849 *binding* conditions. The reasoning, grounded in prior research, is that borrowers are unlikely to respond to nonbinding conditions, because failure to comply with "soft" conditionality does not automatically lead to loan suspension. However, 1100 of the 6849 binding conditions were officially waived by the IMF Executive Board, which means that borrowing countries were ultimately not required to implement these reforms to secure the disbursement of funds. Because these waivers are often discretionary in nature (Nelson, 2017; Stone, 2011), I also estimate models that calculate the value of *Resource Conditionality* only for conditions that were *not* waived. Table G4 presents the results, indicating that the substantive effect of resource conditionality on long-term policy is even larger for binding conditions when such conditions are not subsequently waived.

**TABLE G1** The effect of IMF program participation on long-term natural resource policy: restricting the period of analysis, 1995–2019

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Program participation = 1 | 0.741** | 0.793** | 0.777** | 1.042*** | 1.014*** | 1.015*** |
| | (0.302) | (0.315) | (0.309) | (0.229) | (0.244) | (0.235) |
| Resource conditionality (%) | | −0.009 | | | 0.029** | |
| | | (0.016) | | | (0.013) | |
| Resource conditionality (TF–IDF) | | | −0.118 | | | 0.377* |
| | | | (0.248) | | | (0.202) |
| Previous short-term policy | −1.717*** | −1.721*** | −1.725*** | 1.067** | 1.167** | 1.101** |
| | (0.604) | (0.601) | (0.600) | (0.467) | (0.464) | (0.467) |
| Previous long-term policy | −0.816 | −0.808 | −0.807 | −3.561*** | −3.635*** | −3.576*** |
| | (0.685) | (0.679) | (0.683) | (0.646) | (0.649) | (0.644) |
| GDP per capita (Log) | 0.325 | 0.284 | 0.295 | 4.647*** | 4.551*** | 4.626*** |
| | (0.628) | (0.616) | (0.624) | (0.719) | (0.698) | (0.711) |
| GDP growth (%) | 0.001 | 0.002 | 0.002 | 0.039*** | 0.039*** | 0.039*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.008) | (0.009) |
| Resource rents (% GDP) | 0.001 | 0.001 | 0.001 | 0.007 | 0.007 | 0.007 |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) |
| Working age population (%) | −0.087 | −0.084 | −0.087 | −0.295*** | −0.317*** | −0.297*** |
| | (0.070) | (0.070) | (0.070) | (0.073) | (0.072) | (0.073) |
| Field discovery = 1 | 0.650* | 0.637* | 0.645* | 0.782** | 0.755* | 0.770** |
| | (0.333) | (0.332) | (0.332) | (0.386) | (0.388) | (0.386) |
| Oil price (USD) | −0.025*** | −0.025*** | −0.025*** | −0.025*** | −0.025*** | −0.025*** |
| | (0.008) | (0.008) | (0.008) | (0.006) | (0.006) | (0.006) |
| Crisis = 1 | −0.709 | −0.706 | −0.709 | −0.870*** | −0.931*** | −0.868*** |
| | (0.463) | (0.462) | (0.462) | (0.300) | (0.300) | (0.296) |
| WB extractive project | −0.127 | −0.144 | −0.153 | 0.129 | 0.144 | 0.138 |
| | (0.262) | (0.259) | (0.257) | (0.255) | (0.256) | (0.255) |
| Democracy (Polity2) | 0.036 | 0.039 | 0.039 | −0.182*** | −0.206*** | −0.184*** |
| | (0.052) | (0.052) | (0.052) | (0.033) | (0.034) | (0.034) |
| Left executive = 1 | 0.028 | 0.020 | 0.028 | 0.177 | 0.214 | 0.169 |
| | (0.402) | (0.400) | (0.401) | (0.223) | (0.227) | (0.223) |
| Election year = 1 | −0.018 | −0.019 | −0.018 | −0.270 | −0.258 | −0.271 |
| | (0.201) | (0.201) | (0.201) | (0.178) | (0.177) | (0.177) |

**TABLE G1** (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Oil company nationalization = 1 | 1.166* | 1.128* | 1.123* | −0.367 | −0.376 | −0.367 |
| | (0.611) | (0.621) | (0.624) | (0.556) | (0.565) | (0.559) |
| War = 1 | −0.105 | −0.120 | −0.108 | 1.897*** | 2.058*** | 1.945*** |
| | (0.675) | (0.680) | (0.678) | (0.624) | (0.648) | (0.633) |
| EITI member = 1 | 0.339 | 0.368 | 0.362 | −0.935*** | −0.929*** | −0.932*** |
| | (0.354) | (0.351) | (0.350) | (0.284) | (0.285) | (0.282) |
| Constant | 3.323 | 3.244 | 3.341 | 7.152** | 8.239** | 7.269** |
| | (3.736) | (3.713) | (3.730) | (3.320) | (3.347) | (3.327) |
| Observations | 1424 | 1424 | 1424 | 1424 | 1424 | 1424 |
| Log Likelihood | −195.447 | −195.458 | −195.454 | −77.956 | −78.090 | −78.321 |
| Akaike Inf. Crit. | 568.894 | 570.917 | 570.908 | 333.911 | 336.179 | 336.642 |

*Note*: The results of penalized-likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

**TABLE G2** The effect of IMF program participation on long-term natural resource policy, controlling for extreme values of GDP growth, 1980–2019

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-Term Policy (Models 1–3) | | | Long-Term Policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Program participation = 1 | 0.655** | 0.729** | 0.696** | 0.873*** | 0.805*** | 0.835*** |
| | (0.284) | (0.299) | (0.291) | (0.215) | (0.231) | (0.220) |
| Resource conditionality (%) | | −0.012 | | | 0.038*** | |
| | | (0.016) | | | (0.013) | |
| Resource conditionality (TF–IDF) | | | −0.138 | | | 0.772*** |
| | | | (0.256) | | | (0.230) |
| Previous short-term policy | −1.812*** | −1.820*** | −1.824*** | 1.715*** | 1.860*** | 1.891*** |
| | (0.593) | (0.589) | (0.590) | (0.429) | (0.428) | (0.441) |
| Previous long-term policy | −0.947 | −0.931 | −0.936 | −4.195*** | −4.325*** | −4.321*** |
| | (0.663) | (0.655) | (0.661) | (0.683) | (0.694) | (0.684) |
| GDP per capita (Log) | −0.843* | −0.878** | −0.865** | 3.456*** | 3.596*** | 3.572*** |
| | (0.436) | (0.423) | (0.431) | (0.499) | (0.492) | (0.500) |

(Continues)

TABLE G2 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-Term Policy (Models 1–3) | | | Long-Term Policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| GDP growth (%) | 0.005 | 0.005 | 0.005 | 0.024*** | 0.026*** | 0.025*** |
| | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) |
| Extreme expansion = 1 | −0.110 | −0.118 | −0.111 | −0.590 | −0.608 | −0.602 |
| | (0.346) | (0.347) | (0.346) | (0.410) | (0.405) | (0.406) |
| Extreme contraction = 1 | 0.362 | 0.382 | 0.368 | 0.018 | −0.160 | −0.109 |
| | (0.389) | (0.390) | (0.391) | (0.324) | (0.340) | (0.338) |
| Resource rents (% GDP) | 0.001 | 0.0005 | 0.001 | 0.028** | 0.028** | 0.027** |
| | (0.013) | (0.013) | (0.013) | (0.011) | (0.012) | (0.011) |
| Working age population (%) | −0.037 | −0.036 | −0.039 | −0.308*** | −0.320*** | −0.309*** |
| | (0.058) | (0.057) | (0.058) | (0.049) | (0.049) | (0.049) |
| Field discovery = 1 | 0.625* | 0.610* | 0.620* | 0.486 | 0.451 | 0.467 |
| | (0.322) | (0.321) | (0.321) | (0.387) | (0.392) | (0.390) |
| Oil price (USD) | −0.033*** | −0.033*** | −0.033*** | −0.014*** | −0.014*** | −0.014*** |
| | (0.006) | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) |
| Crisis = 1 | −0.556 | −0.549 | −0.553 | −0.604*** | −0.685*** | −0.643*** |
| | (0.434) | (0.432) | (0.433) | (0.218) | (0.226) | (0.220) |
| WB extractive project | −0.151 | −0.167 | −0.174 | 0.491** | 0.517** | 0.538** |
| | (0.247) | (0.244) | (0.243) | (0.232) | (0.234) | (0.236) |
| Democracy (Polity2) | −0.029 | −0.027 | −0.027 | −0.166*** | −0.186*** | −0.178*** |
| | (0.045) | (0.045) | (0.045) | (0.026) | (0.027) | (0.026) |
| Left executive = 1 | −0.258 | −0.260 | −0.255 | 0.348 | 0.399 | 0.343 |
| | (0.359) | (0.358) | (0.360) | (0.246) | (0.251) | (0.240) |
| Election year = 1 | −0.065 | −0.065 | −0.065 | −0.292* | −0.258 | −0.288 |
| | (0.197) | (0.197) | (0.196) | (0.177) | (0.176) | (0.177) |
| Oil company nationalization = 1 | 1.253** | 1.208** | 1.208** | −0.545 | −0.588 | −0.581 |
| | (0.585) | (0.597) | (0.598) | (0.582) | (0.600) | (0.601) |
| War = 1 | 0.324 | 0.299 | 0.318 | 2.687*** | 2.792*** | 2.784*** |
| | (0.589) | (0.595) | (0.592) | (0.546) | (0.550) | (0.550) |
| EITI member = 1 | 0.459 | 0.494 | 0.482 | −0.624** | −0.663** | −0.687** |
| | (0.349) | (0.346) | (0.344) | (0.275) | (0.274) | (0.274) |
| Constant | 0.979 | 0.943 | 1.053 | 7.167*** | 7.439*** | 7.099*** |
| | (3.006) | (2.989) | (3.006) | (2.177) | (2.209) | (2.192) |

TABLE G2 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-Term Policy (Models 1–3) | | | Long-Term Policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Observations | 2168 | 2168 | 2168 | 2168 | 2168 | 2168 |
| Log-likelihood | −201.471 | −201.402 | −201.433 | −86.109 | −86.120 | −86.090 |
| Akaike Inf. Crit. | 584.942 | 586.804 | 586.866 | 354.218 | 356.239 | 356.179 |

*Note*: The results of penalized-likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

TABLE G3 The effect of IMF program participation on long-term natural resource policy, controlling for external debt, 1980–2019

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Program participation = 1 | 0.796*** | 0.862*** | 0.824*** | 0.943*** | 0.906*** | 0.916*** |
| | (0.290) | (0.300) | (0.295) | (0.214) | (0.227) | (0.217) |
| Resource conditionality (%) | | −0.012 | | | 0.018 | |
| | | (0.016) | | | (0.012) | |
| Resource conditionality (TF–IDF) | | | −0.098 | | | 0.344* |
| | | | (0.244) | | | (0.188) |
| Previous short-term policy | −1.679** | −1.676** | −1.682** | 1.171*** | 1.196*** | 1.192*** |
| | (0.677) | (0.673) | (0.672) | (0.438) | (0.431) | (0.437) |
| Previous long-term policy | −0.002 | −0.005 | 0.009 | −2.912*** | −2.900*** | −2.910*** |
| | (0.944) | (0.933) | (0.937) | (0.784) | (0.775) | (0.776) |
| GDP per capita (Log) | −0.669 | −0.698 | −0.685 | 6.199*** | 6.113*** | 6.165*** |
| | (0.794) | (0.772) | (0.788) | (0.871) | (0.847) | (0.854) |
| GDP growth (%) | −0.030* | −0.030* | −0.029* | 0.049*** | 0.047*** | 0.048*** |
| | (0.017) | (0.018) | (0.018) | (0.015) | (0.015) | (0.015) |
| Resource rents (% GDP) | −0.025* | −0.026* | −0.025* | −0.035** | −0.033** | −0.034** |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.014) | (0.015) |
| External debt stocks | 0.604*** | 0.585*** | 0.585*** | −0.443*** | −0.445*** | −0.437*** |
| | (0.190) | (0.191) | (0.191) | (0.097) | (0.097) | (0.097) |
| Working age population (%) | −0.048 | −0.046 | −0.049 | −0.349*** | −0.347*** | −0.346*** |
| | (0.066) | (0.065) | (0.066) | (0.061) | (0.060) | (0.060) |

(Continues)

TABLE G3 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Field discovery = 1 | 0.686** | 0.671** | 0.682** | 0.724** | 0.709** | 0.722** |
| | (0.344) | (0.342) | (0.343) | (0.352) | (0.353) | (0.352) |
| Oil price (USD) | −0.023*** | −0.023*** | −0.023*** | −0.018*** | −0.018*** | −0.018*** |
| | (0.007) | (0.007) | (0.007) | (0.005) | (0.005) | (0.005) |
| Crisis = 1 | −0.619 | −0.610 | −0.614 | −0.833*** | −0.860*** | −0.838*** |
| | (0.446) | (0.444) | (0.445) | (0.257) | (0.255) | (0.255) |
| WB extractive project | −0.104 | −0.121 | −0.126 | 0.334 | 0.331 | 0.338 |
| | (0.259) | (0.256) | (0.254) | (0.259) | (0.256) | (0.258) |
| Democracy (Polity2) | 0.078 | 0.079 | 0.079 | −0.181*** | −0.192*** | −0.182*** |
| | (0.051) | (0.050) | (0.050) | (0.031) | (0.030) | (0.031) |
| Left executive = 1 | 0.210 | 0.188 | 0.202 | 0.933*** | 0.897*** | 0.896*** |
| | (0.434) | (0.430) | (0.432) | (0.219) | (0.217) | (0.215) |
| Election year = 1 | 0.031 | 0.033 | 0.032 | −0.267 | −0.260 | −0.269 |
| | (0.209) | (0.209) | (0.208) | (0.186) | (0.185) | (0.185) |
| Oil company nationalization = 1 | 0.992 | 0.914 | 0.926 | 0.380 | 0.389 | 0.395 |
| | (0.788) | (0.819) | (0.818) | (0.574) | (0.576) | (0.579) |
| War = 1 | 0.283 | 0.263 | 0.280 | 1.403** | 1.427** | 1.420** |
| | (0.601) | (0.607) | (0.605) | (0.663) | (0.664) | (0.664) |
| EITI member = 1 | 0.366 | 0.409 | 0.389 | −0.598** | −0.586** | −0.607** |
| | (0.370) | (0.368) | (0.365) | (0.274) | (0.275) | (0.273) |
| Constant | −1.120 | −1.086 | −0.976 | 8.622*** | 8.604*** | 8.529*** |
| | (3.604) | (3.571) | (3.602) | (2.501) | (2.492) | (2.479) |
| Observations | 1851 | 1851 | 1851 | 1851 | 1851 | 1851 |
| Log-likelihood | −167.584 | −167.534 | −167.619 | −70.826 | −71.217 | −71.224 |
| Akaike Inf. Crit. | 497.168 | 499.068 | 499.238 | 303.653 | 306.433 | 306.448 |

*Note*: The results of penalized-likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

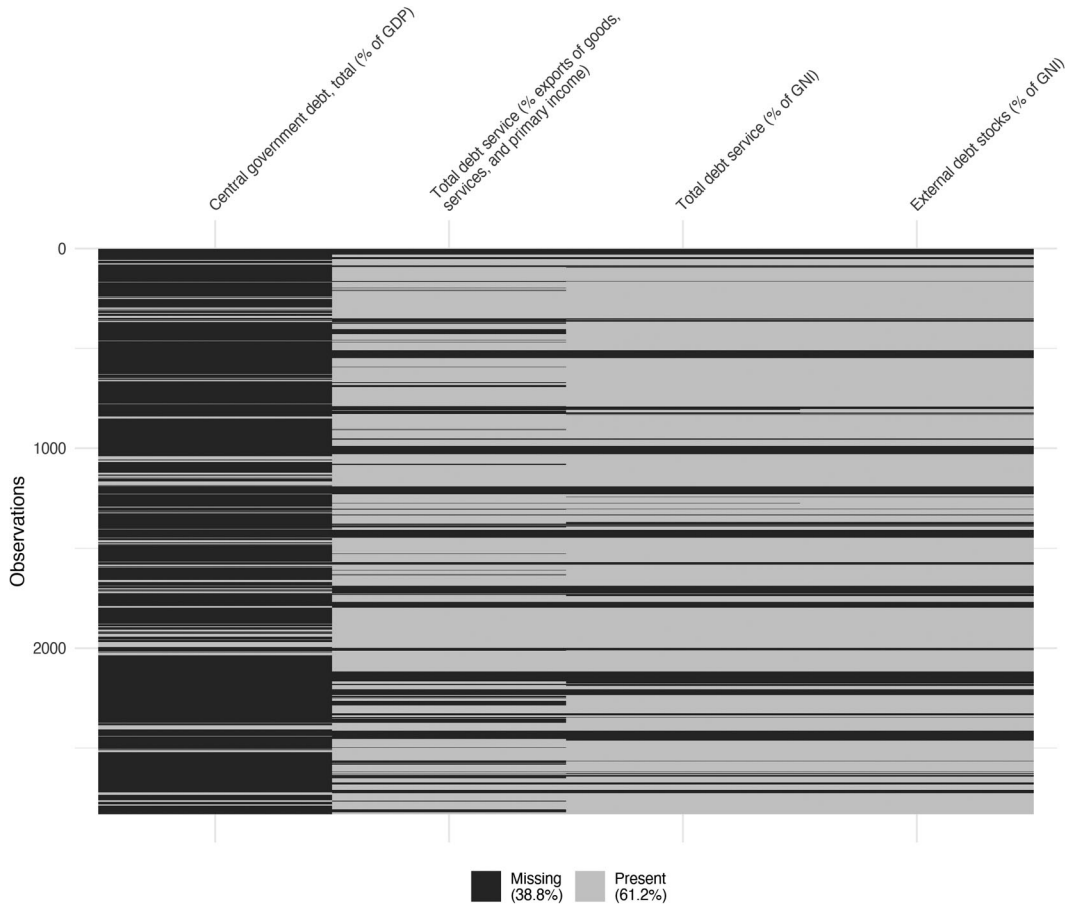


**FIGURE G1** Missingness map, sovereign debt measures. As this figure shows, common sovereign debt indicators from the IMF and the World Bank have limited coverage. For the 74 countries of interest between 1980 and 2019, 38.8% of all observations are missing

**TABLE G4** The effect of IMF program participation and conditionality on natural resource policy: Excluding waived conditions, 1980–2019

| | **Dependent variable** | | | | | |
|---|---|---|---|---|---|---|
| | **Short-term policy (Models 1–3)** | | | **Long-term policy (Models 4–6)** | | |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| Program participation = 1 | 0.670** | 0.751** | 0.721** | 0.966*** | 0.727*** | 0.922*** |
| | (0.288) | (0.295) | (0.295) | (0.225) | (0.252) | (0.232) |
| Resource conditionality (%) | | −0.009 | | | 0.060*** | |
| | | (0.012) | | | (0.012) | |
| Resource conditionality (TF–IDF) | | | −0.194 | | | 0.835*** |
| | | | (0.254) | | | (0.247) |

(Continues)

TABLE G4 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Previous short-term policy | −1.817*** | −1.853*** | −1.838*** | 1.841*** | 2.759*** | 2.048*** |
| | (0.600) | (0.598) | (0.597) | (0.456) | (0.515) | (0.471) |
| Previous Long-term Policy | −0.954 | −0.937 | −0.940 | −4.354*** | −5.001*** | −4.502*** |
| | (0.665) | (0.664) | (0.663) | (0.715) | (0.768) | (0.714) |
| GDP per capita (Log) | −0.732 | −0.799* | −0.765* | 3.832*** | 4.343*** | 3.932*** |
| | (0.452) | (0.433) | (0.445) | (0.507) | (0.516) | (0.507) |
| GDP growth (%) | 0.007 | 0.007 | 0.007 | 0.024*** | 0.028*** | 0.025*** |
| | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) |
| Resource rents (% GDP) | 0.001 | 0.0004 | 0.001 | 0.023** | 0.024** | 0.023** |
| | (0.013) | (0.013) | (0.013) | (0.011) | (0.011) | (0.011) |
| Working age population (%) | −0.042 | −0.042 | −0.044 | −0.346*** | −0.365*** | −0.348*** |
| | (0.058) | (0.058) | (0.058) | (0.051) | (0.055) | (0.052) |
| Field discovery = 1 | 0.618* | 0.599* | 0.613* | 0.490 | 0.430 | 0.454 |
| | (0.324) | (0.325) | (0.324) | (0.380) | (0.396) | (0.383) |
| Oil price (USD) | −0.032*** | −0.032*** | −0.032*** | −0.013*** | −0.014*** | −0.013*** |
| | (0.006) | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) |
| Crisis = 1 | −0.683 | −0.664 | −0.675 | −0.635*** | −0.941*** | −0.684*** |
| | (0.463) | (0.457) | (0.461) | (0.214) | (0.237) | (0.216) |
| WB extractive project | −0.152 | −0.163 | −0.179 | 0.479** | 0.488** | 0.508** |
| | (0.248) | (0.243) | (0.243) | (0.237) | (0.238) | (0.240) |
| Democracy (Polity2) | −0.027 | −0.024 | −0.024 | −0.167*** | −0.229*** | −0.182*** |
| | (0.047) | (0.046) | (0.047) | (0.026) | (0.029) | (0.026) |
| Left executive = 1 | −0.257 | −0.258 | −0.261 | 0.321 | 0.525** | 0.336 |
| | (0.364) | (0.363) | (0.364) | (0.231) | (0.232) | (0.228) |
| Election year = 1 | −0.061 | −0.061 | −0.060 | −0.261 | −0.294 | −0.255 |
| | (0.197) | (0.197) | (0.197) | (0.177) | (0.180) | (0.176) |
| Oil company nationalization = 1 | 1.321** | 1.305** | 1.266** | −0.454 | −0.428 | −0.482 |
| | (0.594) | (0.602) | (0.611) | (0.572) | (0.593) | (0.588) |
| War = 1 | 0.294 | 0.260 | 0.289 | 2.749*** | 3.375*** | 2.866*** |
| | (0.606) | (0.611) | (0.610) | (0.565) | (0.600) | (0.568) |
| EITI member = 1 | 0.463 | 0.474 | 0.493 | −0.703** | −1.010*** | −0.772*** |
| | (0.352) | (0.349) | (0.347) | (0.280) | (0.292) | (0.279) |

TABLE G4 (Continued)

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Short-term policy (Models 1–3) | | | Long-term policy (Models 4–6) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Constant | 0.994 | 1.028 | 1.100 | 8.455*** | 8.300*** | 8.378*** |
| | (3.046) | (3.037) | (3.047) | (2.276) | (2.437) | (2.297) |
| Observations | 2169 | 2169 | 2169 | 2169 | 2169 | 2169 |
| Log-likelihood | −201.342 | −201.246 | −201.207 | −85.572 | −83.320 | −85.511 |
| Akaike inf. crit. | 580.684 | 582.492 | 582.415 | 349.145 | 346.639 | 351.022 |

*Note*: The results of penalized-likelihood models with third-order polynomials, country fixed effects, and standard errors clustered by country are reported. Coefficients represent log odds.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

## APPENDIX H: MANUAL CODING

As a robustness check, I manually coded all 6,849 binding conditions based on the presence or absence of words related to natural resources. To do so, I first generated a list of words and expressions, singular or plural, that are related to natural resources: *natural resource, extractive, oil, petroleum, crude, gas, gasoline, diesel, electricity, fuel, fuels, energy, refinery, hydrocarbon, mineral, mining, mine, copper, gold, diamond, iron, steel, phosphate, EITI, Extractive Industries Transparency Initiative, Fund for Future Generations, sovereign wealth fund*. My list also includes the following national oil or mining companies: Sonelgaz (Algeria), Sonangol (Angola), SOCAR (Azerbaijan), Azerigas (sometimes spelled Azerigaz, Azerbaijan), SONABEL (Burkina Faso), SONABHY (Burkina Faso), SNH (Cameroon), SONARA (Cameroon), PETROCA (Central African Republic), SNPC (Congo), SOGARA (Gabon), PETROCI (Ivory Coast), SOMAGAZ (Mauritania), SONIDEP (Niger), NNPC (Nigeria), Gazprom (Russia), Ukrgazprom (Ukraine), OTP (Togo), Naftogaz (sometimes spelled Naftogas, Ukraine), and PDVSA (Venezuela).

Second, I coded each of these 6849 conditions as one if it included at least one of these words, and zero otherwise. Conditions that only mentioned *vegetable* oil (e.g., palm oil) were coded as zero, as were conditions that referred to economic sectors *excluding the energy, gas, oil, or mining sector*. Through this manual coding, I was able to identify 418 natural resource conditions, which I grouped by country and year to generate the variable *Natural Resource Conditions (Count)*. This variable ranges from zero to 23, and its effect on the outcome of interest is reported in Table 5. Lastly to generate the variable *Natural Resource Condition (% All Conditions)*, I simply divided *Natural Resource Conditions (Count)* by the sum of all conditions for each country and year.