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# Institutional and political drivers for copper government take: new evidence for African and Latin American countries

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### **Institutional and political drivers for copper government take: new evidence for African and Latin American countries**

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Yannick Bouterige  
Bertrand Laporte

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## **Abstract**

Our study addresses the issue of rent sharing and its determinants for the copper-producing countries in Africa and Latin America, which are among the world's leading copper producers. We use an original database to construct our mining tax policy indicator, the average effective tax rate (AETR), and combine it with four other databases to study its determinants. We pay particular attention to political regimes, political environments, and government party affiliations to explain mining tax policies. Our main results suggest that a democratic regime is likely to capture a larger share of the rent than an autocratic regime. Our results also show that the institutional environment, regardless of the political regime, influences rent sharing, as does EITI adoption. Finally, our results suggest that left-wing governments capture a larger share of the rent than right-wing and centrist ones. However, whatever the political regime or the political affiliation of the governments in place, the share of the rent captured by the State remains low about the theory of optimal taxation.

## **Keywords**

Rent sharing, Copper, Government-take, Political regime, Political environment, Government party affiliation, Transparency.

## **JEL Codes**

D70; H30; K34; Q38

## 1. Introduction

The literature on the economics of natural resources is extensive, as is the more specific literature on extractive industries. Many issues are addressed in the context of the natural resource curse (see Frankel, 2010 for an exhaustive survey). In contrast, the question of rent sharing and its determinants is little addressed.

Understanding how the extractive industry is taxed and its influence on the sharing of the rent generated by the sector is a prerequisite for analyzing the sector from a development perspective and increasing the mobilization of tax and non-tax revenues. The issue of rent sharing between governments and investors resurfaces as soon as commodity prices rise. Governments want to increase their share of the mining rent, and companies fear "hold-ups" or expropriations similar to what happened in Latin America during previous price increase cycles (Daniel *et al.*, 2010; Duncan, 2006). Today, the issue of expropriation is no longer on the agenda, but countries such as Chile and Peru, the world's top two copper-producing countries, are reviewing their mining tax regimes to increase taxation significantly. In Peru, the mining rent sharing was a major campaign issue for Pedro Castillo, the president deposed in December 2022. In Chile, in 2021, deputies have been in a battle with the Senate and the government to create an additional 3% tax on the value of certain minerals.

Few empirical studies quantify the rent sharing between investors and governments in the natural resource sector (Laporte *et al.*, 2015). Oil is the sector that has been studied the most (Blake *et al.*, 2006; Daniel *et al.*, 2008; Tordo, 2007), followed by gold (Brewer *et al.*, 1989; Lundstøl, 2022; Otto *et al.*, 2006, among others). In most cases, studies are carried out on hypothetical mining projects. The authors apply different tax regimes to the project (Blake *et al.*, 2006; Brewer *et al.*, 1989) or only change the base for one tax to determine the impact on investment indicators or government-take. Special attention has been paid to different types of royalties (Otto, 2006; Daniel *et al.*, 2010). It is rare for simulations to analyze the overall framework of a mining tax system for a single country. Charges and fees are often dealt with secondarily to tax instruments (Blake *et al.*, 2006), which calculate sharing resource rent incomplete. The authors commonly use the indicators mentioned above to combine the operation of a tax with an objective of neutrality of taxation or government revenue. The most common method is discounted cash flow, combined with ad hoc sensitivity analyses. Few studies consider the effects of interaction between the mining sector and the rest of the economy (Thomas, 2010). Finally, it is essential to note that there has been little analysis of the mining tax regimes in developing countries.

Mining tax regimes are composed of general taxes, often derogatory provisions, and taxes specific to mining activity. The instruments of mining taxation are relatively homogeneous (Charlet *et al.*, 2013). Two types of taxes are distinguished. Production-based taxes cover mining royalties, fixed duties, annual ground fees, customs duties, taxes on petroleum products, and minimum turnover tax. These taxes secure the government's revenues from the beginning of production, regardless of the profitability of the mining project, but they increase production costs for the firm. Profit-based taxes recover corporation tax, withholding tax on dividends and interest.

Some countries add a "super profit" tax. These taxes have the advantage for the firm to be based on profit alone. However, the revenues collected by the government may be eroded by a fall in the project's profitability and by the misuse of transfer prices. In addition to these taxes, the mining sector is subject to other parafiscal taxes, such as State participation in the company's capital<sup>1</sup>. Each of these tax/parafiscal instruments has a different impact on government-take and the attractiveness to investors (Baunsgaard, 2001).

In addition to the ordinary law and the derogatory provisions specified in the sectoral codes, the extractive industries are governed by mining agreements signed between the State and the operating company. The objective is to provide guarantees to investors: (i) to attract investors by offering fiscal and customs advantages to the company (ii) to reduce risks by guaranteeing the stability of the fiscal and customs regime through stability clauses that are even more favourable than those already included in the sectoral codes. These advantages should be included in the sectoral codes as they are exceptions to the general law. However, mining agreements are often negotiated and concluded on a case-by-case basis. While these mining agreements were tax and customs enclaves that largely derogated from the mining code and general law until the beginning of the 21st century, recent tax reforms have tended to restore the primacy of the mining code and the general law over mining agreements (Laporte *et al.*, 2022).

Governments are thus looking for the best mix between production-based taxes and profit-based taxes and are innovating on the application modalities of tax instruments to find the tax design that allows a sufficient government-take without discouraging investment (Charlet *et al.*, 2013). While optimal taxation theory implies that it is possible to tax 100% of rent without changing the investment decision, few empirical works have been done on rent sharing in resource-rich countries because the data needed for this analysis are difficult to obtain (Laporte *et al.*, 2015). For the same reasons, most governments that change their tax design do so without actually conducting a quantitative analysis of the impact of these reforms on rent sharing. These reforms are often carried out during reversals in commodity price cycles based on political or "politician" considerations that are often removed from economic optimality.

Two recent articles go beyond the evaluation of rent sharing and the analysis of tax design by studying the determinants of government-take. Adebayo *et al.* (2022), for gold mining projects worldwide, find that political economy variables have as much predictive power in explaining the government-take about the primary investment theory model based on country risks. Leiva (2020), using a life cycle model for copper mining in Chile, shows that government-take is excessive given the quality of institutions.

Our study differs from and complements those of Adebayo *et al.* (2022) and Leiva (2020). Our study addresses, from an empirical perspective, the issue of rent sharing and its determinants. We are interested in the rent sharing over time for twelve

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<sup>1</sup> In the rest of the article, the term "tax" will be used whether it is either a tax in the literal sense or a parafiscal tax.

countries, six in Latin America and six in Africa, among the world's major copper producers. We are concerned about the tax policy choices resulting from the country's political and institutional organization. We, therefore, calculate a potential rent-sharing that is based solely on the application of laws and regulations. Our approach is therefore *de jure* and ignores any special tax provisions resulting from a specific agreement with the Government. This differs from Adebayo's calculation for gold, which is based on actual payments and therefore incorporates mining companies' more or less aggressive tax optimization strategies. We work over a long period with a double geographical and temporal dimension to have significant heterogeneity in the choice of mining tax policies within the same country and between countries, making it possible to consider the political orientation and alternations. We pay particular attention to political regimes, political environments, and government party affiliations (Right-wing party, Centrist party, and Left-wing party) to explain mining tax policies. Thus, we use interaction variables between the political regime and the political environments variables such as political regulation, political competition, regime durability, military in politics, number of seats held by opposition parties in the legislature, and the share of total votes obtained by all opposition parties in the last election.

Several results emerge from our analysis. The share of the rent captured by the State is very heterogeneous over time and between countries. Beyond the political regimes, the political environment also matters in sharing mining rent. Democratic regimes increase this share, and the government's political orientation significantly affects this share. Left-wing governments capture a larger share of the rent than right-wing and centrist governments. The government-take is larger in Latin American countries than in African countries. However, whatever the political regime or the political affiliation of the governments in place, the share of the rent captured by the State remains low with the theory of optimal taxation. Governments need to acquire the quantitative tools necessary to understand the sharing of rents. Only then will they be able to carry out tax reforms that improve the mobilization of tax and non-tax revenues and thus meet the development challenges.

The rest of the article is organized as follows. Section 2 outlines the steps for estimating the rent-sharing indicator (the AETRs) and provides some stylised facts. Section 3 describes in detail the data sources, the measurements of selected variables, and the empirical specification. Section 4 discusses the empirical outcomes and performs some robustness checks, whereas the last section concludes and derives some policy implications.

## **2. The Average Effective Tax Rate (AETR): an indicator of the mining rent sharing**

The economic rent represents the *"Revenues in excess of all necessary costs of production, including the minimum rate of return to capital"* (IMF, 2012). In most articles, the mining rent-sharing model is based on a representative project. Authors can apply several tax regimes to this project or amend one tax base to determine its impact on investment indicators or the government-take. The discounted cash-flow model (DCF) is the most common model for assessing the rent and its sharing between the investor and the State (Laporte *et al.*, 2015). The Average Effective Tax Rate

(AETR) is the indicator usually used to estimate the share of the rent captured by the State.

## 2.1. Rent sharing model and data

### 2.1.1. The representative mine

To determine the sharing of mining rent in each country, the countries' different tax regimes are applied to a “*representative mine*”. This mine is representative of large industrial copper mines in Latin America and Africa by cross-referencing data from several feasibility studies. The economic and financial data for this mine is summarized in Table 1. Furthermore, this mine is assumed to be a local subsidiary of a multinational firm. Each year the parent company receives 20% of the after-tax profit. The retained after-tax profit are used by the operating company to invest in the renewal and possible expansion of the mine.

Table 1: The “Representative mine”

Description	Units	Values
<b>Mining profil</b>		
Life-span	years	25
Surface area	km <sup>2</sup>	250
<b>Production</b>		
Started year	year	4
End year	year	23
Annual capacity (max)	kt Cu/year	250
Total capacity	kt Cu	4000
<b>Metal price</b>		
Copper price (average)	US\$/ton	7000
Copper price (average)	US\$/lb	3.79
<b>Operating costs</b>		
Capital costs (Capex)	US\$M	2500
Unit operating costs (Opex)	US\$/ton	4000
<b>Parameters</b>		
Discount rate	%	10
Interest rate	%	7
Pre-tax IRR	%	44,2

### 2.1.2. The Countries' tax regimes

The tax regime applied to the representative mine includes eight tax or parafiscal levies, taken from the lawes and regulations in force in the 12 countries for each year. For the African countries, the data is mainly taken from the Ferdi legal and fiscal database on mining taxation<sup>2</sup>. The same methodology is used for Latin American countries to trace each country's taxation history. The information is taken from online legal and regulation texts: general tax codes, tax laws, mining codes, application

<sup>2</sup> <https://fiscalite-miniere.ferdi.fr/>



decrees, etc. They do not consider possible derogations in the firm agreements nor possible divergences in the application of the law by the administrations. Two main categories of taxes are distinguished. *Production-based taxes* are fixed duties, surface royalties, and mining royalties. *Profit-based taxes* include corporate income tax, flat-rate minimum tax, and the special tax on super-profits (applied in Zimbabwe). Withholding taxes may also exist, as well as government participation. A first withholding tax may be imposed on the interest paid on the external loan contracted by the company. Another withholding tax is also imposed on dividends paid by the local company to its foreign-based parent company. The double taxation treaties are not taken account, which may limit the power of taxation or reduce tax rates between countries. Finally, some countries require a free state equity investment in the company. In this case, the government receives its share of the dividends up to the amount of its participation.

## 2.2. Assessing the AETR

A DCF model is built with data from the representative mine and tax data from each country. The AETR of a mining project corresponds (in percentage) to the share of the rent taken by the State (government-take). It is the ratio of the discounted sum of all revenues collected by the State from the mine to the discounted sum of the net pre-tax cash flows generated by the mine. The AETR depends not only on the tax regime but also on the economics of the mine, represented primarily by the quantity produced, the selling price, and the production costs. It is a good indicator of the tax burden on a project over its lifetime. The AETR allows comparison of even very heterogeneous tax regimes. It thus allows spatial (between countries) and temporal (within countries) comparisons.

The pre-tax net present value (NPV) is a proxy of the rent generated by the project, provided that the chosen discounted rate is sufficiently high to consider the opportunity cost of capital. The project NPV is calculated as follows:

$$NPV = \sum_{t=0}^T \frac{Z_t - C_t - K_t}{(1 + i^*)^n} \quad (1)$$

$Z_t$  the expected turnover of the copper selling,  $C_t$  the unit cost of exploitation (operating cost),  $K_t$  the capital cost (initial investment and renewal investment) and  $i^*$  the discounted rate.

The Average Effective Tax Rate (AETR) is then the discounted sum of all levies collected by the State ( $R_t$ ) on the pre-tax NPV, namely:

$$AETR = \frac{\sum_{t=0}^T \frac{R_t}{(1+i^*)^n}}{\sum_{t=0}^T \frac{Z_t - C_t - K_t}{(1+i^*)^n}} \quad (2)$$

## 2.3. Stylized facts

In mining, an AETR between 40% and 60% is generally considered a fair rent sharing. In 2021, for a copper price of \$7,000/t (average price over the last ten years) and an OPEX of \$4,000/t, the AETRs of two countries appeared to be exceptionally high. Venezuela's extreme AETR (82.9%) is explained by its 60% higher corporate tax rate, while Zimbabwe's high AETR (60.6%) is due to its additional profits tax. In

contrast, the AETRs of 3 countries appear quite low. Mauritania's AETR (35.1%) is explained by a corporate tax rate of only 25%, plus an exemption for the first 3 years of operation. Chile's AETR (35.2%) combines a progressive mining royalty that results in a modest effective rate of only 1.5% to 2% of revenues with a corporate tax rate of 27%<sup>3</sup>. Mexico's AETR (35.3%) suffers from the absence of a mining royalty.

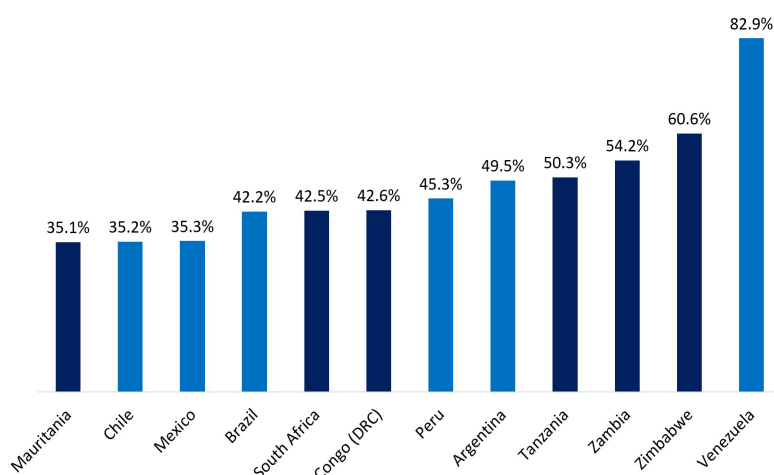
Over 2000 to 2021, an increase in AETRs is observed in 4 countries located on the African continent. For a copper price of \$7,000/t and an OPEX of \$4,000/t, Tanzania's AETR increased by 9.5 percentage points from 40.8% in 2004 to 50.3% in 2021. This increase is done in two stages: the mining royalty, set at 3% in the 1998 mining code, is first increased to 4% in the 2010 mining code and then to 6% in 2017. Zambia's AETR also increased by 9.5 percentage points, from 44.7% in 2000 to 54.2% in 2021. However, the increase is not linear, as the mining royalty and corporate tax rates have moved in opposite directions on several occasions. The DRC's AETR increased by 5.2 percentage points, from 37.4% in 2002 to 42.6% in 2021. This change is mainly due to the increase in the mining royalty rate from 2% to 3.5% when the Congolese mining code was reformed in 2018. Finally, South Africa's AETR increased by 3.7 percentage points, from 38.7% in 2009 to 42.5% in 2021. However, this slight increase is not due to a desire to change the taxation of the mining sector. It is due to the introduction of a withholding tax on interest in 2015 and the increase in withholding tax rates on dividends in 2012 and 2017.

Over the same period, only the AETRs of 2 countries have remained perfectly stable with the highest AETRs: Venezuela and Zimbabwe. In Venezuela, no changes have been made since the 1999 mining law and its 2001 implementing decree. In Zimbabwe, the mining code dates from 1961, and its implementing decree from 1977. Both of these texts have undergone numerous amendments. In particular, the most recent finance acts have amended the mining royalty rates several times in recent years, but the rates for base metals have remained fixed at 2%.

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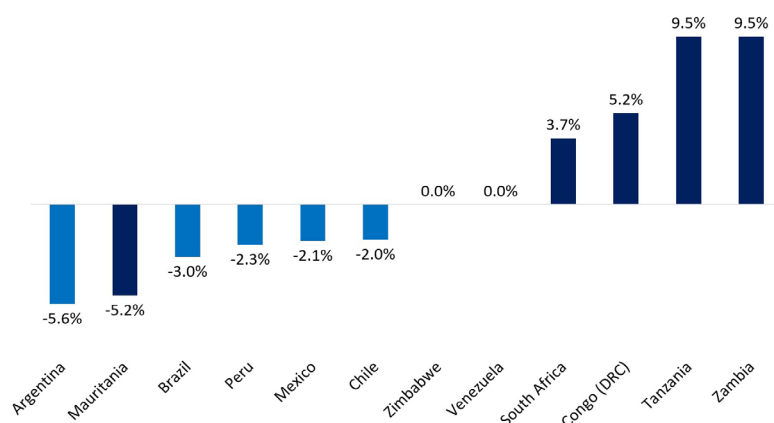
<sup>3</sup> Chile's AETR is certainly undervalued, given the predominance of public enterprise in the Chilean mining industry. However, our results remain robust when Chile is excluded from the sample.

Figure 1: Average Effective Tax Rate, 2021



Source: Authors' calculations based on national legislation for a price of \$7000/t.

Figure 2: Variation of AETR between 2000 and 2021



Source: Authors' calculations based on national legislation for a price of \$7000/t.

Note: For 6 of the 12 countries in the sample, the available information did not allow for a backward link to 2000. This is the case for South Africa (starting in 2009), Chile (2006), DRC (2002), Peru (2005), Tanzania (2004), and Zimbabwe (2010). The calculation of the change is then based on the earliest available year.

In addition to their very high AETR levels, the lack of significant mining tax reform in these two countries reinforces the impression that Venezuela and Zimbabwe are two exceptional cases.

Conversely, a decrease in AETRs is observed in 4 to 6 countries located in Latin America. For a copper price of \$7,000/t and an OPEX of \$4,000/t, Argentina's AETR has fallen by 5.6 percentage points, from 55.1% in 2000 to 49.5% in 2021. The explanation is income tax reforms, not mining tax law. Mauritania is the only African country whose AETR declined by 5.2 percentage points, from 40.2% in 2000 to 35.1% in 2021. This decline is mainly due to the reduction in the corporate tax rate from 30% to 25% for mining companies, which was written into the country's standard mining convention in 2002. The new mining code of 2008 subsequently maintained this rate.

But despite subsequent increases in mining royalty rates in 2008 and 2012, Mauritania's AETR remains lower than it was in 2000. Brazil's AETR declined by 3.0 percentage points from 45.2 percent in 2000 to 42.2 percent in 2021 due to the decrease in the corporate tax rate from 37 percent to 34 percent in 2002. Similarly, Mexico's AETR fell by 2.1 percentage points, from 37.4% in 2000 to 35.3% in 2021. This movement is also explained by the corporate income tax, whose rate first decreased gradually, starting from 35% in 2000 and falling to 28% between 2007 and 2009, before rising slightly to 30% since 2014. Finally, in the base case, for a copper price of \$7,000/t and an OPEX of \$4,000/t, the Chilean and Peruvian AETRs declined slightly, amounting to 2.0 and 2.3 percentage points.

### 3. Methodology and data

#### 3.1. Method

We estimate a regression in Pooled OLS on the government-take according to the political regime of the countries, the country-specific political environment or the affiliation of the party in power, the other determinants of the sharing of the mining rent in the literature, and a dummy variable equal to 1 for all Latin American countries and 0 for African countries. Specifically, we estimate the following model:

$$\text{Gov.Take}_{it} = \alpha + \beta \text{Pol.Regim}_{it} + \phi \text{Pol.Envir}_{it} + \psi \text{Control}_{it} \\ (3) + \delta \text{Continent}_{1|0} + \gamma_t + \varepsilon_{it}$$

where, *Gov.Take<sub>it</sub>* represents the share of the copper mining rent captured by the government in country *i* at period *t*, and  $\alpha$  is the constant term. The parameter estimate  $\beta$  denotes country-specific political regimes' effect on copper government-take. The parameter estimate  $\phi$  captures the effect of the political environment. First, it captures the effect of the interaction between the political regime and each of the variables in the political spectrum. Second, this parameter captures the effect of the ruling party affiliation.  $\gamma_t$  are the dummy for each year that capture shocks common to all countries,  $\psi$  is the estimated parameter reflecting the impact of control variables, and  $\varepsilon_{it}$  is the error term. The differential intercept parameter  $\delta$  indicates how much the share of the copper rent captured by the State differs between the countries of Africa (continent=0) and those of Latin America (continent=1). We compute the estimate parameters using POLS and correct the standard errors that are robust to homoskedasticity and autocorrelation using White's procedure which consists in adding the robust option after the regression command.

#### 3.2. Data analysis

To empirically examine the effect of political regimes (and environments) or political affiliation of government in place on copper rent sharing, and to provide a comparative analysis between African and Latin American countries, we used different data sources. The survey covers 12 copper-producing countries from 2000 to 2021, including 6 Latin American countries (LAC) and 6 Sub-Saharan African countries (SSA). The LAC group consists of Chile, Mexico, Peru, Brazil, Argentina, and Venezuela. Chile is unique in having a major state-owned mining company. The state-owned Codelco (Corporacion Nacional del Cobre), which is 100% owned by the Chilean state, is the country's leading mining producer and contributes a third of Chile's copper production. The SSA group includes Zambia, the Democratic Republic

of the Congo, Sub Africa, Mauritania, Zimbabwe, and Tanzania. The choice of these countries is based on the fact that they are among the leading copper-producing countries on both continents, and especially on the availability of information on the tax system concerning the mining sector.

### 3.2.1. *Copper mining rent sharing*

In the econometric specification, the dependent variable is the estimated AETRs, also known as the government-take ratio. We use the government-take ratio to measure the percentage of the copper rent accrues to the government in a production year. It takes the value from 0 to 100%, and higher values correspond to the capacity of the State to better tax resource rents during market cycles. Using this indicator, our analysis extends the studies that map and benchmark the sharing of mining rents between governments and extractives industries (Collier *et al.*, 2011; Conrad, 2012; Mawejje, 2019; Adebayo *et al.*, 2022; Laporte *et al.*, 2022). Thus, we expand the literature by providing an estimate of AETRs as a measure of the government's take in copper rent and by underlining the factors accounting for differences in AETRs levels based on a comparative analysis of Latin American and African countries.

### 3.2.2. *Political system variables*

The paper's primary aim is to provide evidence of the impact of political systems and the environment in which they operate on mining rent sharing in the copper sector. The mining rent sharing is inherently linked to the political system. Even the literature is relatively straightforward on this linkage<sup>4</sup>. Collier (2010) argue that the social values of natural assets are closely linked to the quality of the political system. Also, political behaviour changes in places that are experiencing mining booms (Asher *et al.* (2019). Collier *et al.* (2009) distinguish between democracy as an instrument of political inclusion but also of electoral competition and political checks and balances as an instrument of accountability in resource-rich countries.

In this respect, we use several measures relating to political economy relating to the objective of the regression. First, focusing on the effect of political regimes on copper rent sharing, we use Polity2 score from Polity V database, as a variable of interest which provide a convenient avenue for capturing the effects of political regimes. The Polity2 score is the most popular measure of a country's political regime to examine the spectrum of political regime authority on a scale ranging from -10 (strongly autocratic) to +10 (strongly democratic). Most studies use this variable to measure democracy (see, for example: Ross, 2001; Arezki *et al.*, 2013 and Garcia *et al.*,

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<sup>4</sup> Lopez *et al.* (2006) provide four ways a nation's political system and its natural resource use are related. First, when property rights to resources are weak, competition to acquire resources can be wasteful and characterized by rent-seeking and violent conflict. Weak ownership claims are most likely in countries where the rule of law is not well-established. Second, when a country's political system is unstable or unrepresentative, the individual's claim to a resource stock's future return can be rendered insecure, reducing the benefits of conserving natural resources. Third, when a country's natural resources are capable of generating significant rents but democratic governance institutions and the rule of law are not well established, corruption of officials responsible for resource management can encourage rent-seeking, dissipating the benefits those resources would otherwise confer. Fourth, its political system can affect the mix of public-private good outputs produced by a nation's natural resources.

2016), but if it can provide a convenient avenue for examining general regime effects, it does not allow for investigation of the varying effects of democracy and autocracy.

Therefore, with Eckstein *et al.* (1975) who posit that autocratic and democratic authority are distinct patterns of authority, elements of which may co-exist in any particular regime context, we test the varying effects of democracy and autocracy separately. The institutionalized democracy and autocracy indicators are scaled from 0 to 10 in each case, and higher values are more democracy or more autocracy, respectively. This data information is also from Polity V Table (Marshall *et al.*, 2019). As learnt from the literature on the links between the political economy and natural resources, the relationship between resource rents and political regimes depends on whether the regime is democratic or authoritarian according to Caselli *et al.* (2016) supported by other empirical works (see among them: Ross, 2001; Andersen *et al.*, 2013; Wright, 2015; Ajide *et al.*, 2020). It appears from these studies that the abundance of resources stabilizes autocratic regimes (Cuaresma *et al.*, 2011), by lowering the chances of democratization (Boix *et al.*, 2003) and reducing the risk of transition to subsequent dictatorship, or both (Wright *et al.*, 2015). Using the democracy and autocracy scores allows us to feed the discussion on political regimes (in their different spectrum) and the resource rents nexus.

### 3.2.3. *Interaction terms: political environments and political regimes*

Beyond political regimes, the political environment would be decisive in leading to tax reforms. Hence, in the wake of the political regime effects of mining rent sharing, we are interested in the political environments. The insight is that each regime scheme can exist and operate in a particular political landscape that is likely to impact the outcome of the ruling regime. Some variables related to the political environments are selected, including political regulation, political competition, regime durability, military in politics, number of seats held by opposition parties in the legislature, and the share of total votes obtained by all opposition parties in the last election.

We postulate for an indirect effect of the political environment on the government's take. This is why we did not directly introduce these variables into the regressions. Instead, we construct interactions involving the multiple of the political regime and each of political environment variable. Then, we introduced them into the regressions alternatively. This approach aims to capture the impact of the interaction between the political regime and the political environment on the sharing of mining rent. We postulate that the political context can influence the government's choice of fiscal policies pushing them to make reforms leading to a sharing of the mining rent in one way or another. The results are interpreted as marginal effects when the interaction term with the political regime (Polity2 scores) is estimated to be statistically significant.

Some useful details on the variables used in the interaction terms are necessary to clarify the results. Certain of these data come from the Polity V database. One of which is the variable "regulation of participation" which indicates a regulated participation to the extent that there are binding rules on when, if and how to express political preferences. One-party states regulate by channelling participation through a one-party structure, with strict limits on the diversity of opinion. In contrast, Western

democracies regulate by allowing relatively stable and durable groups to compete non-violently for political influence. The polar opposite is unregulated participation, in which there are no sustainable national political organisations and no effective regime control over politics. This variable is coded from 1 to 5, and a higher value is regulated participation. We also use the variable "political competition," which is a concept variable to reflect the general degree of coercion displayed during political interactions between regime authorities and non-state actors, particularly evident during election campaigns and popular mobilization and protests. Political competition ranges from 0 to 10, and high values indicate high competition. The variable "regime durability" which denotes the number of years since the most recent regime change or the end of transition period defined by the lack of stable political institutions. The variable is coded so that the first year during which a new polity is established is "year zero" (value = 0) and each subsequent year adds one to the value consecutively until a new regime change or transition period occurs. The higher the value, the more durable the regime.

In addition, we use the variable "military in politics" from the ICRG database, as a measure of military involvement in politics, even at a peripheral level, which diminishes democratic accountability. The variable rescaled 0-6, and higher risk ratings (6) indicate a greater degree of military participation in politics and a higher level of political risk.

The study also considers the pressure exerted by opposition parties using two different measures. The first is the "number of opposition seats," which records the total number of seats held by all opposition parties. While the second is the "vote share of opposition parties," which records the total vote share of all opposition parties in the last election. A high proportion suggests that the governing party is in the minority in the country. These data come from the Database of the Political Institutions (DPI) (Scartascini *et al.*, 2021).

#### 3.2.4. Government party affiliations variables

Another aspect of the study that receives particular interest is the affiliation of political parties. From the top of our intuition, the differences in the sharing of mining rents at the country level can be explained by the affiliation of the party in power. About literature, our study also has the merit of being, to our knowledge, the first to document the difference in rent-sharing in the mining sector for party orientation and can compare the levels of AETRs levied by left-, center- and right-wing governments. To test this intuition, we use the variable "party orientation" from the DPI database, which are coded from 1 to 3. The code 1 is used for left-wing parties, defined as communist, socialist, social democratic, or left-wing. The code 2 encodes the parties that are defined as centrist or when a party's position can best be described as centrist (e.g., party advocates strengthening private enterprise in a social-liberal context). The code 3 denotes the right party i.e., parties that are defined as conservative, Christian democratic, or right-wing. Our contribution concerns the role of the orientation of the parties in power in the sharing of the copper mining rent. In this sense, it is a matter of producing a comparative analysis between the levels of copper rent taken by the right-wing, centrist, or leftist governments.

### 3.2.5. Control variables and treatment

Several control variables frequently used in the literature on resource rents (Manley, 2017; Leiva, 2020; Laporte *et al.*, 2015; Mawejje, 2019) have been appended, such as GDP per capita, aid-to-GNP ratio, corruption, political stability. We also pay particular attention to EITI member countries, with the variable of EITI adoption. These variables are considered relevant to explain the share of mineral rent. And not introducing these control variables into the regressions would lead to a fallacious regression in estimating the coefficients linking the government's share of mining rent and the variables of interest. We provide further descriptions of each selected control variable and its sources of availability.

We paid particular attention to the treatment of corruption variables and EITI adoption. On one hand, it seems essential to control for corruption as numerous studies suggest that corruption has adverse effects on resource rent management in resource-rich countries (Basedau, 2005; Kolstad *et al.*, 2009; Bhattacharyya *et al.*, 2010; Badinger *et al.*, 2014; and Standing, 2007).

Also, it is common in many developing countries abundant in natural resources that corruption is prevalent. Besides, it is documented that the relationship between resource rents and corruption depends on the quality of the democratic institutions (Bhattacharyya *et al.*, 2010), which cannot be separated from political systems (Arezki *et al.*, 2015). Additionally, according to Robinson *et al.* (2006) and Mehlum *et al.* (2006), corruption is a critical issue in rent-seeking and patronage. Hence, we introduce the variable "corruption" as part of the regression and expect that higher corruption may result in a lower government take of the copper rent. The corruption score captures the likelihood that government officials will demand special payments and bribes. The data range 0 (absence of corruption) to 6 (highest corruption) and are taken from *International Country Risk Guide*.

On the other hand, few studies show that the countries most affected by the resource curse lack good governance and are characterized by high corruption, a lack of strong (democratic) political institutions, a weak rule of law, and weak property rights. In this context, transparency can affect governance outcomes, such as reducing corruption (bureaucratic and political), increasing information disclosure, and enhancing accountability, inevitably leading to proper taxation of the natural resources sector. The adoption of the EITI allows for greater control of corruption [David-Barrett *et al.*, 2013; Kasekende *et al.*, 2016; Papyrakis *et al.*, 2019], but opposite results are also evidenced (Oge, 2016; Corrigan, 2014; Lopez-Cazar *et al.*, 2021).

To link our analysis to these studies, we identify two channels through which transparency impacts resource rent sharing. The first channel considers that transparency directly affects rent sharing. Rightly so, we introduce the variable "adoption of the EITI" with is a self-defined dummy variable for EITI members taking the value 1 in the years the country is a member of the initiative and 0 otherwise. Details of member countries and the year of adoption are available on the EITI website. The EITI is a global standard aimed at instituting good governance in the management of oil, gas, and mineral resources. The second channel considers that transparency promotes good governance and therefore has a reducing corruption effect in favour of a more significant share of government-take.



For this reason, we provide evidence that corruption has a diminishing effect on the government's share. At the same time, adopting the EITI allows the government to increase its share in the copper extractive industries sector in a context rife from corruption. Then we investigate the impact of the interaction between the variable's adoption of ITIE and corruption on the government-take.

Political stability is also relevant in assessing the relationship between government-take and political systems. An unstable political situation can destabilize political regimes, weaken institutions and thus encourage corruption and consequently lower the government-take. Conversely, political stability strengthens the confidence of the extractive industries while securing exploitation activities in a context of low political risk. Thus, the government-take is expected to increase with political stability. Then, we control the regression by using the variable "Political stability and absence of violence" from the *Worldwide Governance Indicators*. It measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. The index ranges from -2.5 (weak situation) to 2.5 (best situation).

We also account for the level of development with the variable GDP per capita (constant 2017US\$). It is calculated as real gross domestic product divided by total population, expressed in natural logarithm, using data from the *Penn World Table*.

Finally, to capture the insight that countries receiving large amounts of official development assistance may be willing to under-tax the resource rent (resource curse), we also control for the variable of net ODA received. Net official development assistance is the disbursement flows (net of principal repayment) paid to countries and territories on the DAC list of aid recipients. It is expressed as a percentage of GNP, and data is taken from *World Development Indicators* dataset.

### 3.3. Summary statistics

Summary statistics of the variable are reported in Table 2. On average, governments take 46.8% of copper rent. The highest levy rate of 82.8% is obtained in Venezuela, which is due to the application of a 60% corporate tax rate for mining companies (Art.53 of LISR 2000) and a 3% mineral royalty rate for copper (Art.90 of Decree No.295 introducing the mining code, 1999). Conversely, the minimum levy rate of the copper rent is 30.2%, obtained in Chile in 2013. Although Chile is the world's largest copper producer, the Chilean government's share of the copper rent remains low. Chile introduced a mining royalty only in 2006 (Royalty I), which is progressive depending on the annual sale that exonerates the first 12,000 metric tons of copper produced. In 2011 (Royalty II), a tax reform introduced a second mining royalty ranging from 5% to 34.5% levied on each mining margin on a non-cumulative basis and 14% on the entire taxable margin where the operating margin exceeds 85%. The average annual production of copper is 830.841 metric tons, and the maximum production of 5,831,600 metric tons is reached in 2018 by Chile. The average index of the Polity2 score (4.9) indicates that the sample is composed of countries with fragile democratic regimes knowing that the variable indicates a strong democracy with an index equal to 12. As for copper prices, there is an average level of 5,398 US\$ per metric ton.

Table 2: Summary statistics

Variable	Observation	Mean	Std.deviation	Minimum	Maximum
Net ODA received (% of GNI)	243	3.785	6.270	-0.219	62.187
GDP per capita (constant 2017US\$)	240	8,847	7,579	233.939	24,249
Corruption	242	2.163	0.994	0.000	4.500
Political stability	252	-0.521	0.714	-2.474	1.089
Democracy	221	6.005	3.224	0.000	10.000
Autocracy	221	0.986	1.650	0.000	6.000
Political regime	228	4.917	4.687	-6.000	10.000
EITI membership	264	0.250	0.434	0.000	1.000
Government take	228	0.468	0.141	0.302	0.829

#### 4. Empirical results

The first part of Tables 3 provides evidence of the political regime's effect on the copper rent sharing. We can also point out from the results in the second part, how the political climate in which a ruling regime governs is likely to interact with the share of the copper rent between the government and private extractive companies. Finally, the findings presented in Table 4 give empirical support on how the political orientation of the ruling party can affect copper rent sharing while showing the difference in government-take according to their political orientation.

**The political regime, political climate, and copper rent sharing.** The estimate in column (1) of Table 3 provides evidence of the political regime on sharing the copper rent. The Polity2 score measures the impact of the political regime. One-point increases in the Polity2 score indicates more democracy. The significant impact indicates that political regime matters in the sharing of the mining rent and suggests that a democratic political regime would likely capture a larger share of the mining rent. The results are further reinforced when we test the varying effect of democratic regimes (column 2) and authoritarian regimes (column 3) respectively. The democracy score is positively linked, while the autocracy score is negatively linked to copper rent sharing. Our results are somewhat reminiscent of Ross (2001), who suggest that natural resources allow "rentier states" to tax less to escape accountability, thereby weakening the democratic process. Evidently, democratic regimes tended to capture a larger share of the rent to meet responsibilities vis-a-vis their citizens.

That being so, our empirical evidence of the effect of political regimes on copper rent sharing is in accord with Mitra *et al.* (2002) and (Dizaji *et al.* (2016). The authors stated that democracies might consider more social welfare and hence conduct tax reforms taking the form of higher taxation to provide funding for redistributive policies (eg., education, health). Moreover, in democracies, the constraints on both executive and legislative powers should be greater as they require accountability to a broad set of citizens at regular intervals. In contrast, dictatorships are mainly accountable to a smaller group of elites (e.g., military) and tend to allocate more resources to the military and security services. More, authoritarian regimes may foster an environment conducive to corruption and rent-seeking behavior, where officials and elites siphon off mining revenue for personal gain. This can result in a diminished government take of mining rent.

Considering the political environment in the estimate of the political system-rent sharing nexus, only some interaction variables were significant in all alternative regressions. As can be observed in the second part of Table 3, the interactions between Polity2 score with variables such as political competition, regime durability, military in politics, and the number of seats held by all opposition parties in the legislature, are statistically significant.

The useful insight from these findings is that the political environment matters for rent sharing through the politics of the regime. For instance, in a competitive political environment with diverse policy and leadership choices, government power tends to be less concentrated, leading to a weaker government-take from the ruling regime. This also suggests that strategic politicians may increasingly utilize less significant tax or parafiscal measures when faced with stronger electoral competition, in the sense of Bracco *et al.*, 2019.

Table 3: Political regime, political environment and copper rent sharing

VARIABLES	Political regime effect				Political environment effect					
	Polity2 score	Democracy score	Autocracy score	Corruption x ITIE	Political regulation	Political competition	Regime durability	Military in politics	Opposit. Seat in leg.	Opposit. Vote share
Political regime	0.006*** (0.004)	0.009*** (0.009)	-0.012** (0.015)	0.007*** (0.001)	0.004 (0.101)	0.029** (0.032)	0.000 (0.915)	-0.002 (0.518)	0.010*** (0.000)	0.005 (0.348)
GDP per capita, log	-0.117*** (0.000)	-0.123*** (0.000)	-0.115*** (0.000)	-0.116*** (0.000)	-0.119*** (0.000)	-0.110*** (0.000)	-0.113*** (0.000)	-0.128*** (0.000)	-0.095*** (0.000)	-0.127*** (0.000)
Net ODA received (% of GNI)	-0.006** (0.010)	-0.011*** (0.000)	-0.012*** (0.000)	-0.006*** (0.001)	-0.012*** (0.000)	-0.012*** (0.000)	-0.006*** (0.003)	-0.006*** (0.004)	-0.007*** (0.003)	-0.007*** (0.003)
Corruption	-0.090*** (0.000)	-0.088*** (0.000)	-0.080*** (0.000)	-0.081*** (0.000)	-0.090*** (0.000)	-0.067*** (0.000)	-0.095*** (0.000)	-0.095*** (0.000)	-0.097*** (0.000)	-0.058*** (0.004)
Political stability	0.124*** (0.000)	0.123*** (0.000)	0.113*** (0.000)	0.089*** (0.000)	0.121*** (0.000)	0.108*** (0.000)	0.116*** (0.000)	0.114*** (0.000)	0.113*** (0.000)	0.063* (0.064)
Dummy continent (LAC=1)	0.141*** (0.000)	0.105*** (0.000)	0.103*** (0.000)	0.127*** (0.000)	0.103*** (0.000)	0.111*** (0.000)	0.105*** (0.000)	0.147*** (0.000)	0.128*** (0.000)	0.094*** (0.000)
EITI membership				-0.205*** (0.000)						
Corruption x ITIE				0.074*** (0.001)						
Interaction with Parreg					0.001 (0.482)					
Interaction with Polcomp						-0.003* (0.082)				
Interaction with Durable							0.000*** (0.000)			
Interaction with Military								0.003*** (0.001)		
Interaction with Opp1seat									-0.000*** (0.000)	
Interaction with Opp1vote										0.000 (0.634)
Constant	1.679*** (0.000)	1.758*** (0.000)	1.739*** (0.000)	1.644*** (0.000)	1.764*** (0.000)	1.645*** (0.000)	1.681*** (0.000)	1.778*** (0.000)	1.562*** (0.000)	1.706*** (0.000)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	163	159	159	163	159	159	163	163	163	84
R-squared	0.740	0.766	0.765	0.766	0.767	0.772	0.772	0.754	0.800	0.868

Notes : \*, \*\*, \*\*\* denote statistical significance at the 0.01, 0.05 and 0.1% levels, respectively, and robust pval in parentheses.

We also emphasize that a stable political environment is a favorable factor for government take. In more democratic systems, governments with longer-lasting regimes may have the political stability and control needed to effectively manage and profit from mining activities, leading to a higher government share of mining revenue. Similarly, the military's involvement in politics can establish stability in the short term, leading the political regime to a higher rent share, especially when the latter is a democratic one.

Our empirical evidence also clearly shows that the pressure of opposition parties on the ruling regime changes the regime's incentives in sharing the rent. For example, in democratic regimes, when the number of opposition seats in the legislature is large, this diminishes the rent accruing to the State. We can suppose that when the government in power decides, for example, to pass a law to reform the mining code that could improve the sharing of the rent among the government and private companies, opposition parties may, for political reasons, vote against the government in order to prevent the law from being passed.

**Transparency, corruption and copper rent sharing.** To better understand the impact of good governance in the sharing of mining rent, it is instructive to consider whether the adoption of the transparency initiative has an impact on the government-take dependent on corruption. We investigate this question in column (4) of Table 3 by testing how EITI adoption and its interaction with corruption influence rent sharing in the copper sector. Before this, we test the individual effects of EITI adoption and corruption on government-take. We find a negative association between the adoption of the EITI and the government-take, implying that the countries that have adopted the EITI are taking a lower share of the copper rent compared to the non-ITIE members. This can be attributed to the fact that EITI member countries might adopt tax regimes with fewer distortions, as suggested by Laporte *et al.* (2022). Meanwhile, corruption has a diminishing effect on the mining rent that accrue to the State. Accordingly, countries suffering from corruption in the political sphere retain a relatively small fraction of the total copper mining rent. However, ITIE's emphasis on transparency can help curb corruption and rent-seeking behavior. Then, we introduce the interaction between EITI adoption and corruption. The estimated coefficient of the interaction is statistically significant. Corruption is a key channel through which the adoption of the transparency initiative improves government-take. Such results can be interpreted in two ways. The first sense that brings us back to the idea that corrupt countries do not join the EITI or can not become an EITI member, since there is a compliance period during which the candidate countries must comply with some requirements before being admitted, or a member country in which corruption has occurred may be struck. Second, the EITI's role is to improve the governance of natural resources while fighting corruption. As such, member countries are committed to enhancing transparency and accountability in the management of their extractive sector by implementing the EITI standard. The adoption of the EITI obliges to make the information available (on the financial statements of the extractive industries, mining agreements, exploration or exploitation permits) and to ensure the compliance of contracts between extractive industries and the government. These arguments

corroborate some previous results, according to which access to useful information leads to better governance, enhanced accountability, and may limit corruption (Reinikka *et al.*, 2005; Ejiogu *et al.*, 2019; Mejia Acosta, 2013). In the same sense, Kolstad *et al.* (2009) argues that transparency is crucial to reducing corruption but is insufficient in itself and that increased access to information should focus on the most important areas to mitigate the source curse. From this point of view, we support our empirical findings on the increasing effect of the implementation of the EITI on copper rent sharing based on the fact that compliance with transparency standards leads to good governance in the management of natural resources for a more effective rent sharing while reducing corruption.

**Government affiliation and copper rent sharing.** The estimates presented in Table 4 answer whether the ruling party's political orientation matters in the sharing of mining rents and if there are substantial improvements in the levels of mining rent taken by leftist, right-wing and centrist governments.

In the first step, we introduce these indicators into the regressions alternatively. Both estimations are controlled by the political system (political regime, or democracy and autocracy). Under all political systems, the results are consistent and display the same sign. The right-wing and centrist parties estimate displays a negative and statistically significant relationship, while the coefficient is slightly higher for centrist parties. This means that the government share of mining rent is weak in countries with the right and centrist parties in power.

Conversely, we found a positive relationship between the left-wing party and rent sharing, meaning that the rent share is higher with the left-wing party. One reason for these outcomes is the fundamental divergence between left and right-wing parties from an economic point of view. For example, the left is more interventionist, while the right is more likely to promote the market and privatisation while being pro-capitalist. In this way, left-wing parties are willing to tax mining rent more broadly to finance various redistribution policies. The work of Anderson (2021) has explored why left-wing fiscal policy differs and has found that the left uses different redistributive strategies, such as using progressive taxation to reduce inequality or maximising revenue and redistributing through generous transfers. Nevertheless, our empirical evidence suggests that left-wing parties use taxation of mineral resources for redistributive policy purposes following the socialist or communist ideologies they defend. This also explains the lower taxation of mining by right-wing parties, which are driven by meritocracy and instead encourage hard work and personal achievement. Even if inequalities can be justified for right-wing parties, one should not encourage weakness by redistributing too much income at the risk of discouraging the most enterprising.

Furthermore, the estimation strategy adopted in the column 4 differs from the previous one. This time, the dummy variable indicating the right-wing party has been excluded so that the comparison of the copper rent shares is carried out regarding this reference party. According to the estimates, left-wing governments levy a larger share of rent than right-wing governments. In contrast, the levels of mining rent levied by centrist

governments do not differ fundamentally as its coefficient is not statistically significant. The results are consistent with previous findings whereby rent sharing decreases with right-wing, also with centrist parties but slightly higher in quantitative terms, and increases with left-wing governments.

Table 4: Government affiliation and copper rent sharing

	(1)				(2)				(3)			
	Polity2 score				Democracy				Autocracy			
Political regime	0.001 (0.743)	0.004 (0.359)	0.001 (0.732)	0.001 (0.756)	0.003 (0.646)	0.007 (0.313)	0.003 (0.658)	0.003 (0.680)	-0.001 (0.938)	-0.007 (0.505)	-0.001 (0.887)	-0.001 (0.913)
Right-wing party	-0.067*** (0.003)				-0.067*** (0.004)				-0.068*** (0.003)			
Centrist party	-0.059** (0.011)				-0.059** (0.011)				-0.059** (0.011)			
Left-wing party	0.083*** (0.000)				0.082*** (0.000)				0.083*** (0.000)			
Centrist party ==2	0.006 (0.832)				0.005 (0.839)				0.006 (0.812)			
Left-wing party ==3	0.085*** (0.000)				0.085*** (0.000)				0.086*** (0.000)			
GDP per capita, log	-0.021 (0.367)	-0.040* (0.077)	-0.017 (0.428)	-0.016 (0.460)	-0.023 (0.330)	-0.042* (0.069)	-0.019 (0.397)	-0.018 (0.426)	-0.017 (0.421)	-0.035* (0.099)	-0.014 (0.479)	-0.013 (0.513)
Net ODA received (% of GNI)	-0.003 (0.376)	-0.002 (0.430)	-0.001 (0.608)	-0.001 (0.606)	-0.002 (0.398)	-0.002 (0.479)	-0.001 (0.633)	-0.001 (0.630)	-0.003 (0.373)	-0.003 (0.384)	-0.001 (0.598)	-0.001 (0.598)
Corruption	-0.059*** (0.000)	-0.039** (0.011)	-0.045*** (0.001)	-0.046*** (0.002)	-0.060*** (0.000)	-0.042*** (0.010)	-0.046*** (0.001)	-0.047*** (0.002)	-0.058*** (0.000)	-0.036** (0.017)	-0.043*** (0.001)	-0.045*** (0.002)
Political stability	0.070*** (0.003)	0.059** (0.015)	0.046** (0.038)	0.046** (0.039)	0.071*** (0.003)	0.060** (0.013)	0.047** (0.036)	0.047** (0.037)	0.069*** (0.003)	0.056** (0.020)	0.045** (0.041)	0.046** (0.041)
Dummy continent (LAC=1)	0.039 (0.142)	0.057** (0.038)	0.058** (0.019)	0.058** (0.024)	0.039 (0.137)	0.058** (0.035)	0.059** (0.019)	0.058** (0.023)	0.038 (0.149)	0.056** (0.043)	0.058** (0.020)	0.057** (0.025)
Constant	0.791*** (0.000)	0.908*** (0.000)	0.651*** (0.001)	0.643*** (0.002)	0.802*** (0.000)	0.913*** (0.000)	0.659*** (0.001)	0.652*** (0.002)	0.764*** (0.000)	0.880*** (0.000)	0.630*** (0.002)	0.622*** (0.002)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112	112	112	112	112	112	112	112	112	112	112	112
R-squared	0.248	0.229	0.349	0.349	0.249	0.230	0.350	0.350	0.247	0.225	0.348	0.349

Notes : \*, \*\*, \*\*\* denote statistical significance at the 0.01, 0.05 and 0.1% levels, respectively, and robust pval in parentheses.



Our focus on political regimes, the political climate, or government affiliation does not mean that other factors do not matter in the copper mining rent sharing. Thus, let us focus on the control variables used in our estimations including GDP per capita, Aid ratio to GNI and political stability which are all statistically significant.

The effect of political stability is positively and statistically significant. It must be said that political stability constitutes a guarantee and insurance for foreign investors. Mining operations especially evolve in a high-risk environment as they require a massive initial investment in both the exploration phase without any revenue earned as well as the exploitation phase. However, countries, where the likelihood of the government being destabilized or reversed by political violence and terrorism is low can successfully attract multinational mining companies. As a result, these countries can benefit from political stability in the shape of a larger share of the mining rent. In all specifications, the results are robust and have shown that political stability would consistently lead to a larger government-take.

An increase in real GDP per capita reduces the magnitude of the government-take. A possible explanation that can be used here is that developed countries have fewer financial resource problems and, therefore, can afford a low level of rent. However, the optimal taxation theory can also explain this outcome. This theory studies the design and implementation of taxes that ensure the highest social welfare function while increasing the maximum revenue. For example, Scully (1996) examines the growth maximising tax rate and shows that the tax burden increases with the growth rate to its optimal level, whereby it declines.

Furthermore, the empirical evidence shows a negative relationship between aid and government-take. Such a finding is not surprising, as a large sample of the aid-taxation literature points to a negative relationship between aid and taxation (Bhushan et al, 2012; Brautigam et al, 2004; Perez Nino *et al.*, 2014). The theoretical foundation behind this is that taxes are a "scrutinized" source of revenue as they arise from the social contract between taxpayers and the government. In contrast, as an "unscrutinized" source of revenue, aid can lower tax revenues or discourage governments from reforming their tax systems and raising taxes.

Moreover, to provide a comparative estimate of government-take, we introduce a dummy continent variable into the estimations, which is set to 1 for the LAC countries. We do find a statistically significant and positive estimate. This suggests a fundamental difference in copper rent sharing between Latin American and African countries. More precisely, Latin American countries capture a higher share of the copper rent than African countries. All our empirical evidence strongly reinforces this statement.

#### 4.1. Robustness result based on "representative copper mine"

This section tests the robustness of the results by varying the economic assumptions of the "representative mine", particularly the copper price. Thus, we use the historical copper price for estimating the AETRs (government take). The objective is to introduce variability in copper prices in contrast to the baseline model, which considers an average price given the other economic assumptions taken as an average of the copper mine

information from which the representative mine has been constructed. The econometric specification is similar to that of equation 3. However, the value of the government share changes due to the variability in copper prices. This change is done while keeping all other assumptions of Table 1 constant.

The estimation findings are presented in Table 5. The first part of the table summarises the estimated effect of the political regime on the government-take. There is no significant change in the estimated effects of either the political variables or the other variables introduced as controls in the model. The results confirm that, even under the assumption of copper price variability in the calculation of the government-take, the government's share is higher in the democratic regime while lower in authoritarian ones. This prediction is confirmed by the positive estimation of the variable Polity2 score, and the varying effects of democracy score (positive) and autocracy score (negative) estimates. As for the control variables, they are all significant and show the same signs as estimated in the baseline model. The dummy continent variable, which allows for a comparative analysis between the two continents, is still significant confirming that Latin American governments capture a higher share of the rent, once we account for the variability in the copper price.

The second part of the table summarises the results of estimating the effects of government party affiliation on pension sharing. The estimated effects of government party affiliation are similar to those estimated in the basic model. We note that whatever spectrum of the political regime in place, the right-wing and centrist parties capture a lower share of the rent but slightly greater in the latter case. In contrast, the left-wing party capture a larger share. As for the control variables, they are all still significant and have the same sign as in the baseline model. On the other hand, the estimate confirms the results in comparative analysis, according to which Latin American governments capture a greater share than African governments.

The variability in the price of copper does not provide additional information on the relationship between rent sharing and political regime or ruling party affiliation schemes.

Table 5: Robustness on the "representative copper mine" using historical copper world price

VARIABLES	Political regime effect			Government party affiliation effect								
	Polity2	Democracy	Autocracy	Polity2			Democracy			Autocracy		
Political regime	0.007*** (0.002)	0.010*** (0.003)	-0.013** (0.012)	0.004 (0.214)	0.006** (0.044)	0.004 (0.227)	0.007 (0.166)	0.010** (0.040)	0.007 (0.192)	-0.006 (0.425)	-0.012 (0.107)	-0.007 (0.374)
Right-wing party				-0.063*** (0.010)			-0.063** (0.010)			-0.065*** (0.008)		
Centrist party					-0.045** (0.012)			-0.044** (0.012)			-0.045** (0.015)	
Left-wing party						0.071*** (0.000)			0.070*** (0.000)			0.072*** (0.000)
GDP per capita, log	-0.110*** (0.000)	-0.116*** (0.000)	-0.108*** (0.000)	-0.017 (0.387)	-0.035* (0.071)	-0.015 (0.458)	-0.020 (0.335)	-0.038* (0.067)	-0.018 (0.412)	-0.010 (0.534)	-0.027 (0.101)	-0.009 (0.597)
Net ODA received (% of GNI)	-0.006** (0.010)	-0.012*** (0.000)	-0.012*** (0.000)	-0.002 (0.260)	-0.002 (0.255)	-0.001 (0.489)	-0.002 (0.304)	-0.002 (0.326)	-0.001 (0.554)	-0.003 (0.232)	-0.003 (0.193)	-0.002 (0.439)
Corruption	-0.089*** (0.000)	-0.087*** (0.000)	-0.078*** (0.000)	-0.057*** (0.000)	-0.040*** (0.001)	-0.044*** (0.000)	-0.059*** (0.000)	-0.044*** (0.000)	-0.046*** (0.000)	-0.054*** (0.000)	-0.035*** (0.004)	-0.040*** (0.000)
Political stability	0.115*** (0.000)	0.115*** (0.000)	0.103*** (0.000)	0.058** (0.011)	0.050** (0.023)	0.038* (0.078)	0.060*** (0.009)	0.053** (0.017)	0.040* (0.068)	0.056** (0.015)	0.047** (0.038)	0.035* (0.099)
Dummy continent (LAC=1)	0.121*** (0.000)	0.085*** (0.000)	0.083*** (0.000)	0.016 (0.290)	0.030** (0.016)	0.033** (0.018)	0.017 (0.269)	0.031** (0.015)	0.034** (0.018)	0.014 (0.331)	0.028** (0.021)	0.031** (0.020)
Constant	1.602*** (0.000)	1.685*** (0.000)	1.661*** (0.000)	0.727*** (0.000)	0.841*** (0.000)	0.620*** (0.002)	0.738*** (0.000)	0.846*** (0.000)	0.627*** (0.001)	0.690*** (0.000)	0.803*** (0.000)	0.587*** (0.002)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	163	159	159	112	112	112	112	112	112	112	112	112
R-squared	0.732	0.764	0.760	0.277	0.231	0.356	0.280	0.235	0.358	0.272	0.222	0.351

Notes: \*, \*\*, \*\*\* denote statistical significance at the 0.01, 0.05 and 0.1% levels, respectively, and robust pval in parentheses.

## 5. Concluding remarks

Our study addresses the issue of rent sharing and its determinants for the copper-producing countries in Africa and Latin America, which are among the world's leading copper producers. Our study focuses on the tax policy choices that result from the political and institutional organization of the countries.

The calculation of rent-sharing, the average effective tax rate (AETR), is based on an original database. Mining laws and regulations have been surveyed over a long period for the twelve countries, six in Latin America and six in Africa. The main taxes and levies that apply to the mining sector have been retained. An industrial representative mine for copper was established based on feasibility studies of large industrial mines in Africa and Latin America. Thus, the AETR calculated is a relevant indicator of the mining tax policy established by law and results from each country's tax design for each year.

Therefore, we work over a long period with a double geographical and temporal dimension to have significant heterogeneity in the choice of mining tax policies within and between countries, which allows us to consider the political orientation and alternations. Our original database is then combined with four other databases, Polity V database, DPI database, ICRG database, and Worldwide Governance Indicators, to study the determinants of mining tax policies. We pay particular attention to political regimes, political environments, and government party affiliations (right-wing, centrist, and left-wing), to explain mining tax policies. Thus, we use interaction variables between political regimes and variables such as political regulation, political competition, regime sustainability, military in politics, the number of seats held by opposition parties in the legislature, and the share of total votes obtained by all opposition parties in the last election.

Our results suggest that a democratic regime is likely to capture a larger share of the rent than an autocratic regime. Our results also show that the institutional environment, regardless of the political regime, influences rent sharing, as does EITI adoption. Democratic regimes might consider social welfare more and hence conduct tax reforms taking the form of higher taxation to provide funding for redistributive policies. In addition, the constraints on executive and legislative powers should be more significant as they require accountability to a broad set of citizens regularly in democratic regimes.

Finally, our results suggest that left-wing governments capture a larger share of the rent than right-wing and centrist ones. One reason for these results is the fundamental divergence between left and right-wing parties from an economic perspective. Left-wing governments are more interventionist, while right-wing governments are more pro-business. Left-wing parties are willing to tax mining revenues more heavily to fund development projects and various redistribution policies.

However, whatever the political regime or the political affiliation of the governments in place, the share of the rent captured by the State remains low with the theory of optimal taxation. Governments need to acquire the quantitative tools necessary to understand the sharing of rents. Only then will they be able to carry out tax reforms that

improve the mobilization of tax and non-tax revenues and thus meet the development challenges.

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