Crude Credit: The Political Economy of Global Finance and Natural Resource Wealth in Latin America*

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Abstract

Conventional wisdom suggests that natural resource wealth has adverse effects on economic development. However, recent empirical studies have added more nuance to this debate: oil, gas, and mineral wealth can be a curse or a blessing, conditional on the quality of domestic institutions. We offer new insights into this scholarship by demonstrating that financial markets — not just sovereign governments — may accentuate the resource curse by breeding over-optimism through easy credit. In a study of ten oil-rich Latin American countries, we find that private creditors and sovereign debtors respond to resource wealth differently. Creditors rely on global prices as cognitive shortcuts to evaluate the likelihood of sovereign debt repayment, offering lower financing rates during commodity price upturns. However, debtors do not always take advantage of easy credit: conditional on domestic institutions, governments make borrowing decisions based on local oil production, often surprisingly constraining their debt issuance.

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1 Introduction

In 2017, Venezuelan opposition and National Assembly leader Julio Borges criticized Goldman Sachs for its decision to "aid and abet Venezuela's dictatorial regime"[1] by purchasing $2.8 billion worth of sovereign bonds. Former Planning Minister Ricardo Hausmann even called for Venezuelan bonds to be eliminated from JP Morgan's benchmark Emerging Market Bond Index (EMBI), dubbing them "hunger bonds" for sustaining President Maduro's regime. But Goldman Sachs was not alone: in times of near-zero interest rates, global financial investors surprinsingly continued to buy Venezuela's high-yielding bonds, disregarding the country's food shortages, high inflation, and economic mismanagement. To what extent does natural resource wealth in countries like Venezuela — which has the world's largest proven oil and gas reserves (BP, 2019) — increase investors' confidence that their loans will be repaid?

Next door to Venezuela, Guyana made the first of many sizable oil discoveries off its coast in May 2015. Five months later, Finance Minister Winston Jordan expressed interest in re-entering global bond markets.[2] Similar to elsewhere in the region during Latin America's *Lost Decade*, Guyana had defaulted on its external debt, which in 1982 had exceeded 214 percent of the country's GNP (Reinhart and Rogoff, 2009). Except for a small bond placed in 1994, Guyana took a three-decade hiatus before announcing its return to global capital markets. To what extent did the oil discovery influence Jordan's announcement, and will investors be equally generous with this new, oil-rich market entrant despite its default history?

In this paper, we examine creditor-debtor relationships, exploring the conditions under which global financial markets are willing to provide easy credit to oil-producing nations and the extent to which national governments leverage this financial opportunity. We develop a two-tier theoretical framework that analyzes credit supply and demand. From a supply-

[1] "Goldman Sachs Criticized for Buying Venezuelan Bonds." *The Economist*. 1 June 2017.

[2] Lucien Chauvin. "Guyana Poised to Return to Bond Market After Two Decade Gap." *Global Capital*. 11 October 2015.

side perspective, we argue that market exuberance about commodity upturns reflects a combination of investor heuristics (Barberis and Thaler, 2002; Ritter, 2003) and market liquidity (Mosley, Paniagua and Wibbels, 2020; Ballard-Rosa, Mosley and Wellhausen, 2021). Basing their investment decisions on fleeting economic narratives (Shiller, 2019, 2015; Akerlof and Shiller, 2009), global capital investors tend to disproportionately weigh recent events, trading on such popular media stories as "commodity super cycles."[3] This type of herding behavior, known as projection bias in the behavioral economics literature (Loewenstein, O'Donoghue and Rabin, 2003; Wilson, 2011), can fuel periods of market optimism that lead to more affordable financing opportunities for governments from natural resource economies.

Despite the availability of such funding opportunities, we predict that oil-rich countries will not always borrow more in the wake of field discoveries or when commodity prices are high, for two reasons: institutional memory and information asymmetries.

Compared to the exuberance of markets, national officials from economic institutions (e.g. Finance Ministry and Central Bank) have often internalized the historical lessons from past debt crisis, such as the dangers of fiscal largess in catalyzing Latin America's *Lost Decade*. In light of such historical crisis memories (Kaplan, 2013), recent commodity price trends tend to have less influence over their debt management decisions. Aiming to minimize the state's fiscal burden, Latin American governments have shifted capital investment expenditures directly to state-owned enterprises or to joint ventures formed with private companies.[4]

National economic officials also base borrowing decisions on higher-quality private information about the health of the domestic natural resource sector. Given the state's sweeping involvement in the oil sector in natural resource economies, these officials tends to have privileged information about oil exploration, discovery, and production. With access to such private information, national governments do not need to use the same investment heuristics as global market actors.

[3]A commodity super cycle is a prolonged period of high commodity prices.

[4]State-owned enterprises are not included in public debt calculations when they are a market producer or a producer that sells its goods for economically significant prices (IMF's Government Statistics Manual).

From a demand-side perspective, we thus expect central governments to issue debt less frequently and in smaller amounts when natural resource production is high because resource rents, rather than sovereign debt, can be used to meet existing fiscal needs.

To test these priors, we conduct a statistical test of ten Latin American oil-producing countries between 1996 and 2018. Latin America is an ideal region for this study, given its combination of historical oil dependence and deep capital market development. On average, Latin American governments have funded about two-fifths of their external financing (or more than 11 percent of their total GDP) in global capital markets, beginning with the Brady Plan during the early 1990s. Other resource-rich regions, such as Sub-Saharan Africa, have limited experience with sovereign bond issuance. Other than South Africa, which has regularly issued bonds since 1991, most nations (like Angola, Ghana, and Gabon) have not only entered bond markets recently (after 2006), but also tended to issue official rather than private market debt (Mecagni et al., 2018).

Our study contributes to a growing body of work that seeks to explain capital market behavior. This burgeoning scholarship has established that cross-national investment decisions are a function of electoral and political uncertainty (Kaplan, 2013), public deficit size and inflation rate (Mosley, 2000), incumbent ideology (Campello, 2015; Mosley, 2003), balanced budget rules (Kelemen et al., 2014), size and conditions of IMF loans (Chapman et al., 2017), Central Bank independence (Bodea and Hicks, 2018), regime type (Ballard-Rosa, 2020), and creditworthiness across similar sovereign asset classes (Brooks, Cunha and Mosley, 2015).

We incorporate natural resource wealth into these financial studies to better understand the extent to which global markets might intensify the political resource curse, which predicts that natural resources lead to a deterioration in regime type or institutional quality (Ross, 2015). To date, these studies have yielded mixed evidence about the direction of this effect, with some scholars surprisingly finding a positive (Dunning, 2008; Haber and Menaldo, 2011; Brooks and Kurtz, 2016) rather than a negative (Andersen and Ross, 2014) relationship between natural resources and governance that is conditional on local politics.

Still, the reputational and behavioral implications of resource wealth are understudied (with the notable exception of Collier, 2017).

We begin by developing our argument about how natural resources help developing countries gain cheap short-term financing from sovereign bond markets. In spite of this potential financing boom, we expect that most national governments will not make use of this cheap credit. We then craft an empirical strategy to assess how resource wealth affects both market expectations and sovereign debt issuance, finding support for our argument in the oil and gas sector in Latin America. Finally, we use these empirical results to derive more general implications and develop a road map for future research.

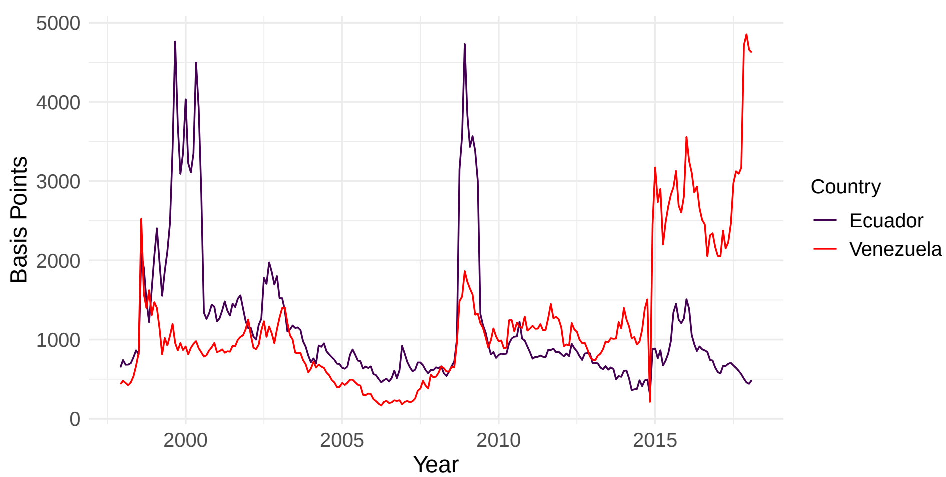
2 Theoretical Framework

Are global investors rational actors who efficiently incorporate information to maximize their economic returns, or do information asymmetries make them prone to mispricing risk, and sometimes making bad investments? The "efficient market hypothesis" states that financial markets incorporate all available information about future asset values because of high competition and low information costs among investors (Fama, 1970). By contrast, the behavioral finance literature questions this assumption, finding that information asymmetries can sometimes plague financial markets and lead to unsustainable bubbles (Shiller, 2019, 2015; Akerlof and Shiller, 2009; Stiglitz, 2002).

We build on this central tenet of the behavioral finance literature, which also shares rich connections with the historic observations of political economists, about the tendency of credit expansions to feed market manias (Kindleberger, 1978). We expect that global investors do not have perfect information, often trading on economic narratives that risk intensifying financial volatility.

For example, between 2011 and 2013, the three major sovereign credit rating agencies (S&P, Moody's, and Fitch) raised Ecuador's credit rating based on the expectation that the global commodity price recovery would improve the country's oil production prospects. They also all flagged the importance of "access to loans from China to shore up government finances."[5] Such favorable financial narratives contributed to a 40 percent improvement in Ecuador's sovereign risk premium over the same period, with the country's ten-year bond yield trading a mere 5 percentage points over comparable US Treasury bonds by the end of 2013. However, the national government had borrowed a lofty 7 percent of its GDP from China, leveraging more than four years' worth of Ecuador's oil supply to help fund its spending. Despite this concerning trend, global investor confidence in Ecuadorean sovereign assets only soured following the commodity downturn in late 2014, with the country's sovereign risk premium swiftly doubling to 10 percentage points over comparable US Treasury bonds in less than one month, as indicated by Figure 1.

Figure 1: EMBI Global Spreads for Ecuador and Venezuela, 1998–2018



This figure shows the value of EMBI spreads for Ecuador and Venezuela. Source: JP Morgan.

What explains the resilience of such market narratives that appear inconsistent with local economic and political developments? To what extent do national governments take advantage of such financial opportunities? To answer these questions, we develop theoretical priors about the relationship between creditors and debtors in natural resource economies.

[5]Nathan Gill. "Ecuador Credit Rating Raised by Moody's on China, Finances." *Bloomberg.* 14 September 2012.

2.1 Examining Credit Supply

Drawing on the behavior finance literature, we develop the micro-foundations of creditor behavior from a supply-side perspective. In particular, we build on the concepts of projection bias and economic narratives. Faced with limited time and certainty, international investors tend to make decisions using representative heuristics to help evaluate sovereign credit risk (Barberis and Thaler, 2002; Ritter, 2003). Assuming recent economic trends are representative of a longer history, we predict that investors engage in projection bias (Loewenstein, O'Donoghue and Rabin, 2003; Wilson, 2011) by placing more weight on a recent commodity boom than a past commodity bust. These positive feedback strategies (known as herd behavior) can intensify short-term market trends despite their long-run tenability, fomenting bubbles in commodity-exporting countries.

What sustains such market movements, particularly when they do not reflect long-run economic fundamentals? A burgeoning scholarship on "economic narratives" suggests that popular ideas about economic life can move markets. Regardless of their validity, memes such as "housing prices never fall" or "tech stocks will only rise" can influence investment trends, intensifying market booms and busts. Likewise, sovereign risk evaluations might often follow the booms and busts of the commodity price cycle: investors tend to evaluate developing countries more favorably during periods of increased liquidity, when cheap credit makes them more tolerant of sovereign risk, and more open to economic narratives about favorable fluctuations in commodity markets. When oil, gas, or mineral prices are high, investors are indiscriminately more willing to finance governments from natural resource economies. Still, these favorable yet crude credit assessments tend to be fleeting, and not reflective of long-term fundamentals.

In a world of capital market liquidity (Ballard-Rosa, Mosley and Wellhausen, 2021; Mosley, Paniagua and Wibbels, 2020), such economic narratives have helped investors rationalize their risk-acceptance. For example, in the early 1990s, US interest rates began a steady three-decade decline that catalyzed an international savings glut, characterized by a mismatch between high savings in developed and emerging Asia countries and insufficient domestic investment opportunities (Bernanke, 2005). Flush with liquidity, global investors searching for higher returns became more willing to invest in sovereign assets from emerging market and developing economies.

Against this backdrop, oil windfalls can shift investors' perceptions of short-term credit worthiness. Employing commodity price heuristics, global investors make swift judgements in a time-sensitive sovereign debt management industry characterized by limited but available real-time data (Mosley, 2000, 2003; Datz, 2009; Nelson and Katzenstein, 2011). We thus predict that a commodity price boom will be associated with an improvement in sovereign risk evaluations across the board, regardless of how much the borrower in question stands to benefit from higher prices.[6] Conversely, a commodity price downturn can quickly shift sovereign risk sentiment in the opposite direction. When facing tight liquidity conditions, investors are more likely to exhibit risk aversion (Kahneman and Tversky, 1979) in an effort to safeguard their financial gains and minimize investment losses.

Hypothesis 1 predicts that sovereign risk evaluations will follow the booms and busts of the commodity price cycle: investors tend to evaluate the developing world more favorably during periods of increased liquidity, as cheap credit makes them more tolerant of sovereign risk and more open to economic narratives about favorable fluctuations in commodity markets (Shiller, 2019).

> **Hypothesis 1:** *Higher natural resource prices are associated with better sovereign risk evaluations.*

A potential alternative explanation would be that investors place more weight on the size of the extractive sector, including reserves, than on natural resource prices. For example, production and reserves account for one-fifth of Moody's Investor Services credit rating

[6] In this sense, the commodity price bubble is comparable to other asset price bubbles, as it fosters similar behavior among investors (Manzano and Rigobon, 2001, 26).

score in the oil and gas sector, suggesting that the size of the oil sector should lead to better sovereign risk evaluations.[7] In addition, improved national economic activity (i.e. higher investment and lower unemployment) tends to be associated with new production capacity, specifically the discovery of oil or gas fields (Arezki, Ramey and Sheng, 2017). Improved economic and production conditions may thus lead to better sovereign risk evaluations.

However, long lags between field discovery and production create too much uncertainty about such long-run economic effects. In fact, given that there is usually a four-to-six-year delay between oil discovery and the start of production (Arezki, Ramey and Sheng, 2017, 104), sovereign risk evaluations are unlikely to improve today in response to expectations about economic developments that may or may not take place four to six years from now. Beyond these production lags, information about the extractive sector is often both local and private, and there is evidence that aggregate sovereign risk assessments do not take such information into account; these assessments tend to focus on macroeconomic outcomes at the expense of microeconomic policy reforms (Mosley, Paniagua and Wibbels, 2020). Thus, Hypothesis 2 predicts that sovereign risk evaluations will not be affected by local information about uncertain long-run economic developments.

Hypothesis 2: *The size of the natural resource sector is not associated with better sovereign risk evaluations.*

2.2 Examining Credit Demand

Cyclical upturns in global commodity prices have produced an alluring narrative, based on the investment heuristic that higher commodity proceeds increase the likelihood that sovereign governments repay their debt. But such narratives can be inaccurate, as we observed in Venezuela following the 2008–2009 global financial crisis. Much like Ecuador, rebounding oil prices were first associated with Venezuela's sovereign risk premium improv-

[7] "Rating Methodology in the Global Integrated Oil & Gas Industry." *Moody's Global Corporate Finance*, December 2019.

ing by about 40 percent from 2011 to 2013 (as shown in Figure 1), before surging following the 2014 commodity downturn to reflect Venezuela's falling oil production. How does such commodity price and market volatility translate to debt issuance?

We hypothesize that there is a mismatch between the behavior of creditors (who make lending decisions based on short-term commodity price heuristics) and the behavior of borrowers (who have access to private information in the extractive sector). Recall that our first hypothesis expects high natural resource prices to translate into better sovereign risk evaluations, and hence, lower interest rates that reflect creditors willingness to lend money.

If national governments were fully myopic, they should take advantage of affordable market financing and issue more debt when commodity prices are high. Notwithstanding cheaper funding, we anticipate that commodity price booms do not lead to greater sovereign debt issuance because of the fleeting nature of these booms. Instead, we expect sovereign borrowers to be less responsive to prices because of their historical crisis memories.

In the past, Latin American governments responded to oil booms by borrowing more than they could afford to repay. Most markedly, the region's excessive borrowing in the prelude to the debt crisis of the 1980s contributed not only to insurmountable debts, but also led to a period of shrinking growth, runaway inflation, and development stagnation. But Latin American economic ministers have generally become more technocratic. Today, they have internalized such lessons from the lost decade of development and are less likely to rely on deficit financing as a funding tool, instead using fiscal reform to raise revenues (Mahon, Bergman and Arnson, 2014; Fairfield, 2015; Flores-Macías, 2019; Ardanaz, Hallerberg and Scartascini, 2020; Bonvecchi and Scartascini, 2020).

In this regard, Nelson Barbosa, Brazil's Finance Minister between 2015 and 2016, recently discussed how his country changed its borrowing behavior after learning about the costs of borrowing in dollar-denominated global capital markets: "It ended in debt in the 1980s. It ended in debt in the 1990s. But, we are not going to go down this road again" (Kaplan, 2021, 274). Similarly, Chile's current Central Bank governor, Mario Marcel, echoed a fiscal learning motif when discussing 21st century regional policy making, saying "macro disequilibrium was the Achilles heel of the new democracies. We learned a lot about what to avoid from experience" (Kaplan, 2013, 209).

Such official commentaries indicate that senior government officials retain and apply the lessons they learn from previous crises, making them more cautious debt managers. The nature of sovereign borrowing has also changed since the 1980s. Today, bond issuance often involves lofty banking fees and steeper-than-official interest rates (Tomz, 2007), providing further reason for national governments to approach private lenders cautiously. Hypothesis 3 thus anticipates that higher commodity prices alone will not be sufficient to substantially increase developing countries' willingness to borrow.

> **Hypothesis 3:** *Natural resource prices are not associated with more frequent and more sizeable sovereign debt issuance.*

In addition to the historical lessons outlined above, most Latin American countries are price takers rather than price setters in global commodity markets, meaning they are unlikely to make borrowing decisions based solely on commodity prices that are beyond their control. Rather, we expect them to condition their borrowing decisions on local natural resource production. This is because the quality of information differs between private creditors and debtor governments. Compared to market actors that base their lending decisions on cross-country macroeconomic outcomes or on "contaminated" information that seeks to conceal economic rents (Ross, 2012), national governments tend to leverage private information into their decision-making process.

In light of this information asymmetry, governments do not need to employ the same representative heuristics, or cognitive shortcuts, as financial investors to understand how national production will respond to commodity booms. They have access to the production plans of state-owned enterprises, including the projected pace of resource extraction and the likelihood of new resource discoveries. For example, in Ecuador, state-owned oil companies are responsible for 80 percent of the country's oil production; the remaining private sector firms are extensively regulated by the Ministry of Energy and Non-Renewable Resources. Perhaps most importantly, the state awards all contracts for oil exploration and discovery though its Hydrocarbons Law.

This extensive state involvement in the oil sector is common in natural resource economies, providing their national governments with high level access to privileged information about oil exploration, discovery, and production. For example, in both Brazil and Mexico, the director of the state-owned oil company (Petrobras and Pemex, respectively) is appointed by the president, providing direct access to privileged information. These national governments thus have full knowledge of sizable discoveries prior to the general public, as evidenced by the tendency of presidents to personally make these announcements. During the 2008 Biofuels International Conference, Brazilian president Luiz Inácio Lula da Silva directly announced the discovery of two giant offshore oil wells.[8] Similarly, Mexican president Enrique Peña Nieto personally announced the discovery of oil field Ixachi in 2017.[9]

Given this information asymmetry (Stiglitz, 2002), creditors and debtors should respond to the same price fluctuation with different intensities. We also expect to observe variation in the willingness of resource producers to issue debt based on their own resource output. Countries will issue less debt in primary capital markets — and less frequently — when their resource output is high. Rather than borrow excessively or at lofty fees, they will prefer to cover their financing needs using commodity windfalls (Murillo, Oliveros and Vaishnav, 2011). In light of the lessons learned from their exuberant debt issuance in the 1980s, national economic officials prefer to boost their fiscal space through new revenues from national production, rather than through deficit financing. Conversely, when resource output is low, countries will be more willing to issue debt more frequently and in larger amounts.

> **Hypothesis 4:** *A smaller natural resource sector is associated with more frequent and more sizeable sovereign debt issuance.*

[8] "Lula Anuncia Descoberta de Novo Superpoço de Petróleo no Espírito Santo." *O Globo.* 21 November 2008.

[9] "México Anuncia 'Importante' Hallazgo de Petróleo y Gas." *Agence France Presse.* 3 November 2017.

In sum, we predict that information asymmetries between global creditors and sovereign borrowers often lead to divergent behavior. On the one hand, in periods of high global liquidity, international investors lacking perfect information misprice risk because of their tendency to use cognitive shortcuts based on economic narratives, such as "commodity supercycles," that can prolong market upturns. Commodity booms can thus catalyze global capital inflows, creating a "double bonanza" in natural resource economies (Reinhart, Reinhart and Trebesch, 2016), where cheap market credit intensifies resource-led expansions.

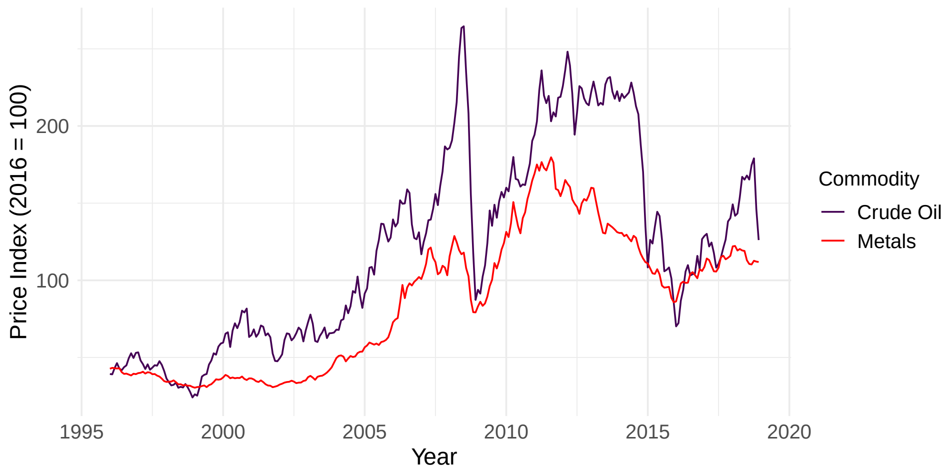
Resource producers, on the other hand, do not necessarily leverage cheap market financing to fuel government spending sprees. They may issue debt to cover greater spending, as observed recently in Ecuador and Venezuela. However, economic officials in these nations can also be surprisingly prudent: on average, they do not automatically borrow more when commodity prices are high, instead adapting their short-run behavior to the output of the extractive sector.

In particular, Hypotheses 3 and 4 should hold for nations with technocratic leaders at the helm of their economic governance institutions. Technocratic economic advisors — such as Nelson Barbosa and Mario Marcel, who both have PhDs in mainstream economics — tend to internalize past lessons of excessive debt issuance. They are less likely to issue debt during commodity booms, responding to changes in local production rather than changes in global prices.

3 Research Design

We examine how natural resources affect sovereign risk evaluations and sovereign debt issuance on a monthly basis, between January 1996 and December 2018, for ten net oil exporters in Latin America: Argentina, Bolivia, Brazil, Colombia, Ecuador, Guatemala, Mexico, Peru, Trinidad and Tobago, and Venezuela. Two recent oil producers, Guyana and Suriname, are excluded from the analysis due to limited data availability.

Figure 2: Crude Oil and Metal Prices, 1996–2018



This figure showcases the monthly price index for crude oil and metals, both calculated using 2016 as the base year. Source: IMF Primary Commodity Prices Database.

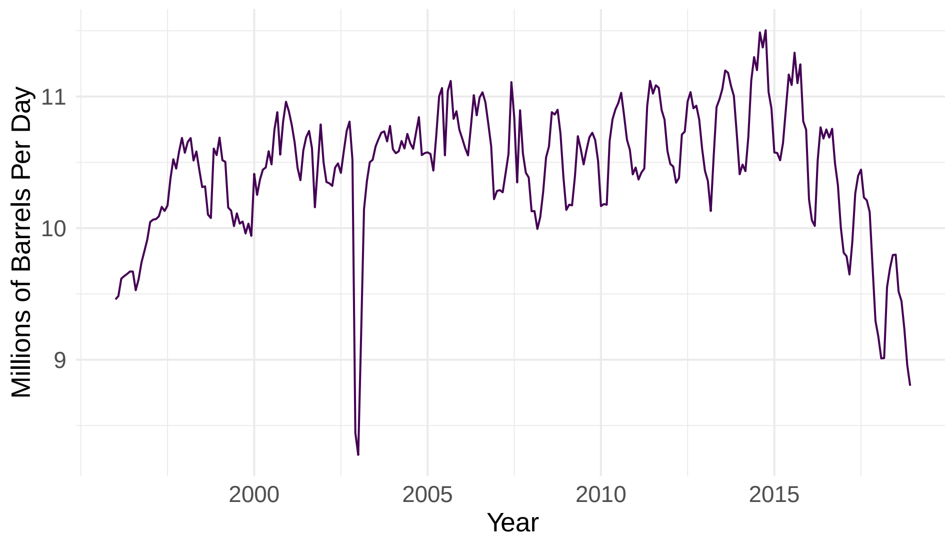
3.1 Independent Variables

To test our two supply-side hypotheses and two demand-side hypotheses, we use the same set of independent variables, which seek to capture different dimensions of natural resource wealth: first, the international price of natural resources; second, the present size of the domestic natural resource sector; and third, expectations about the future size of the domestic natural resource sector.

To measure the effect of international prices, we use the crude oil price index and the metals price index, both calculated using 2016 as the base year and reported on a monthly basis by the IMF Primary Commodity Prices Database. The first index is a simple average of three crude oil spot prices (Dated Brent, West Texas Intermediate, and Dubai Fateh). The second index consists of international prices for base metals (aluminum, cobalt, copper, iron ore, lead, molybdenum, nickel, tin, uranium, and zinc) and precious metals (gold, silver, palladium, and platinum). These prices are correlated at 0.904 ($p < 0.001$), as Figure 2 confirms, which is why models only include one index at a time.

To quantify both the present and the future expected dimension of domestic natural resource wealth, we use two variables related to the oil and gas sector, which is the only

Figure 3: Total Production of Crude Oil, Natural Gas, and Other Liquids, 1996–2018



This figure showcases the daily production of crude oil, natural gas, and other liquids for all ten countries in the sample. While this figure reports production in millions of barrels, estimations use output data in thousands of barrels, logged. There is a considerable drop in production around December 2002, when employees of Venezuela's state-owned oil company PdVSA went on strike. The seasonal component after 2005 is a function of Brazil's biofuel production. Source: EIA.

sector for which production data are available on a monthly basis. *Oil and gas production* is the average daily output of crude oil, natural gas, and other liquids, in thousands of barrels, compiled by the US Energy Information Administration (EIA) and reported at the end of each month. Figure 3 shows the total production for all ten nations during each year. There is significant variation across countries: on an average day in 2018, Brazil produced 3.353 million barrels, while Guatemala only produced 12.6 thousand barrels. We use logged values to address this skewness, adding one barrel before logging when the value equals zero.

The second variable pertaining to the size of the extractive sector is *Field discovery*, which indicates the discovery of a giant, supergiant, or megagiant oil and gas field — that is, a field with over 500 million recoverable barrels of oil or over 3 trillion cubic feet of gas — between 1998 and 2018, as compiled by Horn (2014) and depicted in Figure 4.[10] *Field discovery* indicates the month and year in which discoveries are announced, not necessarily

[10] We thank James Cust and Alexis Rivera Ballesteros from the World Bank for extending Horn's dataset until 2019. Since the resulting dataset only lists field discoveries on a yearly basis, we use LexisNexis to uncover the exact month the discovery is made public.

Figure 4: Location of Oil and Gas Fields Discovered in Latin America, 1996–2018

This figure indicates the location of 42 oil and gas fields discovered in Latin America between 1996 and 2018: 23 in Brazil, four in Bolivia, three in Mexico, two in Guyana, three in Venezuela, two in Trinidad and Tobago, and one each in Argentina, Colombia, and Peru. The two Guyanese fields are not included in the statistical analysis. Source: Horn (2014).

when they are made; even if discovering an oil or gas field is arguably exogenous, states often have access to private information. When incumbents know about a large discovery and know that a public announcement is forthcoming, they might adjust their expectations accordingly. This variable allows us to gauge how governments and financial markets alike respond to "new shocks about future output" (Arezki, Ramey and Sheng, 2017, 121).

Oil and gas production captures beliefs about resource output today, whereas *Field discovery* captures beliefs about resource wealth tomorrow. Oil, gas, metals, and other non-renewable resources have a low price elasticity of supply (van der Ploeg and Poelhekke, 2009): producers are not able to immediately adjust the supply in response to a change in demand, so they cannot respond to price changes by increasing or decreasing production from one month to another. As a result, *Oil and gas production* is unlikely to change in response to changes in price, and the inverse is equally unlikely to occur (after all, Latin American nations are price takers and not price setters). This gives us confidence that resource prices and resource output will have separate effects on the dependent variables.

3.2 Control Variables

Both our supply-side models and our demand-side models control for several factors that might affect market expectations and borrowing decisions. To capture political uncertainty, we use the Database of Political Institutions (Cruz, Keefer and Scartascini, 2021) to construct the count variable *Months since election*, which indicates the time elapsed since the last executive or legislative election, as well as the binary variable *Left executive*, which indicates the ideological orientation of the president. *IMF agreement* is a binary variable measuring whether or not the government in question was under an IMF program in a given month (using data from Kentikelenis, Stubbs and King 2016 complemented by the IMF MONA Database). To capture uncertainty in the domestic economy, we use yearly averages of consumer prices, national wealth, and economic growth, reported by the World Bank: *Inflation* (in percent, logged), *GDP per capita* (in constant 2010 US dollars), and *GDP growth* (in percent), respectively.

We further control for each country's degree of *Capital openness* (Chinn and Ito, 2006) and the size of its *International reserves*, excluding gold, for every quarter, in billions of US dollars, logged (using data from the Joint External Debt Hub). Finally, we control for monthly variation in the *US treasury rate* (specifically, the per annum yield of ten-year Treasury constant maturities, reported by the US Federal Reserve), since an increase in US rates should reflect tighter borrowing conditions at the global level. The economic variables *International reserves* and *US treasury rate* are lagged by one month, whereas *Inflation*, *GDP per capita*, *GDP growth*, and *Capital openness* are only available on a yearly basis and correspondingly lagged by one year.

3.3 Dependent Variables and Empirical Strategies

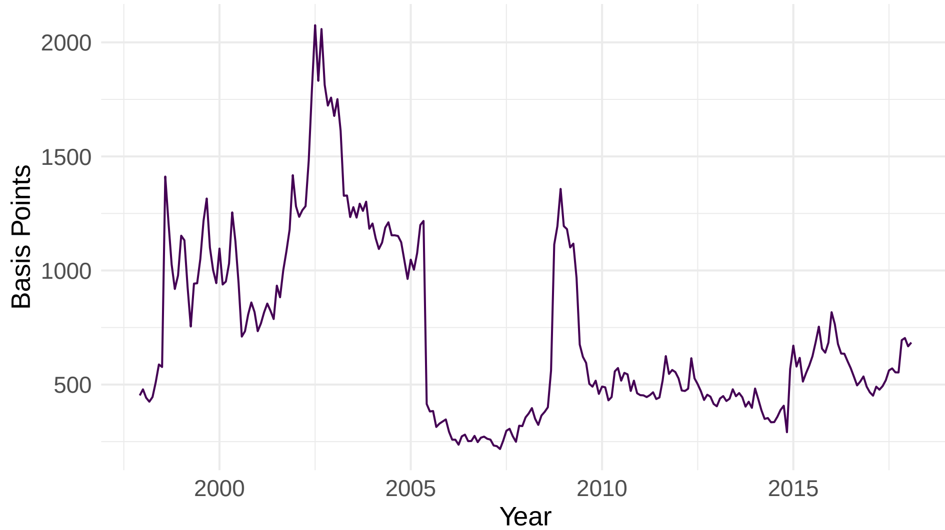
3.3.1 Credit Supply

The dependent variable used to test Hypotheses 1 and 2 is JP Morgan's EMBI Global *Spread*, which represents the weighted average of ten-year yield spreads for US dollar denominated bonds with outstanding face value of at least $500 million over comparable US Treasury bonds. This variable, available for the 1998–2018 period, allows us to assess investors' expectations. Figure 5 shows the monthly average EMBI spread for all ten countries included in the analysis. Higher values indicate higher risk; under these circumstances, external borrowing is more expensive. JP Morgan does not calculate EMBI spreads for all countries throughout the entire period; spreads for Bolivia and Guatemala, for example, are only available after 2012. Despite these limitations, we choose this dependent variable because EMBI spreads serve as the benchmark to evaluate the performance of external debt instruments in emerging markets; they are an important reflection of investors' sovereign risk evaluations.

We theorize that commodity pricing has reputational benefits for sovereign nations (as measured by decreases in the dependent variable *Spread*), but this effect may not be immediate. Even if commodity prices and sovereign risk are in a dynamic equilibrium and move together in the long run, they might deviate from this equilibrium and move in different ways in the short run (Box-Steffensmeier et al., 2014).[11] To capture both the short-run and the long-run effects of resource wealth on sovereign spreads, we take a cue from Brooks, Cunha and Mosley (2015) and estimate error correction models, conditioning predicted changes in *Spread* not only to its own past levels, but also to past changes and levels of the key

[11] Indeed, augmented Dickey-Fuller tests show that *Spread* is non-stationary: its mean and variance vary over time, and the best predictor of today's value is yesterday's value. The same applies to the independent variables of interest. Furthermore, all dependent-independent variable pairs are cointegrated, confirming the existence of a joint long-run relationship.

Figure 5: Average EMBI Global Spreads, 1998–2018



This figure shows the value of *Spread*, averaged across all ten countries included in the study. Source: JP Morgan.

independent variables. Error correction models are the standard approach to deal with cointegrated time series, though they can also be used for stationary data (Boef and Keele, 2008). Following the specification of Keele, Linn and Webb (2016), we estimate Equation 1,

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \beta_0 \Delta X_t + \beta_1 X_{t-1} + Z_{t-1} + \mu_i + \varepsilon_t, \tag{1}$$

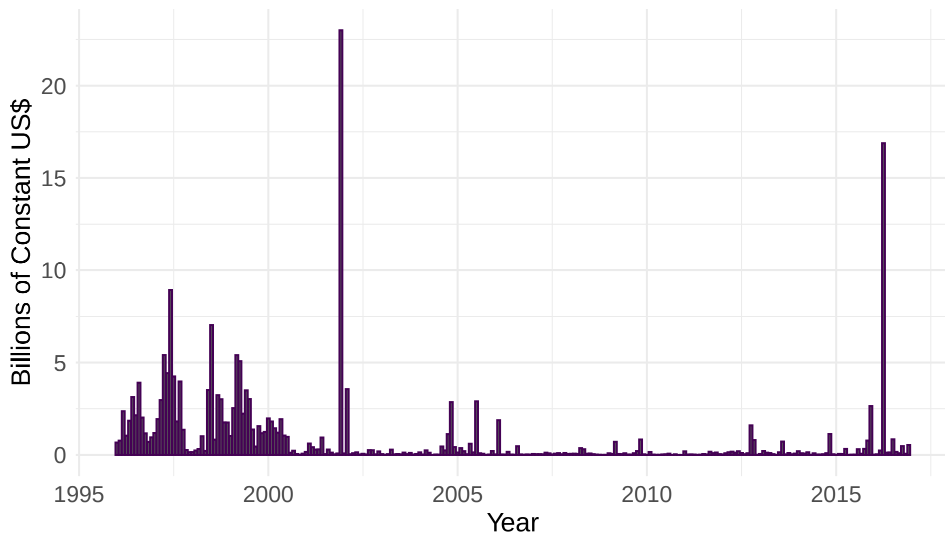
where α_1 is the error correction rate (that is, the rate at which Y changes to restore its long-run equilibrium with X, a value between –1 and 0); β_0 captures the short-term effect of changes in X on Y; $\frac{\beta_1}{\alpha_1}$ represents the long-run relationship between X and Y; Z is a set of control variables; and ε is the error term (Beck and Katz, 2011). This estimation includes country and time (month-year) fixed effects.[12]

3.3.2 Credit Demand

To test Hypotheses 3 and 4, we use data collected by Ballard-Rosa, Mosley and Wellhausen (2021) on all untapped bonds with maturities greater than six months issued be-

[12]The parameter estimates of autoregressive models with fixed effects are biased by $\frac{1}{t}$ (Nickell, 1981). However, the bias in our models is negligible because $t = 252$, as we are working with monthly data for 21 years, from 1998 until 2018.

Figure 6: Total Amount of Debt Issued, 1996–2016



This figure pools *Amount issued* for all countries in the sample, for every month between January 1996 and December 2016. The two spikes are driven by Argentina: in December 2001, the Argentine debt increased 63 percent after a crisis-induced refinancing process called *megacanje*; and in April 2016, the government issued debt for the first time in 15 years, in an auction that was four times oversubscribed. While the figure reports *Amount issued* in billions of constant US dollars, estimations use the logged value of this variable, adding one dollar before logging when the value equals zero. Source: Ballard-Rosa, Mosley and Wellhausen (2021).

tween 1996 and 2016. Like the authors, we use two dependent variables: *Bond issuance* indicates whether the central government[13] issued debt in primary capital markets each month, whereas *Amount issued* indicates how much debt was issued, in constant US dollars (logged), gathered from Bloomberg Terminals. We add one US dollar to country-months without issues before logging.

Figure 6 shows the total amount of debt issued by the ten countries of interest between 1996 and 2016.[14] There is considerable variation not only in the *amount* of debt, but also in whether a country issues any debt in the first place. The average Latin American nation included in the analysis issued untapped bonds with maturities greater than six months in

[13] Since we focus on debt issued by the *central government*, our analysis does not include debt issued by state-owned oil enterprises like PdVSA (Venezuela), Pemex (Mexico), or Petrobras (Brazil).

[14] The first spike, in December 2001, is driven by Argentina's debt restructuring, while the second spike is driven by Argentina's return to capital markets. See "Blindaje, Megacanje y Corralito: las Medidas que Marcaron el Final de De la Rúa." *Ámbito Financiero.* 9 July 2019. Also: Hugh Bronstein and Sarah Marsh. "Argentina Returns to Global Debt Markets After 15 Years." *Reuters.* 20 April 2016.

81.6 of all 252 months. However, while Bolivia issued debt for 148 months between January 1998 and December 2018, Guatemala only did so for 11 of these 252 months, and Ecuador only did it once. Thus, *Amount issued* is left-censored: it takes the value of zero for a substantial number of observations. Our empirical strategy must account for this censoring, as parameters obtained with ordinary least squares would be biased. Like Ballard-Rosa, Mosley and Wellhausen (2021), we model bond issuance using a two-step strategy (Tobin, 1958). First, a probit selection equation (Equation 2) models whether our outcome of interest is observed, that is, whether or not a country issues a bond in a given month, as captured by the latent variable y_i^*. If the outcome is observed, the second step (Equation 3) is to estimate an equation with the observed dependent variable y_i, which in our case is *Amount issued* (logged):

$$y_{it}^* = x_{it}'\beta + \epsilon_{it} \tag{2}$$

$$y_{it} = \begin{cases} 0 & \text{if } y_{it}^* \leq 0 \\ y_{it}^* & \text{if } y_{it}^* > 0 \end{cases} \tag{3}$$

This two-step process captures our expectation that both the decision to issue debt and — if applicable — the amount of debt issued are influenced by natural resources. As recommended by Carter and Signorino (2010), we model time using cubic polynomials to mitigate issues of quasi-complete separation. Models also include country-fixed effects to control for heterogeneity across units. For small values of t, probit or tobit models with fixed effects yield biased estimates, in what is called the incidental parameters problem (Greene, 2004). Still, the long duration of of our time series ($t = 252$) minimizes this issue.

Table 1: The Effect of Natural Resources on Sovereign Bond Spreads in Latin America, 1998–2018 (Error Correction Models)

	Dependent variable:	
	Spread $_{\Delta}$	
	(1)	(2)
Spread $_{t-1}$	-0.112^{***}	-0.113^{***}
	(0.011)	(0.011)
Oil price index $_{t-1}$	-0.171^{**}	
	(0.084)	
Oil price index $_{\Delta}$	-3.326^{**}	
	(1.593)	
Metals price index $_{t-1}$		-0.461^{**}
		(0.232)
Metals price index $_{\Delta}$		-5.049^{**}
		(2.435)
Oil and gas production (log) $_{t-1}$	-76.744^{*}	-75.995^{*}
	(40.346)	(42.187)
Oil and gas production (log) $_{\Delta}$	3.085	−36.497
	(50.856)	(50.137)
Field discovery $_{t-1}$	-43.428^{**}	-45.620^{***}
	(17.369)	(15.249)
Field discovery $_{\Delta}$	−13.385	−19.121
	(13.589)	(12.054)
Months since election	0.226	0.178
	(0.265)	(0.268)
Left executive	26.484^{**}	31.474^{*}
	(13.461)	(16.606)
IMF agreement	−33.498	−39.335
	(27.048)	(27.120)
Inflation (log)	4.409	0.691
	(6.731)	(7.650)
GDP per capita	1.773	6.585
	(4.036)	(5.074)
GDP growth	-2.303^{*}	-3.224^{**}
	(1.253)	(1.556)
Capital openness	−11.852	−3.028
	(35.435)	(37.357)
International reserves (log)	1.283	3.919
	(1.758)	(2.800)
US Treasury rate	13.770^{**}	12.828^{**}
	(6.783)	(6.124)
Observations	1,473	1,473
R^2	0.099	0.075

This table presents the results of error correction models with country fixed effects, time fixed effects, and standard errors clustered by country.

*p<0.1; **p<0.05; ***p<0.01

4 Results

4.1 Credit Supply: Do Natural Resources Affect Sovereign Risk Evaluations?

Table 1 reports the results of two error correction models assessing how natural resources impact borrowing conditions, as measured by sovereign bond spreads. The coefficient for the lagged dependent variable (see Models 1 and 2) captures the error correction rate. The differences (Δ) represent short-term effects.

In both models, the coefficients illustrate a negative short-run relationship between the dependent variable *Spread* and the corresponding price index. All else equal, a one-point increase in the crude oil price index (Model 1) is, on average, associated with a statistically significant 3.3 short-term basis point reduction in Latin American EMBI spreads. Likewise, a one-point increase in the metals price index (Model 2) is associated with a 5.1 short-term basis point reduction in Latin American bond spreads.

These results, which corroborate Hypothesis 1, are intuitive. As oil prices increase in a world that is flush with petrodollars, EMBI spreads go down: sovereign risk evaluations improve across the region, and financial market actors use the representative heuristic of improved commodity prices to justify new capital market investments. The same logic applies to the prices of metals, such as aluminum, cobalt, copper, gold, or silver. The impact of these short-run changes is substantial, as indicated by the coefficients for the lagged dependent variable: only 11 percent of the deviation (i.e. "error") from long-term yield trends is corrected within the month.

In contrast, there is no consistent short-term relationship between sovereign risk evaluations and domestic natural resource sectors, as reflected in the lack of statistical significance for the coefficients for *Oil and gas production* (Δ) and *Field discovery* (Δ). This pattern supports our theoretical priors that investors are less likely to incorporate microeconomic information, including potential production lags, into their sovereign risk evaluations.

Having discussed the short-term effects, we now move to a discussion of long-term effects, which are computed by dividing the coefficient for the lagged independent variables by the error correction rate. For example, in Table 1, the long-run change in resource prices is 1.5 basis points ($-0.171/0.112$). In other words, for every one-point increase in the oil price index, the yield spread declines by 1.5 basis points. The effect is statistically significant, meaning the divergence persists in the long-run, albeit substantively weaker than in the short-run. By comparison, the domestic natural resource sector exhibits a long-run effect on investors' assessment of sovereign creditworthiness (though not a significant short-term effect, as we discussed above). For every discovery of a giant, supergiant, or megagiant oil and gas field, a government's bond yield spread declines over 40 basis points in the long run (see Models 1 and 2). To some extent, investors thus employ new oil field discoveries as an investment heuristic, despite their tendency to more generally overlook microeconomic developments.

4.2 Credit Demand: Do Natural Resources Affect Debt Issuance?

In Table 2, Models 1 and 2 present the results of the first stage regression: two probit models investigating the factors contributing to Latin American governments' initial choice to issue debt, using the dependent variable *Bond issuance*. If a government decides to issue debt in a given month, Models 3 and 4 present the results of the second stage regression: two tobit models with *Amount issued* as the dependent variable.

When deciding about the placement and size of bond issues, Latin American governments do not appear to account for international prices. Rather, they primarily focus on domestic economic output, as indicated by the negative and statistically significant coefficient for *Oil and gas production*. All else equal, when a country produces approximately 10 thousand barrels of oil each month (such as Guatemala did in 2010), its probability of issuing debt is close to 100 percent (see Models 1 and 2). By contrast, when a country produces over 3.5

Table 2: The Effect of Natural Resources on Sovereign Bond Issuance, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Bond issuance (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.002		0.036*	
	(0.001)		(0.019)	
Metals price index		0.001		0.032
		(0.003)		(0.037)
Oil and gas production (log)	−1.159***	−1.145***	−17.732***	−17.376***
	(0.178)	(0.176)	(2.449)	(2.426)
Field discovery	−0.143	−0.131	−2.440	−2.261
	(0.237)	(0.234)	(3.619)	(3.594)
Months since election	0.004*	0.004*	0.056*	0.062**
	(0.002)	(0.002)	(0.031)	(0.031)
Left executive	0.511***	0.518***	7.749***	7.777***
	(0.143)	(0.145)	(2.041)	(2.069)
IMF agreement	−0.236**	−0.215**	−2.642*	−2.227
	(0.108)	(0.107)	(1.535)	(1.522)
Inflation (log)	0.246***	0.239***	3.304***	3.246***
	(0.081)	(0.082)	(1.021)	(1.038)
GDP per capita	0.007	0.011	0.371	0.409
	(0.037)	(0.037)	(0.558)	(0.561)
GDP growth	0.004	0.007	0.075	0.116
	(0.015)	(0.015)	(0.214)	(0.210)
Capital openness	−2.726***	−2.750***	−32.199***	−32.789***
	(0.369)	(0.363)	(4.876)	(4.807)
International reserves (log)	−0.084**	−0.087**	−1.105**	−1.156**
	(0.037)	(0.037)	(0.552)	(0.552)
US Treasury rate	−0.142**	−0.127**	−2.026**	−1.767**
	(0.064)	(0.062)	(0.907)	(0.881)
Constant	8.164***	8.212***	113.246***	113.366***
	(1.151)	(1.174)	(15.970)	(16.275)
Observations	2,076	2,076	2,076	2,076
Log Likelihood	−931.595	−932.704	−3,134.615	−3,136.199

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

million barrels of oil per month (such as Brazil between 2017 and 2018, or Mexico between 2001 and 2007), its average predicted probability of debt issuance is — all else equal — close to zero. This effect is robust to the inclusion of control variables, cubic polynomials, and country fixed effects. These relationships suggest that smaller resource economies may be more likely to issue debt to help develop economies of scale in the natural resource sector.

Turning to Models 3 and 4, both the dependent variable *Amount issued* and the independent variable *Oil and gas production* are logged, signifying that the coefficient for *Oil and gas production* is an indicator of elasticity. Correspondingly, a one percent increase in oil and gas production (which is quite substantial, as it is measured in thousands of barrels) is associated with a more than 17 percent decline in the amount of debt issued.

Finally, governments appear to respond to oil and gas field discoveries with far less enthusiasm than market actors, given that such discoveries do not have a significant effect on their decisions about the placement or the size of debt issuance. The remaining coefficients, effect sizes, and directions are similar to those obtained by Ballard-Rosa, Mosley and Wellhausen (2021), who also investigate the predictors of the size and likelihood of debt issuance. This gives us further confidence in the results presented in Table 2.

Overall, we find support for Hypotheses 3 and 4, identifying a significant association between the current size of the natural resource sector and the dependent variables *Bond issuance* and *Amount issued*. This evidence corroborates our theoretical prior that national governments are more likely to factor microeconomic developments into decisionmaking compared to global financial markets (see Section 2.2). National governments understand that global oil booms can be fleeting and, on average, tend to condition debt issuance on local production. Why? Higher domestic production boosts national revenue gains, which translates to greater fiscal space, but without any new deficit financing or debt servicing costs.

4.2.1 Robustness Check: Exploring the Mechanism

Why might Latin American economic managers exhibit such prudent behavior? In other words, why might national governments be more responsive to local conditions than to global changes? Our theory predicts that they have internalized past lessons of excessive debt issuance.

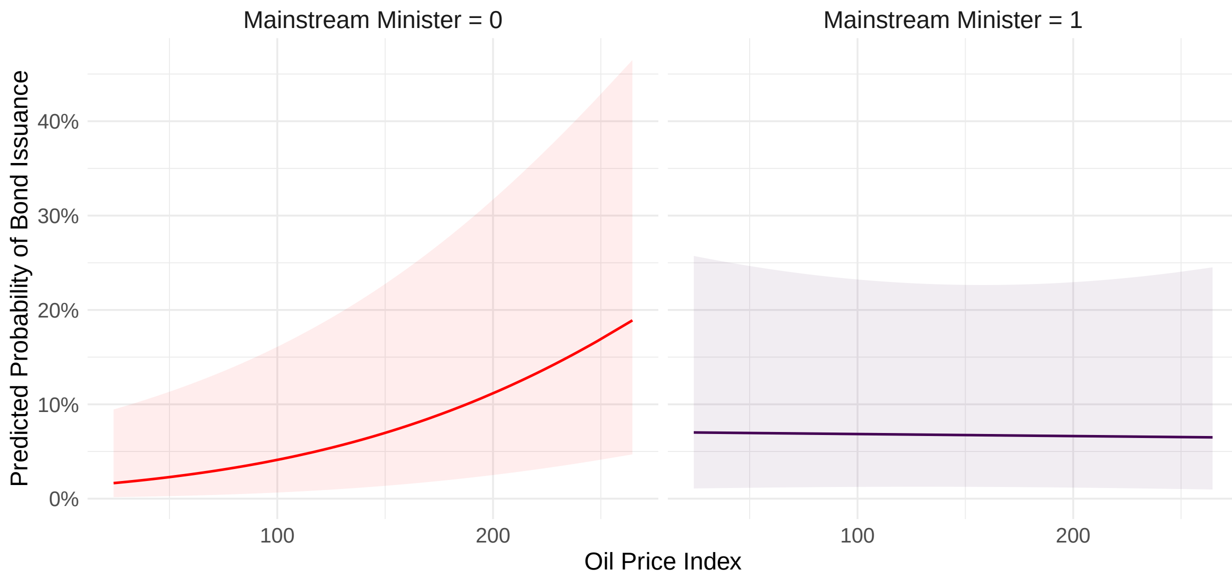
To probe this mechanism and explore variation in the sample, we examine the extent to which the professional training of policymakers affects the choice to issue debt. Extant research shows that the education of cabinet members reflects their ideological preferences and is a good predictor of the policies they will pursue during their appointment (Chwieroth, 2007; Nelson, 2014; Alexiadou, 2015; Kaplan, 2018). In particular, cabinet members with graduate degrees in economics from US universities are more likely to hold neoliberal beliefs; therefore, they tend to promote fiscal discipline, trade liberalization, lower public expenditure, and limited debt when in power (Nelson, 2014). Beyond this diffusionary pattern, Kaplan (2018) finds that economic orthodoxy is also a product of historic national economic conditions. Correspondingly, individuals trained in mainstream economics departments in Latin American universities — such as Universidad Torcuato Di Tella in Buenos Aires or the Instituto Tecnológico Autónomo de México (ITAM) in Mexico City — are just as likely to embrace neoliberal approaches as their US-trained counterparts.

In line with these findings, we examine the education of Economic Ministers, the policy actors who typically oversee budgetary and debt-related decisions.[15] We build on Kaplan's (2018) Index of Economic Advisors to generate the variable *Mainstream minister*, which takes the value of one if the incumbent Economic Minister earned a master's degree or above from a mainstream economics department in Latin America or the US (and zero otherwise).

Table 3 confirms our expectation that mainstream economists, who internalized the perils of excessive debt issuance in their advanced economics training, are not responsive to

[15] In additional robustness checks (reported in the appendix), we run similar tests with the education of Central Bank presidents.

Figure 7: Effect of Oil Prices on Bond Issuance, Conditional on Minister Type



Based on Model 1 of Table 3, this figure shows the predicted probability of observing *Bond issuance* at different variables of the *Oil price index*, conditional on the Finance Minister's professional training (with 95 percent confidence intervals).

transient changes in the global environment. Model 1 provides support for such prudent policy-making perspectives, with the coefficient for the interaction *Mainstream minister* × *Oil price index* all but canceling out the individual coefficient for *Oil price index*, as illustrated by Figure 7. By and large, mainstream ministers do not respond to oil price increases by issuing debt more frequently (Model 1) or by issuing larger amounts of debt (Model 3). By comparison, national governments without technocratic advisors, on average, issue more debt, appearing less likely to heed these historic economic lessons (see Figure 7).

In the past, Latin American countries paid the price of excessive borrowing with a lost decade of shrinking growth, runaway inflation, and development stagnation in the 1980s. To paraphrase Brazil's Finance Minister Nelson Barbosa, policymakers are less willing to go down this road again. Technocratic advisors from across the region have also tended to reinforce this observation.

Table 3: The Effect of Natural Resources on Sovereign Bond Issuance, Conditional on Minister Education, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.005***		0.078***	
	(0.001)		(0.019)	
Metals price index		0.006**		0.096**
		(0.003)		(0.038)
Oil and gas production (log)	−0.916***	−0.946***	−13.205***	−13.466***
	(0.183)	(0.181)	(2.453)	(2.411)
Field discovery	−0.114	−0.075	−1.647	−1.153
	(0.382)	(0.362)	(5.791)	(5.661)
Mainstream minister	−1.122***	−1.247***	−18.863***	−20.712***
	(0.378)	(0.379)	(5.512)	(5.536)
Mainstream minister × Oil price index	−0.005***		−0.079***	
	(0.001)		(0.018)	
Mainstream minister × Metals price index		−0.006***		−0.098***
		(0.002)		(0.027)
Mainstream minister × Oil and gas production	0.335***	0.336***	5.455***	5.530***
	(0.061)	(0.061)	(0.894)	(0.903)
Mainstream minister × Field discovery	0.189	0.159	1.683	1.269
	(0.518)	(0.502)	(7.067)	(6.960)
Months since election	0.003	0.004	0.039	0.053*
	(0.002)	(0.002)	(0.032)	(0.032)
Left executive	0.375***	0.384***	5.235***	5.259***
	(0.135)	(0.137)	(1.923)	(1.967)
IMF agreement	−0.190*	−0.182*	−1.986	−1.770
	(0.111)	(0.109)	(1.511)	(1.497)
Inflation (log)	0.319***	0.319***	4.214***	4.285***
	(0.090)	(0.091)	(1.056)	(1.085)
GDP per capita	−0.057	−0.042	−0.507	−0.362
	(0.041)	(0.041)	(0.587)	(0.593)
GDP growth	−0.002	0.002	−0.059	0.011
	(0.015)	(0.014)	(0.206)	(0.201)
Capital openness	−2.202***	−2.183***	−21.337***	−21.411***
	(0.391)	(0.384)	(4.987)	(5.004)
International reserves (log)	−0.089**	−0.093**	−1.162**	−1.224**
	(0.039)	(0.039)	(0.563)	(0.566)
US Treasury rate	−0.129**	−0.112*	−1.769**	−1.500*
	(0.066)	(0.064)	(0.893)	(0.865)
Constant	6.752***	6.934***	87.080***	88.769***
	(1.195)	(1.223)	(16.466)	(16.825)
Observations	2,046	2,046	2,046	2,046
Log Likelihood	−899.446	−904.040	−3,073.637	−3,078.610

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

For example, José Luis Machinea, who served for two different Argentine presidential cabinets and as the Executive Secretary of the United Nations Economic Commission for Latin America and the Caribbean, is ideally suited to observe such regional trends. The former Argentine Economic Minister, who received his doctorate in economics from the University of Minnesota, highlighted that much of the region has become fiscally responsible, after "learning from history and learning from governments that have collapsed from grave economic crises" (Kaplan, 2013, 226). Former Brazilian and MIT-educated Central Bank governor, Ilan Goldfajn, echoes this perspective in a recent interview, saying that "fiscal responsibility is something people want to continue having in order to not be called irresponsible, because irresponsible means that you will generate inflation and people have the memory of hyperinflation of the 80s and beginning of the 90s. So, inflation is still an issue."[16]

4.3 Discussion

Our models provide compelling evidence that creditors charge a lower risk premium when they expect global liquidity to increase because of commodity price booms or new oil field discoveries. Creditors are not always able to make nuanced, country-specific assessments about the extractive sector because they do not have perfect information about each country's short-term and medium-term production trends. Given the need to make quick real-time judgments, these individuals are likely to engage in projection bias, extrapolating from past returns to project future returns, expecting price trends to continue in the short run and responding to field discoveries almost instantly. This behavior, reflected by a decline in EMBI spreads, indicates a bias towards exaggerating potential future revenues, particularly when it comes to oil (Collier, 2017).

Admittedly, our analysis is restricted to the period between 1996 and 2018, which limits our ability to draw inferences about earlier history or the future relationship between sovereign debt and commodity price booms in Latin America. Still, these supply-side find-

[16] Author's interview in São Paulo, Brazil.

ings align with historical evidence from the oil price boom of the 1970s, when commercial banks awash with petrodollars lent to Latin American governments at generous interest rates. At the time, Argentina, Brazil, Mexico, and other countries borrowed large sums to fund their domestic public spending, and later defaulted on their debt commitments, precipitating the Latin American debt crisis of the 1980s. Our results suggest that the behavior of creditors has not changed from the 1970s until today: they still respond positively to "new shocks about future output" (Arezki, Ramey and Sheng, 2017, 121), whether these shocks are commodity price increases or oil field discoveries.

Our demand-side results suggest that the behavior of debtors has changed, however. In the 1996–2018 period, commodity price booms might have increased creditors' willingness to lend (as indicated by lower EMBI spreads), but did not significantly affect states' willingness to borrow (as indicated by the variables *Bond issuance* and *Amount issued*). The discovery of 42 giant, megagiant, and supergiant oil and gas fields did not significantly influence debtors' behavior either, showing that emerging markets internalized the lessons learned from past periods of excessive debt issuance.

That said, resource exploration is uncertain and unpredictable; after all, geological features, technological innovations, or political events might delay a country's ability to explore fields and collect rents (Arezki, Ramey and Sheng, 2017). As a result, oil-producing Latin American countries tend to condition sovereign borrowing decisions primarily on trends in oil and gas output in the previous month. These findings align with Campello (2015) and others, who show that resource-rich countries tend to issue debt less frequently and in smaller amounts, since their resource windfalls can be used to cover domestic expenditures. Table 2 suggests that there is variation even within resource-rich countries, which borrow more when output decreases and less when output increases.

With the exception of Ecuador and Venezuela (which were already OPEC members by 1973), most Latin American governments did not produce large quantities of oil or natural gas until very recently. Today, incumbents have access to information about the operational environment of local resource sectors, which was unavailable in the past. They can employ this local knowledge to help condition their borrowing behavior on domestic resource output, instead of merely responding to increases in global liquidity. Information asymmetries can thus explain why governments (which have private information about the state of their own economy) are more cautious in entering debt markets than investors.

5 Conclusion

This paper argues that natural resource wealth can improve sovereign risk perceptions. Given that investors can only collect and evaluate a limited amount of information, we predict that they will use natural resource prices as a heuristic to appraise the short-term credit worthiness of any potential borrower: in general, higher prices will be associated with an improvement in sovereign risk evaluations.

That said, we expect natural resource wealth to affect credit supply and credit demand differently, as borrowers have access to private information about the size of the domestic resource sector and can better assess their own latent spending needs. We derive four testable hypotheses from our theory and test them using monthly data from 1996 to 2018 for ten Latin American countries.

Our findings suggest that commodity price booms are associated with a substantial decrease in sovereign risk premiums, but do not lead to substantial changes in the frequency or amount of debt issued by sovereign governments in capital markets. Instead, sovereign nations condition their borrowing decisions on the characteristics of the domestic economy based on their access to private information. We also find that they may be more prudent debt managers, in part because of the lessons national officials from economic institutions (e.g. Finance Ministry and Central Bank) have learned from their crisis histories.

Despite the focus on Latin America, our theoretical framework offers several future research opportunities because it has the potential to explain borrowing behavior across the developing world. As Gabon, Ghana, Nigeria, Senegal, Tanzania, Zambia, and other resource-rich countries in Sub-Saharan Africa enter global bond markets, it becomes increasingly important to understand the interaction of these two sources of public financing: resource rents and sovereign debt. To the extent that capital-scarce countries can choose between these different funding sources, there are different implications for national budgets, government spending, and long-run economic development.

In showing that financial market volatility may intensify the resource curse, our work also speaks to a large literature on the *conditionality* of such a curse. Jones Luong and Weinthal (2006), Liou and Musgrave (2014), and several others suggest that the negative effects of oil, gas, and mining endowments are not absolute, but rather contingent on the quality of institutions. "Good" institutions are subject to government oversight, fostering transparent regulatory environments that are less susceptible to corruption and rent-seeking (Mahdavi, 2020). We find that technocratic governance may also help natural resource economies avoid financial boom and bust cycles. Future research can examine the extent to which technocrats in financial institutions are able to protect the natural resource sector from such market volatility (or vice-versa), reducing the risk that emerging market economies incur onerous debts by borrowing too much from overly exuberant creditors.

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Appendix

A Countries Included in the Analysis

Argentina, Bolivia, Brazil, Colombia, Ecuador, Guatemala, Mexico, Peru, Trinidad and Tobago, and Venezuela.

B Descriptive Statistics

Table B.1: Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Spread	1910	701.96	938.17	0.00	7078.00
CDS	364	337.98	561.45	28.44	4201.61
Central government debt	2676	37.72	20.20	8.00	152.00
Bond issuance	2640	0.33	0.47	0	1
Amount issued (log)	2640	5.32	7.89	0.00	23.86
Oil price index	3000	118.20	63.58	24.09	264.61
Metals price index	3000	85.42	44.20	30.42	179.73
Oil and gas production (log)	2966	5.93	1.70	2.16	8.36
Field discovery	3000	0.01	0.11	0	1
Months since election	3000	21.60	15.10	0	64
Left executive	2988	0.38	0.48	0.00	1.00
IMF agreement	3000	0.22	0.42	0	1
Inflation (log)	2484	1.72	0.93	−1.59	5.54
GDP per capita	2940	7.40	4.12	1.49	17.06
GDP growth	2940	3.17	3.71	−10.89	18.29
Capital openness	2880	0.61	0.32	0.00	1.00
International reserves (log)	2838	23.11	1.06	19.64	26.66
US Treasury rate	2990	3.96	1.55	1.50	7.78
Mainstream minister	2733	0.46	0.50	0	1
Mainstream Central Bank president	2667	0.62	0.49	0	1

C Alternative Specifications

C.1 Credit Supply

Table C.1 replicates the results presented in Table 1, but replacing the dependent variable *Spread* with *CDS*. Since CDS data are only available for four countries (Argentina, Brazil, Colombia, and Mexico) from 2004 to 2012, our sample size shrinks considerably, so we hesitate to draw any inferences from this alternative specification. But we find support for the argument that an increase in natural resource prices is associated with a significant improvement in sovereign risk evaluations, regardless of whether such evaluations are measured as CDS or EMBI spreads.

Table C.2 similarly replicates Table 1, but interacting *Oil price index* with *Oil and gas production* (Model 1) as well as *Metals price index* with *Oil and gas production* (Model 2). Given that the interactions are not statistically significant, we conclude that the effects of resource prices and resource production on sovereign risk evaluations are largely independent from each other.

According to Table C.3, our creditor-side results remain statistically and substantively unchanged if we exclude any of the three largest oil producers — Brazil, Mexico, or Venezuela — from the analysis.

Table C.1: The Effect of Natural Resources on Credit Default Swap Prices, 2004–2012 (Error Correction Models)

	Dependent variable:	
	CDS $_{\Delta}$	
	(1)	(2)
CDS $_{t-1}$	-0.187^{***}	-0.184^{***}
	(0.017)	(0.011)
Oil price index $_{t-1}$	-0.110^{***}	
	(0.025)	
Oil price index $_{\Delta}$	-0.736^{***}	
	(0.008)	
Metals price index $_{t-1}$		-0.229^{***}
		(0.039)
Metals price index $_{\Delta}$		-0.566^{***}
		(0.075)
Oil and gas production (log) $_{t-1}$	-34.256^{***}	-31.677^{*}
	(7.440)	(16.950)
Oil and gas production (log) $_{\Delta}$	-42.788^{***}	-59.229^{***}
	(12.576)	(9.991)
Field discovery $_{t-1}$	25.533^{***}	19.899^{***}
	(4.308)	(2.403)
Field discovery $_{\Delta}$	11.462^{**}	5.986^{**}
	(5.009)	(3.035)
Months since election	0.137	0.059
	(0.098)	(0.106)
Left executive	5.013	3.293
	(8.391)	(9.879)
IMF agreement	-8.565^{*}	-12.460^{**}
	(4.855)	(4.921)
Inflation (log)	−1.450	1.099
	(7.491)	(5.972)
GDP per capita	1.220	0.465
	(1.286)	(1.083)
GDP growth	4.687^{**}	−4.034
	(2.027)	(4.718)
Capital openness	4.347^{**}	5.985^{***}
	(1.677)	(1.854)
International reserves (log)	-9.805^{**}	-11.398^{***}
	(3.879)	(2.106)
Observations	276	276
R^2	0.181	0.138

This table presents the results of error correction models with country fixed effects, time fixed effects, and standard errors clustered by country.

*p<0.1; **p<0.05; ***p<0.01

Table C.2: The Effect of Natural Resources on Sovereign Bond Spreads in Latin America: Examining Conditional Effects, 1998–2018 (Error Correction Models)

	Dependent variable:	
	Spread $_{\Delta}$	
	(1)	(2)
Spread $_{t-1}$	−0.112***	−0.113***
	(0.011)	(0.011)
Oil price index $_{t-1}$	−0.118	
	(0.193)	
Oil price index $_{\Delta}$	−3.320**	
	(1.601)	
Metals price index $_{t-1}$		−0.876
		(0.625)
Metals price index $_{\Delta}$		−5.010**
		(2.439)
Oil and gas production (log) $_{t-1}$	−76.957*	−76.310*
	(40.718)	(40.684)
Oil and gas production (log) $_{\Delta}$	−0.638	−33.108
	(51.031)	(52.439)
Oil and gas production × Oil price index $_{t-1}$	−0.009	
	(0.034)	
Oil and gas production × Oil price index $_{\Delta}$	−2.913	
	(3.434)	
Oil and gas production × Metals price index $_{t-1}$		0.061
		(0.083)
Oil and gas production × Metals price index $_{\Delta}$		−4.337
		(8.878)
Field discovery $_{t-1}$	−42.026**	−45.243***
	(17.123)	(14.882)
Field discovery $_{\Delta}$	−12.793	−19.276
	(13.391)	(12.156)
Months since election	0.227	0.178
	(0.266)	(0.276)
Left executive	25.651*	36.756*
	(14.742)	(19.718)
IMF agreement	−33.811	−39.453
	(26.812)	(26.798)
Inflation (log)	4.428	0.402
	(6.671)	(8.012)
GDP per capita	2.055	5.980
	(3.945)	(4.070)
GDP growth	−2.337*	−3.108**
	(1.239)	(1.546)
Capital openness	−10.952	−4.918
	(35.312)	(38.526)
International reserves (log)	1.304	3.828
	(1.787)	(2.750)
US Treasury rate	13.770**	12.939**
	(6.938)	(6.085)
Observations	1,473	1,473
R^2	0.099	0.075

This table presents the results of error correction models with country fixed effects, time fixed effects, and standard errors clustered by country.
*p<0.1; **p<0.05; ***p<0.01

Table C.3: The Effect of Natural Resources on Sovereign Bond Spreads in Latin America: Excluding Largest Producers, 1998–2018 (Error Correction Models)

	Dependent variable:					
	Delta $_\Delta$					
	Excl. Brazil		Excl. Mexico		Excl. Venezuela	
	(1)	(2)	(3)	(4)	(5)	(6)
Spread $_{t-1}$	−0.114***	−0.116***	−0.113***	−0.115***	−0.103***	−0.103***
	(0.012)	(0.013)	(0.011)	(0.012)	(0.003)	(0.002)
Oil price index $_{t-1}$	−0.182*		−0.206**		−0.111*	
	(0.098)		(0.097)		(0.060)	
Oil price index $_\Delta$	−3.749**		−3.822**		−2.656*	
	(1.822)		(1.845)		(1.540)	
Metals price index $_{t-1}$		−0.532**		−0.658**		−0.345*
		(0.271)		(0.268)		(0.203)
Metals price index $_\Delta$		−5.645**		−5.614**		−4.757*
		(2.780)		(2.822)		(2.627)
Oil and gas production (log) $_{t-1}$	−94.753	−98.697	−67.936	−48.955	−73.130*	−72.558*
	(61.524)	(62.757)	(46.744)	(40.079)	(42.249)	(43.017)
Oil and gas production (log) $_\Delta$	50.184	23.309	12.299	−22.053	2.268	−29.617
	(63.052)	(57.405)	(52.540)	(54.703)	(52.212)	(48.748)
Field discovery $_{t-1}$	−51.429	−58.083*	−42.503**	−47.384***	−44.388***	−46.653***
	(52.989)	(34.775)	(19.010)	(17.518)	(15.569)	(14.210)
Field discovery $_\Delta$	−38.396	−43.873	−9.671	−18.906	−14.680	−19.553*
	(43.640)	(27.560)	(13.377)	(13.245)	(12.535)	(11.585)
Months since election	0.006	−0.058	0.235	0.177	0.229	0.190
	(0.227)	(0.219)	(0.295)	(0.306)	(0.268)	(0.271)
Left executive	31.184	38.603*	28.826**	38.794**	24.669*	28.469*
	(19.382)	(22.936)	(12.150)	(16.960)	(13.775)	(16.399)
IMF agreement	−49.589	−55.274*	−35.115	−41.877	−32.933	−37.435
	(31.777)	(30.906)	(30.239)	(29.117)	(26.364)	(26.743)
Inflation (log)	5.171	0.833	1.963	−4.118	−0.240	−3.389
	(9.958)	(11.300)	(6.609)	(6.263)	(4.095)	(5.476)
GDP per capita	−1.325	5.701	3.333	9.133*	3.963	7.635
	(4.516)	(5.993)	(4.766)	(5.361)	(2.873)	(4.854)
GDP growth	−2.258*	−3.292**	−2.725**	−3.570**	−1.747	−2.437
	(1.311)	(1.539)	(1.316)	(1.514)	(1.280)	(1.493)
Capital openness	14.692	25.650	−12.367	−1.829	−28.714	−19.059
	(27.155)	(26.946)	(38.497)	(40.692)	(30.612)	(33.018)
International reserves (log)	2.650	6.415**	0.457	3.871	2.013	4.330
	(1.859)	(2.980)	(2.104)	(3.462)	(1.570)	(2.802)
US Treasury rate	15.421*	14.091*	16.741***	16.584***	16.377**	15.445***
	(9.041)	(8.163)	(6.341)	(5.469)	(6.389)	(5.528)
Observations	1,233	1,233	1,231	1,231	1,401	1,401
R^2	0.108	0.079	0.105	0.079	0.091	0.077

This table presents the results of error correction models with country fixed effects, time fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

C.2 Credit Demand

Table C.4 replicates Table 3, but replacing *Mainstream minister* with *Mainstream Central Bank president*. There is one important difference between both tables: we do not interact *Mainstream Central Bank president* with *Field discovery* due to multicollinearity (this interaction is a perfect predictor of the dependent variable *Amount issued*).

Table C.5 replicates Table 2, but interacting *Oil price index* with *Oil and gas production* (Models 1 and 3) as well as *Metals price index* with *Oil and gas production* (Models 2 and 4). These interactive effects are substantively small, but statistically significant, confirming that Latin American states tend to issue debt less frequently, and in smaller amounts, the higher their oil and gas production — even if this increase in production is accompanied by an increase in natural resource prices.

Finally, we replicate Table 2, but excluding the three largest oil producers — Brazil (Table C.6, Mexico (Table C.7, and Venezuela (Table C.8) — from the analysis. We find that our results are robust to these exclusions.

Table C.4: The Effect of Natural Resources on Sovereign Bond Issuance, Conditional on Central Bank President Education, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.010***		0.131***	
	(0.002)		(0.023)	
Metals price index		0.010***		0.142***
		(0.003)		(0.041)
Oil and gas production (log)	−0.526**	−0.519**	−8.579***	−8.493***
	(0.212)	(0.214)	(2.816)	(2.852)
Field discovery	−0.131	−0.133	−2.443	−2.427
	(0.287)	(0.284)	(3.250)	(3.276)
Mainstream Central Bank president	2.615***	2.542***	37.369***	36.119***
	(0.592)	(0.610)	(9.548)	(10.115)
Mainstream Central Bank pres. × Oil price index	−0.011***		−0.139***	
	(0.001)		(0.019)	
Mainstream Central Bank pres. × Metals price index		−0.014***		−0.182***
		(0.002)		(0.030)
Mainstream Central Bank pres. × Oil and gas production	−0.214	−0.245*	−3.082	−3.330
	(0.137)	(0.140)	(2.368)	(2.468)
Months since election	0.005**	0.005**	0.067**	0.076**
	(0.002)	(0.002)	(0.031)	(0.031)
Left executive	0.325**	0.296**	4.596**	4.240**
	(0.133)	(0.136)	(1.982)	(2.080)
IMF agreement	−0.097	−0.119	−0.573	−0.746
	(0.120)	(0.119)	(1.563)	(1.593)
Inflation (log)	0.092	0.098	1.048	1.160
	(0.073)	(0.073)	(0.876)	(0.894)
GDP per capita	−0.096**	−0.078*	−0.936	−0.739
	(0.044)	(0.044)	(0.638)	(0.633)
GDP growth	0.017	0.018	0.230	0.268
	(0.013)	(0.013)	(0.206)	(0.200)
Capital openness	−1.991***	−2.019***	−19.339***	−20.297***
	(0.386)	(0.387)	(5.512)	(5.541)
International reserves (log)	−0.092**	−0.097**	−1.185**	−1.271**
	(0.041)	(0.041)	(0.554)	(0.564)
US Treasury rate	−0.132**	−0.114*	−1.887**	−1.593*
	(0.065)	(0.064)	(0.891)	(0.877)
Constant	4.908***	5.171***	64.131***	68.291***
	(1.307)	(1.330)	(17.166)	(17.988)
Observations	1,983	1,983	1,983	1,983
Log Likelihood	−890.642	−898.409	−3,082.752	−3,090.976

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

Table C.5: The Effect of Natural Resources on Sovereign Bond Issuance: Examining Conditional Effects, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.021***		0.317***	
	(0.003)		(0.038)	
Metals price index		0.023***		0.379***
		(0.005)		(0.063)
Oil and gas production (log)	−0.540***	−0.617***	−7.602***	−8.571***
	(0.200)	(0.194)	(2.636)	(2.586)
Oil and gas production × Oil price index	−0.003***		−0.050***	
	(0.0005)		(0.006)	
Oil and gas production × Metals price index		−0.004***		−0.061***
		(0.001)		(0.010)
Field discovery	−0.101	−0.139	−1.749	−2.428
	(0.233)	(0.228)	(3.332)	(3.386)
Months since election	0.005**	0.005**	0.065**	0.073**
	(0.002)	(0.002)	(0.030)	(0.031)
Left executive	0.035	0.082	0.154	0.318
	(0.139)	(0.152)	(2.009)	(2.225)
IMF agreement	−0.202*	−0.175	−1.987	−1.806
	(0.112)	(0.110)	(1.499)	(1.516)
Inflation (log)	0.075	0.124	0.650	1.294
	(0.075)	(0.077)	(0.909)	(0.953)
GDP per capita	−0.031	−0.033	−0.135	−0.252
	(0.039)	(0.038)	(0.550)	(0.565)
GDP growth	0.010	0.007	0.158	0.119
	(0.014)	(0.014)	(0.188)	(0.191)
Capital openness	−2.463***	−2.468***	−24.807***	−25.198***
	(0.396)	(0.382)	(4.890)	(4.984)
International reserves (log)	−0.094**	−0.091**	−1.246**	−1.215**
	(0.041)	(0.040)	(0.579)	(0.588)
US Treasury rate	−0.125*	−0.117*	−1.513*	−1.460*
	(0.064)	(0.062)	(0.870)	(0.863)
Constant	5.554***	5.874***	68.610***	73.315***
	(1.284)	(1.288)	(17.433)	(17.845)
Observations	2,076	2,076	2,076	2,076
Log Likelihood	−893.627	−912.094	−3,085.252	−3,105.324

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

Table C.6: The Effect of Natural Resources on Sovereign Bond Issuance: Excluding Brazil, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.002*		0.034*	
	(0.001)		(0.019)	
Metals price index		0.002		0.026
		(0.003)		(0.038)
Oil and gas production (log)	−0.504**	−0.487**	−7.982***	−7.611**
	(0.212)	(0.211)	(3.089)	(3.061)
Field discovery	−1.021*	−0.997*	−16.756*	−16.459*
	(0.537)	(0.534)	(8.902)	(8.900)
Months since election	0.003	0.004	0.054*	0.059*
	(0.002)	(0.002)	(0.033)	(0.033)
Left executive	0.299**	0.307**	3.963**	4.031**
	(0.135)	(0.137)	(2.022)	(2.049)
IMF agreement	−0.192*	−0.166	−2.607	−2.183
	(0.116)	(0.115)	(1.708)	(1.690)
Inflation (log)	0.368***	0.361***	5.274***	5.205***
	(0.101)	(0.102)	(1.237)	(1.254)
GDP per capita	−0.038	−0.034	−0.306	−0.275
	(0.039)	(0.039)	(0.580)	(0.586)
GDP growth	−0.005	−0.003	−0.032	0.002
	(0.015)	(0.015)	(0.216)	(0.212)
Capital openness	−1.745***	−1.776***	−15.281***	−15.919***
	(0.397)	(0.390)	(5.368)	(5.309)
International reserves (log)	−0.102**	−0.106**	−1.203*	−1.264**
	(0.043)	(0.043)	(0.640)	(0.638)
US Treasury rate	−0.154**	−0.138**	−2.389**	−2.144**
	(0.068)	(0.066)	(0.967)	(0.944)
Constant	5.473***	5.538***	69.023***	69.743***
	(1.340)	(1.357)	(19.117)	(19.363)
Observations	1,824	1,824	1,824	1,824
Log Likelihood	−828.851	−830.151	−2,722.953	−2,724.377

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

Table C.7: The Effect of Natural Resources on Sovereign Bond Issuance: Excluding Mexico, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.003*		0.036*	
	(0.002)		(0.020)	
Metals price index		−0.001		−0.005
		(0.003)		(0.041)
Oil and gas production (log)	−1.273***	−1.245***	−18.181***	−17.744***
	(0.213)	(0.216)	(2.800)	(2.806)
Field discovery	−0.016	0.009	−0.637	−0.348
	(0.241)	(0.233)	(3.391)	(3.339)
Months since election	0.007***	0.006***	0.087***	0.087***
	(0.002)	(0.002)	(0.031)	(0.030)
Left executive	0.349**	0.388**	4.918**	5.275**
	(0.156)	(0.163)	(2.089)	(2.142)
IMF agreement	−0.597***	−0.578***	−7.848***	−7.573***
	(0.126)	(0.126)	(1.575)	(1.569)
Inflation (log)	0.034	0.004	0.076	−0.218
	(0.080)	(0.081)	(0.938)	(0.957)
GDP per capita	0.037	0.049	0.927	1.025
	(0.050)	(0.050)	(0.661)	(0.665)
GDP growth	−0.005	−0.003	−0.051	−0.033
	(0.017)	(0.017)	(0.232)	(0.233)
Capital openness	−4.919***	−4.947***	−59.814***	−60.702***
	(0.448)	(0.430)	(5.129)	(5.030)
International reserves (log)	−0.051	−0.057	−0.854	−0.925
	(0.043)	(0.043)	(0.598)	(0.601)
US Treasury rate	−0.168**	−0.138**	−1.552*	−1.230
	(0.071)	(0.069)	(0.924)	(0.904)
Constant	9.716***	10.042***	131.450***	134.929***
	(1.397)	(1.438)	(18.030)	(18.422)
Observations	1,824	1,824	1,824	1,824
Log Likelihood	−722.737	−724.726	−2,567.243	−2,569.053

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01

Table C.8: The Effect of Natural Resources on Sovereign Bond Issuance: Excluding Venezuela, 1996–2016 (Probit and Tobit Models)

	Dependent variable:			
	Any issue (Yes = 1)		Amount issued (log)	
	Probit		*Tobit*	
	(1)	(2)	(3)	(4)
Oil price index	0.002		0.039**	
	(0.001)		(0.019)	
Metals price index		0.002		0.043
		(0.003)		(0.037)
Oil and gas production (log)	−1.155***	−1.138***	−17.538***	−17.148***
	(0.178)	(0.176)	(2.438)	(2.413)
Field discovery	−0.147	−0.135	−2.494	−2.305
	(0.237)	(0.234)	(3.594)	(3.566)
Months since election	0.004	0.004*	0.054*	0.062**
	(0.002)	(0.002)	(0.031)	(0.031)
Left executive	0.512***	0.515***	7.743***	7.707***
	(0.143)	(0.145)	(2.026)	(2.054)
IMF agreement	−0.233**	−0.210*	−2.584*	−2.148
	(0.108)	(0.107)	(1.529)	(1.516)
Inflation (log)	0.240***	0.235***	3.157***	3.135***
	(0.082)	(0.083)	(1.018)	(1.035)
GDP per capita	0.008	0.011	0.415	0.427
	(0.037)	(0.037)	(0.559)	(0.563)
GDP growth	0.007	0.009	0.113	0.141
	(0.016)	(0.015)	(0.222)	(0.218)
Capital openness	−2.738***	−2.760***	−32.095***	−32.667***
	(0.371)	(0.365)	(4.855)	(4.790)
International reserves (log)	−0.087**	−0.089**	−1.131**	−1.170**
	(0.037)	(0.037)	(0.548)	(0.549)
US Treasury rate	−0.160**	−0.146**	−2.253**	−1.998**
	(0.065)	(0.063)	(0.913)	(0.886)
Constant	8.254***	8.240***	113.569***	112.765***
	(1.155)	(1.177)	(15.874)	(16.177)
Observations	2,004	2,004	2,004	2,004
Log Likelihood	−891.879	−893.008	−3,028.587	−3,030.193

This table presents the results of two probit models and two tobit models, all with cubic polynomials, country fixed effects, and standard errors clustered by country. *p<0.1; **p<0.05; ***p<0.01