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# Is the conventional wisdom on resource taxation correct? Mining evidence from African countries' tax legislations

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## 1. Introduction

The Addis-Ababa Conference on Financing for Sustainable Development in July 2015 stressed the importance for developing countries to increase the mobilization of domestic fiscal resources. Taxing mineral resources is challenging for all mineral-rich countries, particularly many African countries.

The tax regime results from a trade-off between the need to attract the international investors necessary to extract mineral resource rent and sufficient capturing of this rent by and for the government (Laporte and Rota-Graziosi, 2015). This trade-off is particularly challenging by the characteristics of the extractive sector (non-renewable resources, irreversible investments, high uncertainty, and risks) and international competition to attract foreign technical expertise, which is limited but essential to extract the resource.

A multinational firm's decision to invest in a mining project depends on a complex decision-making process that considers the physical and economic characteristics of the mine, the mining tax design, the reliability of the host country's government in meeting its commitments... and, consequently, the various risks that condition the expected profitability of the investment (Daniel et al., 2010). Changes in government policy and/or political institutions could affect the investment behaviour of multinationals, as the risk premium is introduced into any investment project and, therefore, the location decision is influenced by political risk (Busse et al., 2007). Governments, which need foreign investments to extract resources, cannot ignore the strategies of multinational firms when defining their mining tax design. The question of risk is thus the core of the trade-off between attractiveness and taxation of the rent. Risk therefore influences the investment decision, the level of taxation, and in consequence the share of the rent that could be captured by the governments if the mining projects are implemented.

In a recent paper, Adebayo et al. (2021) theoretically and empirically investigate the determinants of government take based on a standard model of investment decisions under uncertainty with an extension to introduce political economy variables, notably governments' preference for unofficial side payments. These authors combined a microeconomic database on gold mining projects around the world with data for three years (2015-2017) with a macroeconomic database to study the determinants of government take empirically. Adebayo et al's government take is defined as "the ratio of total payments to the government from a mining project (including taxes, fees, and royalties) relative to the mining company's pre-tax net revenue from the same project", over a three-year period. The empirical results for political economy

variables align with the predictions of the extended investment theory model but in contrast for the risk. Higher country risk is associated with higher government take.

Our paper is different but complementary to that of [Adebayo et al. \(2021\)](#). Our approach differs on several points. [Adebayo et al.](#)'s microeconomic database covers active mines on all continents, located in both developed and developing countries, potentially exhibiting very high heterogeneity in terms of mines, firm strategies, and tax policies. We are interested in the government take over time for twenty-one African gold-producing countries. We define government take as the share of the rent that goes to the government. The rent is "the amount by which revenues exceed all production costs, including those of discovery and development, as well as the normal return on capital" ([IMF, 2012](#)). [Adebayo et al.](#)'s measure of government take differs from ours and moves away from the concept of rent. Their government take is expressed as a percentage of net revenues from mining operations over a three-year period, 2015-2017. Because mining project revenues vary significantly from one period to another depending on the life cycle of each project and the world gold price cycle, this measure does not accurately reflect the share of the rent that the government captures for each project. 2015-2017 are a period of falling gold pricing after the 2012 peak. Thus, as most tax regimes are regressive ([Laporte et al., 2022](#)), low prices automatically translate into a high government take over this period.

We are concerned about the government mining tax policy choices in an environment of uncertainty and risk country. Our question is: Does country risk influence mining tax design and, in consequence, de jure government take? The Adebayo measure does not fully address this question. The government take based on actual firm payments can result from government's choices (general laws and/or specific agreements), but also poor capacity of revenue administration, or more or less aggressive tax optimization strategies of firms. To answer our question, we prefer to calculate the government take as the share of the rent that the government hopes to capture through the implementation of his mining tax design. Ideally, it is necessary to measure the rent for each mining project and calculate the expected government's revenue over the entire lifespan of the project. No database records cash flows from different mining projects worldwide over a long period. Also, we calculate a potential/de jure government take based on the complete application of laws and regulations for three "representative mines". First, we assume that specific agreements do not significantly deviate from general mining tax law. Indeed, specific 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 in African countries have tended to restore the primacy of the mining code and the general law over mining agreements (Laporte et al., 2022). Second, these mines are representatives of large industrial gold mines in Africa by cross-referencing data from several feasibility studies. Thus, differences in de jure government take related to the geological, economic, and financial characteristics of each project are thus neutralized for projects in the same country and between countries. This method assumes that the choice of tax design and thus de jure government take do not depend on the economic and financial characteristics of the different projects. This assumption is balanced through our robustness tests since the results are replicated with different grades of mine.

We work over a long period, from 1991 to 2021, to have significant heterogeneity in mining tax policies and country risks within the same country and between countries. We use the composite risk score from ICRG Table 2B to measure the country risk premium. Finally, we use political regimes for the control variables and use interaction variables between risks and political economy variables to investigate the different transmission channels precisely.

Several results emerge from our analysis. First, we reconcile Adebayo et al.'s theoretical model with empirical results. Higher country risk is associated with lower de jure government take. Governments consider their country risk when designing their tax regime to attract foreign investors. Second, our results show a complex relationship between country risk and government take, which is certainly nonlinear. The positive coefficient on country risk squared is consistent with Adebayo et al.'s results. Third, our results confirm political regime variables' direct and indirect effects on the government take. When country risks increase, weaker political institutions exacerbate the impact of higher country risk on de jure government take. Fourth, we track different transmission channels such as socioeconomic conditions, internal and external stability, corruption, religious tensions, ethnic tensions, and democratic accountability.

Finally, Adebayo et al.'s approach and our own are complementary. Our approach questions the government's choice of tax regime in the presence of country risk. It's a de jure approach. Adebayo et al.'s approach is de facto. It questions firms' tax optimization strategies in the face of country risk, and in particular their ability to circumvent the de jure tax rules.

The rest of the article is organized as follows. Section 2 outlines the steps for estimating the government take. Section 3 describes the data sources, the measurements of selected variables, and the empirical specification. Section

4 discusses the empirical results and performs some robustness checks. The last section concludes and derives some policy implications.

## 2. Measuring government take

A discounted cash-flow model (DCF) is built with data from a representative mine and tax data from each country to calculate the government take (Laporte et al., 2018). The DCF model structure is connected with the investment theory model used by Adebayo et al. (2021). The government take of a mining project corresponds (in percentage) to the share of the rent taken by the government. It is the ratio of the discounted sum of all revenues the government collects from the mine to the discounted sum of the net pre-tax cash flows it generates. The de jure government take 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 investment and production costs.

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 take the opportunity cost of capital into account. 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 ore selling,  $C_t$  the unit cost of operating cost,  $K_t$  the capital cost (initial investment and renewal investment), and  $i$  the discounted rate.

The government take (GT) is then the discounted sum of all levies collected by the Government ( $R_t$ ) on the pre-tax NPV, namely:

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

This measurement, in line with the Average Effective Tax Rate calculation (Devereux et al., 1998), reflects the mining tax policy choices. It is a potential government take with the entire application of laws and regulations. The tax regime applied to the representative mines includes eight tax or parafiscal levies taken from the legislation and regulations in force. The data is taken from the Ferdi legal and fiscal database on mining taxation<sup>1</sup>, and concerns fixed duties, surface royalties, mining royalties, corporate income tax, flat-rate minimum tax, special tax on super-profits, withholding taxes on interests

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<sup>1</sup> <https://fiscalite-miniere.ferdi.fr/>

and dividends, and state equity. These key tax instruments shape tax design and therefore define governments' mining tax policy choices.

The de jure government take is connected to the country risk, in particular via the discount rate. The discount rate ( $i^*$ ) can be broken into risk free interest rate ( $r$ ) and country risk premium ( $\delta$ ) such that  $i^* = r + \delta$  considers the time value of the money and the project risk. Hence, the higher the country risk ( $\delta$ ), the higher the discount rate. The risk premium can be very decisive, especially since the required return on investment depends on it:

$$NPV(.) = \sum_{t=0}^T \frac{Z_t - C_t - K_t}{(1 + r + \delta)^n}$$

As the discount rate increases, the present value of future cash flows decreases at a faster rate. This phenomenon is attributed to the time value of money, whereby future cash flows are more heavily discounted. Consequently, this leads to a non-linear relationship between the discount rate and the Net Present Value (NPV). For a given tax design, it may also result in a non-linear relationship between government take and the country risk premium. For instance, non-linear relationship has been found by [Adebayo et al. \(2021\)](#) between Mine age and government take meaning that young and old mines pay the highest rate.

### 3. Data and estimation strategy

#### 3.1. Data

The panel structure in our dataset exhibits an inherent imbalance, with observations spanning 19 distinct countries over various time periods. These temporal spans vary significantly, extending from as short as T=4 periods for Angola to as long as T=28 periods for Mali. This disparity in the duration of observations across countries underscores the complexity of our dataset, which presents both challenges and opportunities for in-depth analysis and interpretation.

##### 3.1.1. Gold mining projects

The government take dataset, sourced from the Ferdi fiscal and legal database (Laporte et al., 2018), covers twenty-one resource-rich countries with significant gold mining activities. These countries either possess at least one operational industrial mine or have proven but untapped mineral resources. Our analysis uses an indicator that measures the sharing of mineral resource rents between governments and investors. The calculation is based on national legislation and representative economic data specific to African mines. Three standard structures commonly found in African gold mines assess the sensitivity of government take. These structures differ in mineral

content and are categorized as low-grade, medium-grade, and high-grade mines. Each structure exhibits distinctive economic characteristics such as mine lifespan, production capacity, mineral reserves' content, capital expenditure (Capex), and operating expenditure (Opex) (Table 1). Two hypotheses to calculate annual cash flows are worth highlighting. First, capital costs are funded through borrowing up to 90% or limited by the thin-capitalisation ratio set out in the country's legislation. Loans are assumed to have been obtained from non-resident agents, repayable in constant instalments, over a maximum duration of five years and at an interest rate of 6%. Second, the payment of dividends to non-resident shareholders represents 20% of the annual earnings after tax, rising to 100% of such earnings during the final year of production. Accumulated earnings not paid out during the course of the project are assumed to be used for internal financing or extending the mine. Where the government requires the company to transfer a share of its capital to it free of charge, the payment of dividends is deemed to have priority.

Table 1. Economic assumptions for the three 'standard mines'

	Low-grade, open-pit	Medium-grade, open-pit	High-grade, open-pit and underground
Life cycle	13 years	13 years	13 years
Area	150 km <sup>2</sup>	150 km <sup>2</sup>	150 km <sup>2</sup>
Stripping ratio	1/9	1/9	1/9
Mineral grade	1.8 g/t	3.0 g/t	4.0 g/t (open-pit); 5.5 g/t (underground)
Recovery rate	86%	88%	88% (open-pit); 95% (underground)
Initial investment	USD 190 million	USD 150 million	USD 290 million
Length of investment	2 years	2 years	2 years
Renewable investment	USD 18 million	USD 13.5 million	USD 22.5 million
Extraction costs	USD 2.5/t of waste rock mined	USD 2.8/t of waste rock mined	USD 3/t of waste rock mined
Processing costs	USD 15/t of mineral processed	USD 20/t of mineral processed	USD 22/t of mineral processed
Administrative costs	USD 3.5 million/year from year 3	USD 4 million/year from year 3	USD 5.1 million/year from year 3
Refining and sales costs	USD 5/oz	USD 5/oz	USD 5/oz



### 3.1.2. De jure government take

Our dependent variable, the de jure government take, is firstly derived from the characteristics of a low-grade gold mine with an average gold price of 1,500SD/oz. This choice closely aligns with the gold mines found in Africa. However, de jure government take data from the medium and high-grade mine structures are used in additional regressions to examine the robustness of the relationship between the country risk premium, government take, and other determinants.

Figure 1. Average de jure government take and policy instruments by types of mine

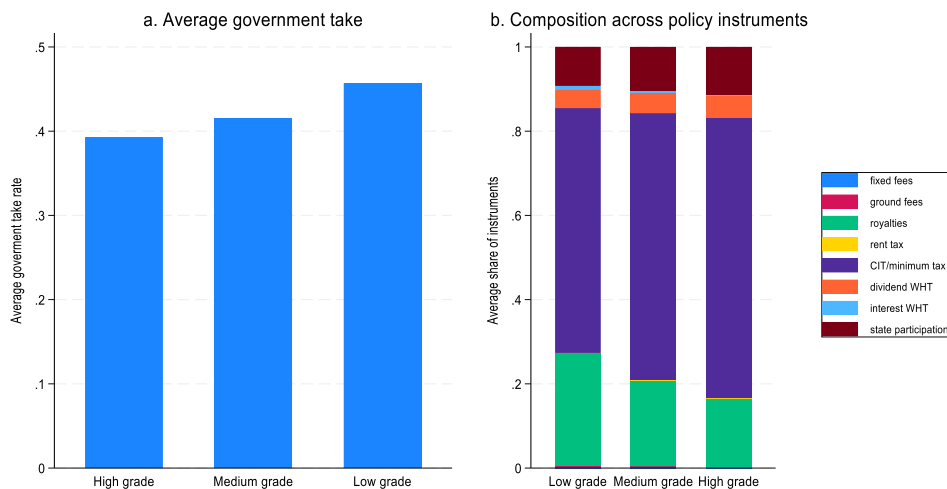


Figure 1 shows the average government take and the contribution of each tax instruments over the three representative mines computing using a gold price of \$1500/oz. From (a), the government take is higher on low grade gold mining projects, meaning a much higher de jure government take in case levies are applied to low-profit mines compared to medium- or high-profit ones. From (b), on the average, approximately 85% of the de jure government take comes from corporate tax and ad valorem mining royalties, with state participation accounting for nearly 10%.

Figure 2. Trend in de jure government take by types of mine

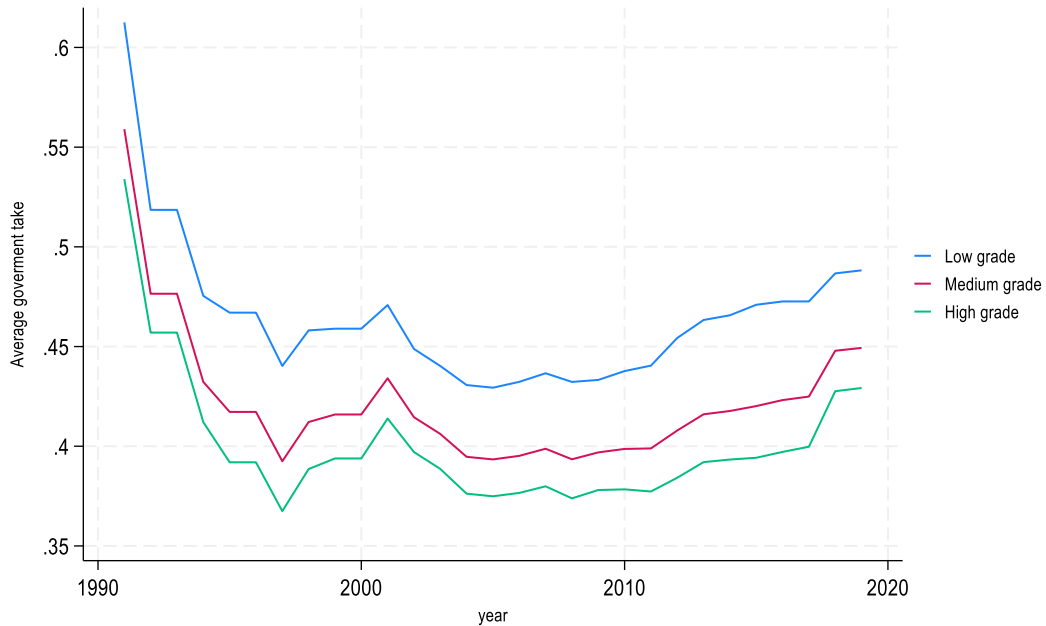


Figure 2 shows the annual trend in the average government take for the three representative mines at a gold price of \$1500/oz. Over time, a downward trend in the de jure government take for each grade of mine is observed until 2008, the year of the first major boom in the world gold price. However, after that year, the trend shifts upwards due to successive booms. This trend implies that some countries are adjusting tax designs during gold price booms to demand a larger of the government take.

Figure 3. Average de jure government take across countries

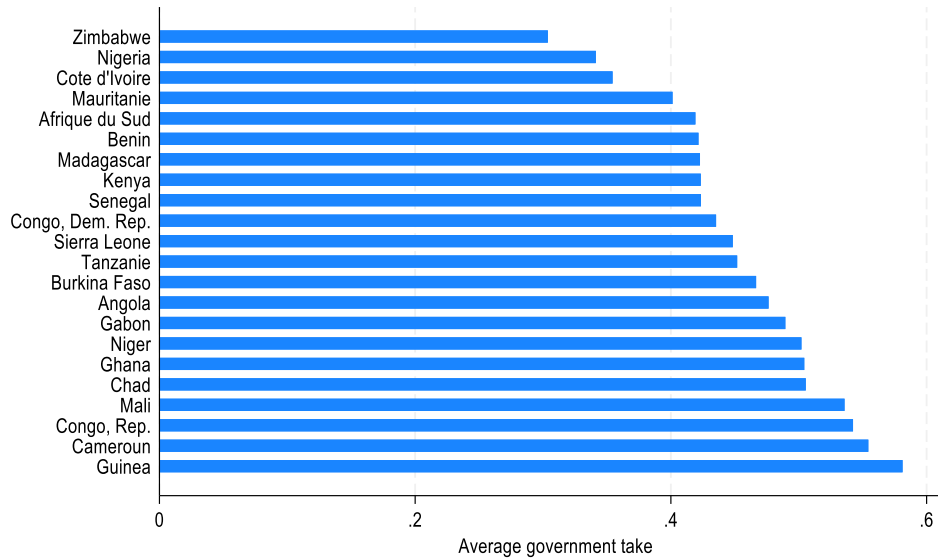


Figure 3 illustrates the average de jure government take across countries for the representative low-grade mine, considering a gold price of \$1500/oz. We note some heterogeneities in the jure government take. Countries such as Zimbabwe, Côte d'Ivoire, and Nigeria are among those that would capture a lower share, specifically less than 40%. Meanwhile, Mali, the Republic of Congo, Cameroon, and Guinea are among the countries with the highest average de jure take rate.

Figure 4. Variations in the jure government take by country over the sample period

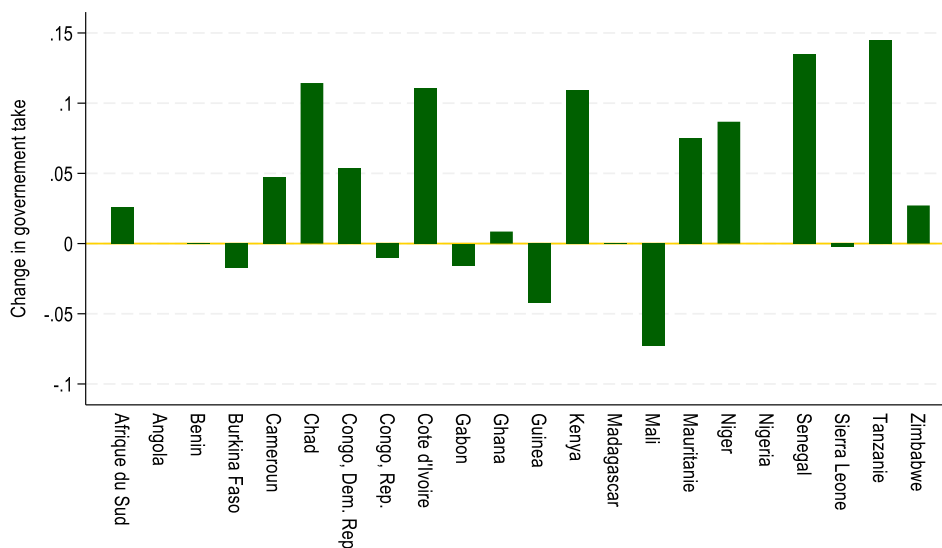


Figure 4 shows the variations in the jure government take by country over the sample period, using the representative low-grade mine with a gold price of \$1500/oz. In countries where the bars are located above the  $y=0$  axis, an increase in take rate was observed, with Tanzania and Senegal leading the list, both experiencing an increase of more than 10 percentage points. Conversely, countries with bars below the line experienced a decline, with Mali losing nearly 7 percentage points, followed by Guinea. No apparent change was observed in countries where no bars were represented, such as Angola and Nigeria.

### 3.1.3. Political economy variables

The primary objective of this paper is to reexamine the relationship between the country's risk and government take, building upon the research conducted by [Adebayo et al. \(2021\)](#). Contrary to their model's predictions, their study discovered a positive association between the country's risk premium and government take in gold mining projects. Our variable of interest is the country's risk. We use the composite risk score from ICRG Table 2B to measure the country risk premium. This score comprises political risk (maximum of 100 points), financial risk (maximum of 50 points), and economic risk (maximum of 50 points). The total points from these three indices are divided by two to determine the weights included in the composite country risk score. The highest overall score (theoretically 100) indicates the lowest risk, while the lowest score (zero) suggests the highest risk. In order to facilitate the interpretation of statistical results, the index is rescaled from a range of 0, indicating low risk, to a range of 100, indicating high risk. Then, the country risk premium is calculated by subtracting the index from 100.

Additionally, we emphasize the significance of political risk factors as they serve as indicators for assessing the political stability of countries, a crucial element in attracting investors to the high-risk mining sector that necessitates substantial investments ([Zall'e, 2023](#); [Khoshnoodi et al., 2022](#); [Arezki and Gylfason, 2013](#)). The country risk premium variable would exhibit a close association with the twelve distinct political

risk components employed by [the Political Risk Services \(2021\)](#) to evaluate the political stability of countries. These components encompass government stability, socioeconomic conditions, internal and external conflicts, corruption, law and order, military in politics, democratic accountability, investment profile, bureaucracy quality, and religious and ethnic tensions. We use these factors to augment the explanatory power in predicting government take in gold mining projects. These factors focus on political risk aspects, precisely political sources that pose risks to the profitability and security of foreign investments. They offer various measures of political (in)stability and institutional quality, which are crucial in the literature on resource rents and investment theory.

As a further step, we use the Polity2 score variable from the Polity V database ([Marshall et al., 2019](#)) to consider the effects of the political regime on de jure government take and check how various types of regimes can mitigate or reinforce this relationship throughout the country risk. As such, we can test the varying effects of democratic and authoritarian regimes in the spirit of [Caselli and Tesei \(2016\)](#); [Haber and Menaldo \(2011\)](#); [Ajide et al. \(2020\)](#), and [Andersen and Aslaksen \(2013\)](#), among others. The Polity2 score is calculated by evaluating the constraints imposed on the chief executive, the level of competitiveness in political participation, and the openness and competitiveness of executive recruitment. The score ranges from -10 to +10, where higher values indicate the presence of stronger democratic institutions.

#### *3.1.4. Others control variables*

Some other relevant variables were also used to control the estimate of the relationship between government take and country risk in the interests of ensuring that our model does not suffer from missing variable bias. We include all the control variables simultaneously, as Table 11 in Appendix indicates no potential collinearity among the explanatory variables.

To account for the role of the level of development in explaining the sharing of mining rent, we include the variable GDP per capita (constant 2015 US\$). GDP per capita is calculated as the gross domestic product divided by the mid-year population, expressed in natural logarithms. This data is obtained from the World Development Indicators of the World Bank. The level of development is relevant, as highlighted by [Laporte et al. \(2022\)](#), due to the enhanced capability of tax administrations in more developed countries to handle less distortive tax systems that rely on profits-based taxation.

We also use the variable regime durability from the Polity V database as a control for the stability and longevity of a political regime and the extent to which the government claims a take from mining activities. It is a measure used to quantify the length of time since the last regime change or the end of a transition period characterized by the absence of stable political institutions. By assigning the first year of a new polity as "year zero" with a value of 0, each subsequent year adds one to the value, indicating the passage of time without a regime change. The higher the value of the regime duration variable, the more durable or stable the regime is. It indicates the years since a significant political shift, suggesting higher institutional stability and continuity. Existing studies have examined the impact of natural resource abundance on the durability of political regimes. For instance, resource rents enhance regimes'

durability in countries with low political risks (Zall'e, 2023). Conversely, discovering natural resources can trigger revolutions, especially in countries with weak institutions (Cabrales and Hauk, 2011), thereby reducing the durability of the political regime. However, there is an interest here in taking the durability of the political regime into account when analyzing a potential link between country risk and the sharing of mining rents.

As a measure of good governance in the extractive sector, we use the variable EITI adoption, which is constructed using data on member countries and the respective adoption year available on the EITI website. Haufler (2010) mentioned that the global promotion of transparency in the extractive sector represents a suitable solution for addressing governance weaknesses in resource-rich developing countries. The EITI is a global standard for promoting good governance in managing oil, gas, and mineral resources. It is an initiative aimed at enhancing the management of natural resources, combating corruption, and mitigating conflicts (Sovacool and Andrews, 2015; Epremian et al., 2016; Asgill, 2012; Papyrakis et al., 2019), constitute a credible signaling mechanism to investors (Fraser, 2022) and signal of commitment to stable natural resource management (Malden, 2017). So, the good governance has an effect on actual government take but also on de jure government take because the reduction of unofficial side payments could lead companies to accept a higher level of taxation by the government. For member countries, the variable is assigned a 1 in years when they are part of the initiative and 0 otherwise. Transparency and good governance will lead to an increase in the government take of mining revenues from gold mining projects.

### 3.2. Estimation strategy

We now describe the estimation strategy for predicting de jure government take from country risk changes. The benchmark model assumes a unidirectional relationship between the government take and the country's risk premium. In each main regression, the control variables included are level of development, transparency, regime durability, political regime, and year-fixed effects. Specifically, we estimate the model:

$$GT_{it} = \alpha + \psi Crisk_{it} + \delta Control_{it} + \beta Interaction + \gamma_t + \varepsilon_{it} \quad (3)$$

where,  $GT_{it}$  represents the de jure government take in country  $i$  at period  $t$ , and  $\alpha$  is the constant term. The parameter  $\psi$  captures the different slopes of the de jure government take as a function of various levels of the country-specific risk premium. The estimated parameter  $\delta$  captures the effects of the control variables. The parameter estimate  $\beta$  captures the marginal effect of the interaction between the country risk premium and factors likely to explain government take, regardless of whether they are part of the country risk premium. The parameter  $\gamma_t$  represents time dummies for each year, capturing shocks common to all countries. Furthermore,  $\varepsilon_{it}$  represents the error term. We perform Pooled OLS regression with Driscoll-Kraay's methods for obtaining standard errors that are consistent to heteroskedasticity and autocorrelation. As such, it should be noted that there is little evidence that within-country changes over time driving the results. Rather, clustering standard errors is probably of greater importance if most of the variation is coming from cross-country variation.

The political regime may also play an essential role in explaining the government take in mining projects. However, it is worth noting that the country risk premium is a composite index derived from annual averages of various risk factors, including political, financial, and economic aspects. Consequently, any changes in the range of political regimes would impact the country's risk premium's magnitude. Therefore, a clear connection exists between the government take and the political regime through the country's risk premium. It is why the political regime variables (Polity2, democracy, and autocracy scores) were introduced, each with its respective interaction with the country risk premium.

To extend our understanding of the complex links between country risk and government take, we suspect that country risk may have a nonlinear relationship with de jure government take. We then regress the variables country risk, square, and cube on de jure government take simultaneously.

Thereafter, to better grasp the various signs of the estimated coefficients of country risk and identify the relevant channels, we focus on the political risk factors that contribute to the components of the country risk premium. The underlying argument is that any changes in these factors would result in corresponding adjustments to the country's risk premium. Consequently, there is an indirect relationship between these factors and the de jure government take. Then, in practice, we increase the estimates of each of these factors and subsequently incorporate their interaction with the country risk premium. This procedure offers the advantage of providing plausible explanations for the varying slopes of the de jure government take based on the country's risk level.

As part of a robustness check, we focus on the measurement characteristics of the representative gold mine used to calculate de jure government take measures. Therefore, we replicate the regressions using the government take data obtained from medium and high-grade mines, bearing in mind that the baseline estimates were based on low-grade mines. Summary statistics of the variables used in the analysis are presented in Table 2, and the correlations between the variables of interest are found in Table 11 in Appendix.

Table 2. Summary statistics

	Observation	Mean	Standard deviation	Minimum	Maximum
De jure Government take	304	0.46	0.08	0.27	0.73
Country risk	304	39.42	6.64	24.71	64.35
GDP per capita, log	304	35.39	1.06	27.53	36.84
Regime durability	304	8.13	7.03	0.00	31.00
Adoption of EITI	304	0.46	0.50	0.00	1.00
Political regime	304	3.15	4.19	-6.00	9.00
Democracy	289	4.77	2.78	0.00	9.00
Autocracy	289	1.47	1.62	0.00	6.00

#### 4. Main results

Table 3 summarises the results of our estimates regarding the linear relationship between the de jure government take and the level of premium risk. Column 1 presents the least squares estimates without control variables and time-fixed effects. Column 2 includes time-fixed effects in the regression, and shows that the inverse relationship between de jure government take and the country risk premium remains statistically significant, even when not controlling for time effects.

However, column 3, which represents our preferred estimate, includes all the control variables simultaneously. It shows that the individual effect of country risk on de jure government take, while quantitatively similar to the previous regressions, is estimated to be negative and statistically significant at the 5% level. The result suggests that as the country risk increases, the de jure government take will decrease. One standard deviation increases in the country risk premium leads to a decrease in the de jure government take by approximately 0.2 standard deviations.<sup>2</sup> In other words, in countries where risk perception is high in terms of investment, the government would capture a smaller share of mining rent. This relationship is intuitive since higher risk may deter foreign investors, resulting in lower government take. Our result, although contrary to [Adebayo et al. \(2021\)](#), is consistent with the predictions of their theoretical model. The Columns 4-6 document the estimates of the interaction term between the country risk premium and country-specific Polity2 score to investigate potential cross-country heterogeneity in the impact of country risk on de jure government take. Polity2 score is used to measure the overall effect of the political regime, where an increase indicates stronger democratic institutions. The interaction term results from multiplying the country risk and Polity2 variables. However, the coefficients of the Polity2 score variable and its interaction with the country risk premium are statistically significant while accounting for other control variables and time-fixed effects. First, a negative and significant coefficient at the 1% level is estimated for the Polity2 score, and suggests that countries with more stable democratic institutions would capture lower government take. As for the interaction term, it is positive and indicates that the adverse influence of country risk on de jure government take is not uniform across countries. This effect is moderated by the type of political regime. In stronger political institutions, a lower on de jure government take is observed when facing high country risk perception. Thus, the overall impact of the country risk premium on a country's de jure government take would be negative for country with the lowest average Polity2 score over the sample period, as Cameroon. Conversely, it would become positive for South Africa with the highest Polity2 score.

However, estimates of the varying effect of political regimes (democratic versus authoritarian) support the previous findings. The estimated individual coefficients for the democracy and autocracy scores are significant at the 1% level, with negative (column 5) and positive signs (column 6), respectively, and suggests that, on average, democratic regimes may have a weaker de jure government take compared to autocratic regimes. The interaction term between country risk and the democracy score is also positive and

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<sup>2</sup> To obtain this result, we first multiply the coefficient -0.002, which is associated with the individual effect of country risk, by its standard deviation of 6.64 from Table 2 and then divide this product by the standard deviation of the de jure government take 0.08 so that  $-0,002 \times 6,64/0,08 = -0,2$ .



confirms the non-uniform effects of country risk on de jure government take when analyzing the interaction effect using the Polity2 score.

Table 3. Estimation results of the baseline model

	(1)	(2)	(3)	(4)	(5)	(6)
Country risk	-0.002** (0.019)	-0.002*** (0.000)	-0.002** (0.023)	-0.003*** (0.000)	-0.005*** (0.000)	0.003** (0.037)
GDP per capita, log			0.017** (0.045)	0.017** (0.029)	0.016** (0.035)	0.016** (0.037)
Adoption of EITI			0.024** (0.043)	0.011 (0.413)	0.014 (0.374)	0.007 (0.560)
Regime durability			0.002* (0.100)	0.002 (0.153)	0.001 (0.283)	0.001 (0.320)
Political regime				-0.028*** (0.000)		
CRISK x Polity2 score				0.001*** (0.000)		
Democracy					-0.032*** (0.000)	
CRISK x Democratic score					0.001*** (0.001)	
Autocracy						0.085*** (0.000)
CRISK x Autocratic score						-0.002*** (0.000)
Time FE	No	Yes	Yes	Yes	Yes	Yes
Observations	304	304	304	304	289	289
R-squared	0.024	0.099	0.173	0.231	0.183	0.231
Countries	19	19	19	19	19	19

Note: The dependent variable is de jure government take (in low-grade mine) as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unreported constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

In contrast, the interaction with the autocracy score is significant and positive, indicating that in more authoritarian countries, the negative effects of country risk on de jure government take are mitigated or even reversed. As a result, the overall effect of country risk is positive for countries with the lowest average autocracy scores, such as South Africa, and becomes negative for countries like Cameroon or Congo Republic, which have higher average scores over the sample period. In summary, it's worth noting that the varying effects of autocracy and democracy scores align with the estimated results for the Polity2 score, whether in terms of individual effects or the marginal impact through the interaction term. This reinforces the observation that strong political institutions contribute to deflating the adverse effects of country risk on de jure government take.

#### 4.1.1. Marginal Effects of country risk

To assess the magnitude involved, we calculate and plot the marginal impact of the country risk premium on government take across various levels of political regimes. The

regression results allow us to estimate the effect of country risk on de jure government take for different values of variable combined (for example Polity2) with country risk. Referring to equation (3), the marginal effect of country risk on de jure government take is computed as follows:

$$\frac{\partial GT}{\partial Crisk} = \psi + \beta. (Polity2) \quad (4)$$

This equation indicates that the marginal effect of the country risk is equal to the estimated country risk coefficient plus the estimated coefficient of the interaction term between the country risk multiplied by the selected Polity2 variable. It should also be noted that with the interaction term, the confidence interval for the estimated marginal effect of the country risk also varies according to the different values taken by Polity2.

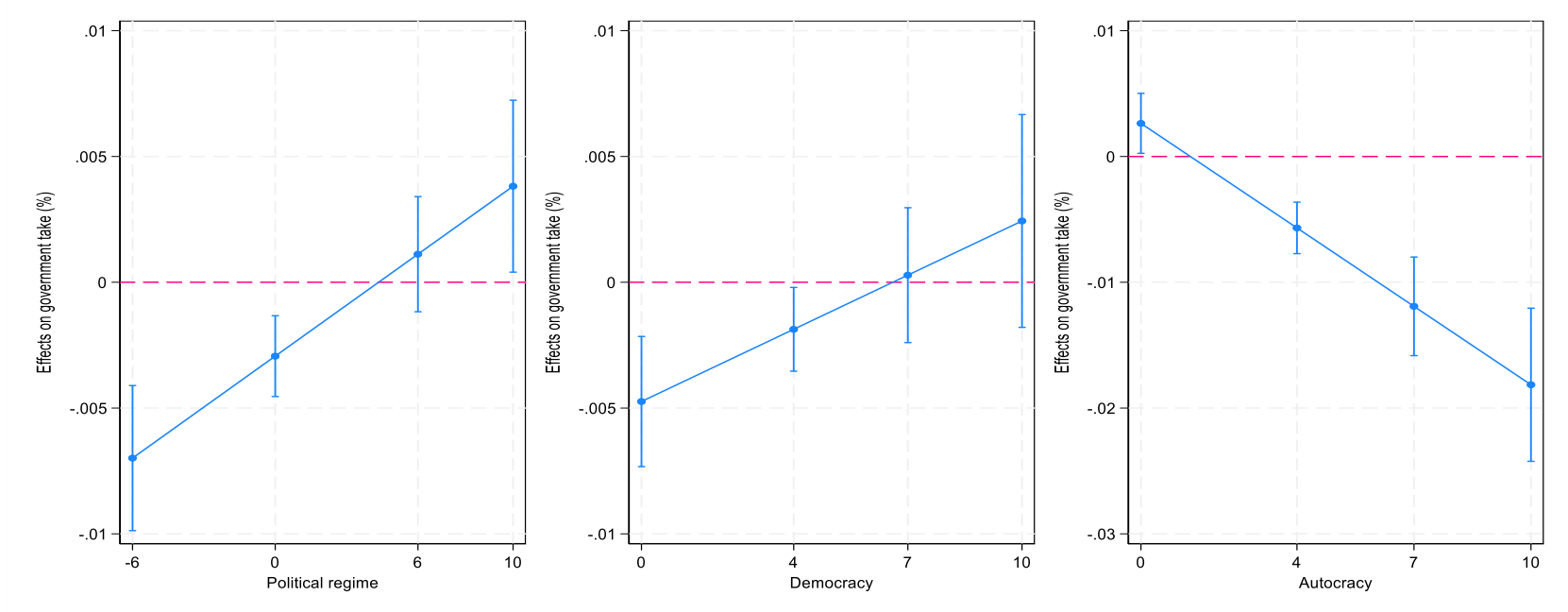
Figure 5 plots the estimated marginal effect for specification (4) in Table 3 using the Polity2 score and thereafter employs democracy (column 5) and autocracy (column 6) scores separately for computing the interaction term. The x-axis is the range of political regime values used to calculate the marginal effect, while the y-axis is the predicted de jure government take in percentage. The solid blue line in the graph represents the estimated marginal effect of country risk on de jure government take, while the vertical lines plot the 95% confidence interval for the estimated effect.

In the interpretation of Figure 5, starting with the left graph, it is estimated that the country risk has both negative and positive marginal effects on government take as Polity2 varies. For example, when Polity2 takes its minimum value of -6, an increase by one standard deviation in the country risk would decrease the de jure government take by 0.8 standard deviations, while with its maximum value of +9, there is an increase in the de jure government take by 0.5 standard deviations.<sup>3</sup> In simpler terms, as political regimes become more democratic, the adverse marginal effect of country risk diminishes and can even reverse. Both of these marginal effects are statistically significant.

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<sup>3</sup> These magnitude results are obtained by adding the value of the coefficient associated with the individual effect of country risk and the coefficient of the interaction term multiplying by each value in Polity2 score as follow:  $-0.003 + 0.001 * polity2$ . Thereafter, the result is multiplied by the ratio of standard deviation of the country risk over that of the de jure government take.

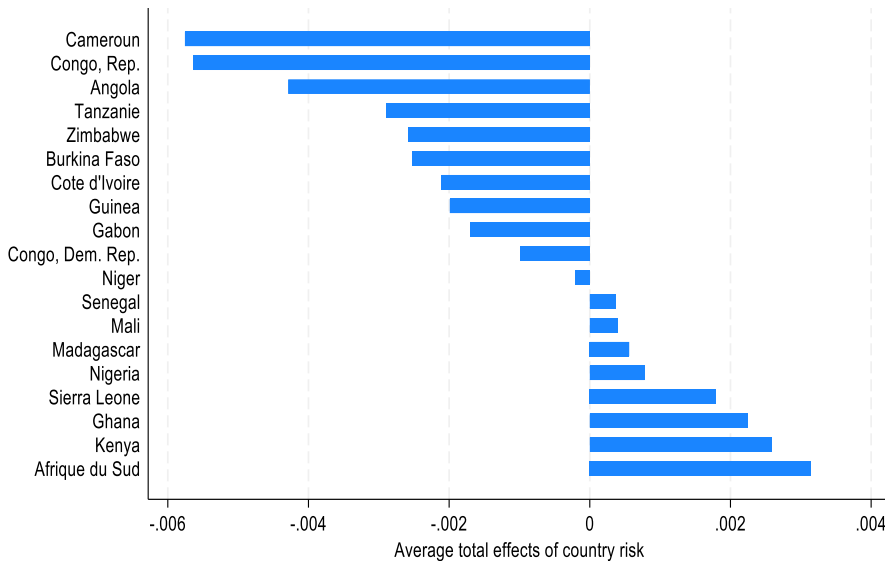
Figure 5. Marginal effect for different ranges of political regime



In the middle graph using the democracy score, the marginal effect is negative and significant up to a certain threshold, beyond which it becomes positive. When the democracy score is zero (minimum value), the country risk has a significant and negative marginal effect on the de jure government take. This negative effect is directly reflected in the intercept of the solid marginal effect line, which is -0.005. Once this particular threshold is reached, the marginal effect becomes positive but statistically insignificant.

The graph on the right illustrates marginal effects using specification (6), which involves an interaction with the autocratic score. The estimated marginal effects are statistically significant and positive for low values of the autocratic score, up to a threshold where they become negative and significant for higher values. For precision, in this specification, with the minimum value of the autocratic score being zero, the marginal effects associated with this value are given by the intercept equal to +0.003, which is associated with the estimated individual effect of country risk. Thus, for higher values of the autocratic score, the marginal effects of the country risk become more adverse<sup>4</sup>. It's worth noting, however, that the marginal effects of varying variables related to political regimes, such as democracy and autocracy, align with and reinforce the marginal effects estimated for different values of Polity2, which combines these two types of regimes. To reinforce our results, Figure 6 plots the overall effects, highlighting the cross-country heterogeneity in the impact of country risk on de jure government take at various values of the Polity2 score.

Figure 6. Cross-country overall effects of country risk



Furthermore, we have found that the control variables exhibit predictive power in determining de jure government take. The results show a positive link between these variables and de jure government take. For instance, a positive association is observed

<sup>4</sup> The magnitude of the marginal effects of the country risk when the interaction involves the autocratic score and country risk is calculated as follows:  $+0.003 - 0.002 \cdot \text{Autocracy}$ .

between the variable GDP per capita (taking in logarithm) and de jure government take, with a coefficient of 0.017, which is statistically significant at the 5% level. This suggests that countries with higher GDP per capita tend to demand a larger government take. Also, governments can consider their development objectives when determining the tax design applied to gold mining projects. By doing so, they can strategically allocate a more significant share of mining revenues, which can be used for public infrastructure, social programs, or other development initiatives.

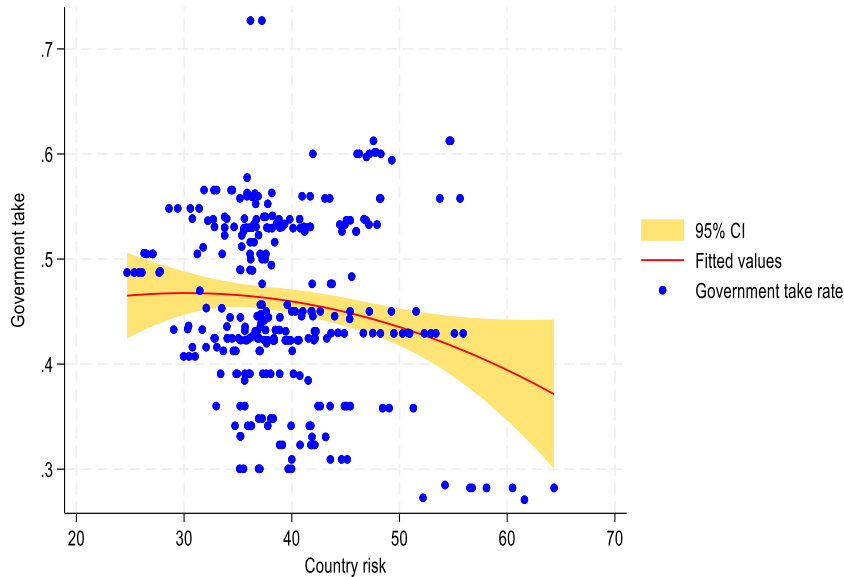
Additionally, the coefficient for the EITI adoption variable is positive and significant at the conventional level of 5%. This indicates that countries that have adopted this transparency initiative are more likely to demand a higher share of mining rent compared to those that have not. The coefficient of 0.024 represents the estimated increase on de jure government take associated with EITI adoption. The adoption of the EITI reflects a commitment to transparency and accountability in the extractive industries. By adhering to EITI standards, governments aim to ensure that revenues generated from mining activities are accurately reported and disclosed. This transparency enables the identification of gaps between de jure and actual take rate, which, in turn, minimizes profit under-declarations by companies seeking to avoid taxes. This supports the idea that governments may rightfully claim a larger take following the adoption of the EITI.

Finally, the coefficient for the durability of the political regime is also found to be positive and significant at the 10% level. This result states that countries with more stable and enduring political systems would demand higher de jure government take. The durability of the regime encompasses both political stability and investor confidence. Regarding political stability, a consistent and stable regime is more likely to implement and uphold policies and regulations related to natural resource extraction. It creates a favorable environment for investment and encourages resource extraction industries to operate within the country. In the case of investor confidence, resource extraction companies are more inclined to make significant investments if they trust the stability and continuity of the political environment. Consequently, the government can leverage its bargaining power to secure more significant benefits in mining contracts or establish a mining tax design for capturing more rent. In pursuit of this stability, the government can impose higher levies or royalty rates as a share of the revenues generated by resource extraction.

#### *4.1.2. Testing a potential non-linearity*

In order to reconcile the empirical results of Adebayo et al, 2021 with their theoretical model, we examine in additional regressions the existence of a potential non-linear effect between the government take and the country risk premium. To verify this intuition, we represent the following graph (Figure 7) with a quadratic fit at a 95% confidence interval. As observed, an increase in country risk leads to a notable shift in the trajectory of government take, suggesting a non-linear relationship. However, further analysis is needed to explore this fact. Thus, we introduce in the initial regression the country risk variables, its square, and its cube so that if the estimated coefficients are significant and of opposite sign, it would confirm that the relationship between the two variables follows a non-linear pattern. The results are documented in Table 4.

Figure 7. Non-linear effect between de jure government take and country risk



According to the respective estimates, including or not the control variables and time effects, the hypothesis of non-pattern is confirmed. Focusing on the estimates, in column 1, we show the non-linear effects of country risk on the de jure government take is confirmed as all variables are statistically significant at 1% and are of opposite sign, even when omitting to control for fixed time effects and other relevant controls. Although we control only by time effects (column 2), or both by relevant controls in addition (column 3) the results remain robust. It can also be observed that the adverse effect of country risk premium on de jure government take becomes more pronounced when the estimation considers the non-linear relationship between the two variables. Hence, two distinct slopes are estimated for the de jure government take as the country risk premium increases. The negative sign aligns with our baseline findings, suggesting that as the risk premium rises, the government may seek a smaller share of the rent from gold mining projects, in accordance with Adebayo's theoretical predictions. Conversely, the positive sign implies that as country risk increases, the government may aim for a larger share, contrary to the theoretical predictions of [Adebayo et al. \(2021\)](#) but in line with their empirical results.

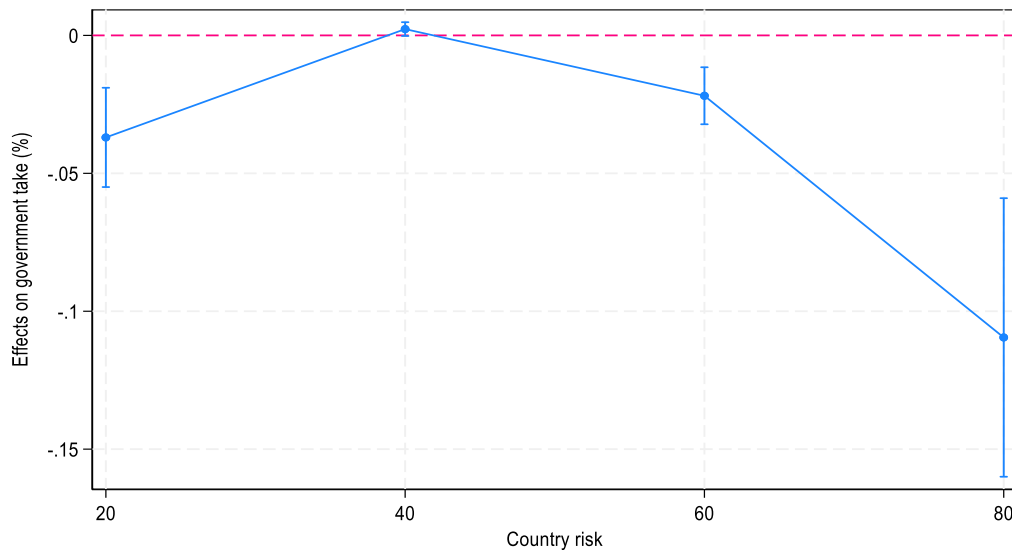
Table 4. Estimation results testing for nonlinear effects

	(1)	(2)	(3)
Country risk	-0.112*** (0.002)	-0.120*** (0.000)	-0.140*** (0.000)
Country risk square	0.003*** (0.002)	0.003*** (0.001)	0.003*** (0.000)
Country risk cubic	-0.000*** (0.002)	-0.000*** (0.001)	-0.000*** (0.000)
GDP per capita, log			0.015* (0.056)
Adoption of EITI			0.026*** (0.000)
Regime durability			0.003** (0.027)
Time FE	No	Yes	Yes
Observations	304	304	304
R-squared	0.070	0.140	0.225
Number of groups	19	19	19

Note: The dependent variable is de jure government take (in low-grade mine) as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unreported constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

The plot of the marginal effects of country risk on de jure government take, based on the estimated coefficients from specification (3) including the control variables, affirms the nonlinearity of the relationship (Figure 8). For lower country risk values, the marginal impact is negative and statistically significant up to a specific threshold, after which it becomes positive but loses statistical significance. Beyond this threshold, the marginal impact reverts to being negative and remains statistically significant for higher country risk values.

Figure 8. Marginal effects of country risk for various values of country risk



#### 4.1.3. *Investigating the transmission channels*

The preceding sections of this paper have illustrated that the political regime spectrum mitigates and even reverses the negative influence of country risk on de jure government take. An immediate follow-up question is whether this mitigating effect is mediated by the political-institutional factors that underlie political risks. While changes in each of these factors can influence the level of country risk, we aim to determine if the marginal effects of country risk remain uniform or not regardless of any changes in the levels of each of these factors. Table 7 (in the appendix) investigates this matter, based on same approach in Equation (4) to predict the marginal effects. The relevant transmission channels are grouped into two categories according to the signs of the interaction terms.

The first category presents the marginal effects of variables for which the lowest values translate into negative marginal effects of country risk on de jure government, up to a certain threshold beyond which the marginal effects turn positive. These variables include factors such as socioeconomic conditions, corruption, and democratic accountability. For each of them, the estimated marginal effects, whether positive or negative, are statistically significant. In the second category, for the factors of religious and ethnic tensions, there are statistically significant and positive marginal effects for the lowest values, whereas for military involvement, the marginal effects are neither positive nor statistically significant. However, the marginal effects for the three factors become statistically negative and significant once specific thresholds are reached. It emerges from the analysis of the transmission channels that the impact of country risk on de jure government take is not homogeneous across different ranges of these factors. Therefore, factors like socioeconomic conditions, corruption, democratic accountability, military involvement, and religious or ethnic tensions can either mitigate or exacerbate the adverse impact of country risk on de jure government take.

#### 4.1.4. *Endogeneity of country risk*

We now detail the main endogeneity problems that can arise in the context of regressing country risk on government take. As a result, the estimated parameters can be biased, making it difficult to establish causal relationships.

There is an endogeneity problem in country risk when some institutional factors in country risk are captured by the random component of the regression equation. This can occur due to reverse causality or the existence of certain unobserved or missing variables that directly affect both country risk and de jure government take, such as levels of corruption, the type of political regime, or also macroeconomic conditions. Reverse causality is a problem when the tax design choices made by the government can be influenced by the perceived level of risk in a country, and at the same time, the policies chosen by the government can affect the country's risk perception. More particularly, it is the idea that a higher de jure government take can be perceived as a country risk. For example, a government may increase revenues from extractive resources in response to higher country risk, but this policy change may also influence investors' perception of risk. In this case, the government take in the current period



affects the country risk in the same period. The endogeneity due to omitted variable bias is mitigated by the fact that we use a set of relevant control variables in addition to the annual fixed effects. And even though, it would therefore be cautious to qualify the results of the regression as correlational rather than associational, as country risk may probably cause reverse causality with the de jure government take.

#### 4.1.5. *Robustness checks*

To ensure that our main results are not driven by the specific characteristics of the average gold mine used to calculate the de jure government take, we conduct additional regressions using the de jure government take calculated from a medium-grade and high-grade mine. This approach allows us to consider changes in economic factors such as production capacity, mine life, mineral reserve content, and capital and operating costs, which are specific to each representative mine used in the calculation (as described in [Laporte et al., 2018](#)). However, it is essential to note that the structure of the low-grade mine aligns more closely with the characteristics of the most common gold mining projects in Africa.

Table 6 presents the results of our previous regressions using a dependent variable (de jure government take) based on medium and high-grade mine structures, respectively. While some estimates have lost statistical significance, for example the autocracy score in specification 7 of both mining content, the signs and magnitudes, in the others specifications, remain unchanged. Our main finding, which emphasizes the role of country risk as a significant factor in de jure government take, the existence of non-linear pattern, as well as the moderating effects of political regimes and institutional factors on the link between de jure government take and country risk, holds for various gold mine structures. Therefore, the association between de jure government take and country risk is not driven by the specific economic characteristics of the gold mine.

Besides, two other additional factors have been identified as determinants of de jure government take and as moderating channels. These include factors such as internal and external conflict, which in the baseline model (government take based on low-grade mining projects) were not identified as being able to determine de jure government take or to influence the relationship between the latter and country risk. However, according to the results, countries that exhibit both internal and external stability (where a high score indicates stability in both variables) are expected to achieve a higher de jure government take. Additionally, internal and external stability serve as moderating factors in mitigating the negative link between country risk and government take.

Table 6. Robustness results based on de jure government take in medium and large-grade mining projects

	Medium-grade mine							Large-grade mine						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country risk	-0.002*** (0.005)	-0.003*** (0.000)	-0.002*** (0.004)	-0.003*** (0.000)	-0.004*** (0.000)	0.002 (0.130)	-0.126*** (0.000)	-0.002*** (0.002)	-0.003*** (0.000)	-0.002*** (0.002)	-0.003*** (0.000)	-0.004*** (0.000)	0.001 (0.266)	-0.121*** (0.000)
Country risk square							0.003*** (0.000)							0.003*** (0.000)
Country risk cubic							-0.000*** (0.000)							-0.000*** (0.000)
Political regime				-0.021*** (0.000)							-0.018*** (0.000)			
CRISK x Polity2 score				0.001*** (0.000)							0.000*** (0.001)			
Democracy					-0.021*** (0.002)								-0.016** (0.018)	
CRISK x Democratic score					0.000** (0.012)								0.000* (0.076)	
Autocracy						0.071*** (0.000)								0.064*** (0.000)
CRISK x Autocratic score						-0.002*** (0.000)								-0.002*** (0.000)
GDP per capita, log			0.017** (0.026)	0.018** (0.016)	0.017** (0.020)	0.016** (0.021)	0.015** (0.030)			0.018** (0.018)	0.018** (0.011)	0.017** (0.013)	0.017** (0.014)	0.016** (0.021)
Adoption of EITI			0.024* (0.077)	0.014 (0.316)	0.017 (0.302)	0.011 (0.452)	0.026*** (0.003)			0.027* (0.053)	0.019 (0.187)	0.022 (0.196)	0.016 (0.289)	0.030*** (0.002)
Regime durability			0.002* (0.061)	0.002* (0.086)	0.002 (0.195)	0.002 (0.206)	0.003** (0.017)			0.002** (0.043)	0.002* (0.058)	0.002 (0.149)	0.002 (0.159)	0.003** (0.012)
Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	304	304	304	304	289	289	304	304	304	304	289	289	289	304
R-squared	0.035	0.099	0.187	0.223	0.178	0.227	0.232	0.039	0.099	0.195	0.222	0.182	0.226	0.236
Number of groups	19	19	19	19	19	19	19	19	19	19	19	19	19	19

Note: The dependent variable is de jure government take (in medium and large-grade respectively), as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unreported constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

## 5. Conclusion and Discussion

Our study reexamines the relationship between country risk and government take, following research by [Adebayo et al. \(2021\)](#). They theoretically and empirically investigate the determinants of government take based on a standard model of investment decisions under uncertainty with an extension to introduce political economy variables. Their empirical results for political economy variables align with the predictions of the extended investment theory model but in contrast with risk. Higher country risk is associated with the greater government take.

Our approach is different but complementary to that of [Adebayo et al. \(2021\)](#). We are concerned about the mining tax policy choices in an environment of uncertainty and risk country for twenty-one African gold-producing countries. We calculate a de jure government take based on the complete application of laws and regulations for three *standard* mines. These mines are representatives of large industrial gold mines in Africa by cross-referencing data from several feasibility studies. Thus, differences in government take related to the geological, economic, and financial characteristics of each project are thus neutralized for projects in the same country and between countries. Our measure differs from [Adebayo et al.](#), which is based on actual payments between 2015-2017 for each specific project and therefore incorporates mining companies' tax optimization strategies. We work over a long period, from 1991 to 2021, to have significant heterogeneity in mining tax policies and country risks within the same country and between countries. Finally, we use political regime for the control variables and use interaction variables between risks and political economy variables to track precisely the different transmission channels.

Our results reconcile [Adebayo et al.](#)'s theoretical model with empirical results. Higher country risk is associated with lower de jure government take. The lower the perceived country risk, the more attractive the country is to investors. The government take may be higher, as the government has greater bargaining power due to the reduced risk premium. Mining companies may also be more willing to accept a higher de jure government take when the investment climate is more favorable, the risk is perceived to be lower, and the expected profit of mining companies is high.

Our empirical results are also consistent with those of [Adebayo et al. \(2021\)](#). Our results show a complex nonlinear relationship between country risk and de jure government take.

We also examine the impact of the political regime on government take. Our results suggest that democratic regimes demand a lower de jure government take. Nevertheless, the coefficient of the interaction term suggests that as the country risk increases, the decline in the de jure government take is less pronounced so that stronger democracies can even capture a larger share. We then introduce each component of country risk and its interaction term to track transmission channels. Our findings indicate that countries with a high level of military involvement in politics, internal and/or external stability, as well as ethnic and/or religious cohesion, are better positioned to capture a larger share of mining rents. The coefficient of interaction terms all have negative signs. Thus, when country risk is high, these determinants have less influence on the de jure government take. In such circumstances, countries may face challenges in attracting investors, effectively administering and enforcing regulations, and accurately taxing mining rents, leading to a lower de jure government take.

Finally, our results show that the fiscal design determining the level of de jure government take depends on the country's risk, which is mitigated by many other factors. The challenge for each government is to target the most appropriate transmission channels to attract investment, extract the rent and obtain a sufficient share of it to finance their development through increased tax mobilization.

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## 7. Appendix

Table 7. Estimation results tracking transmission channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Country risk	0.004 (0.406)	-0.007*** (0.000)	-0.004 (0.416)	0.003 (0.501)	0.009 (0.191)	-0.005*** (0.000)	-0.000 (0.581)	0.020*** (0.000)	0.001 (0.615)	0.011** (0.032)	-0.006*** (0.000)	-0.003* (0.074)
Government stability	0.035 (0.165)											
CRISK x Government stability	-0.001 (0.225)											
Socioeconomic conditions		-0.095*** (0.000)										
CRISK x Socioeconomic conditions		0.003*** (0.000)										
Investment Profile			-0.017 (0.510)									
CRISK x Investment profile			0.001 (0.100)									
Internal conflict				0.029 (0.218)								
CRISK x Internal conflict				-0.001 (0.291)								
External conflict					0.044 (0.162)							
CRISK x External conflict					-0.001 (0.107)							
Corruption						-0.099*** (0.001)						
CRISK x Corruption						0.003*** (0.000)						
Military in politics							0.032** (0.050)					
CRISK x Military in politics							-0.001** (0.030)					

Religious tensions										0.194***		
										(0.000)		
CRISK x Religious tensions										-0.005***		
										(0.000)		
Law and order										0.050		
										(0.190)		
CRISK x Law and order										-0.001		
										(0.135)		
Ethnic tensions										0.164***		
										(0.004)		
CRISK x Ethnic tensions										-0.004***		
										(0.003)		
Democratic accountability											-0.065***	
											(0.000)	
CRISK x Democratic accountability											0.001***	
											(0.001)	
Bureaucracy quality												-0.027
												(0.539)
CRISK x Quality of bureaucracy												0.001
												(0.434)
Controls variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	304	304	304	304	304	304	304	304	304	304	304	304
R-squared	0.187	0.297	0.221	0.182	0.183	0.205	0.186	0.316	0.182	0.271	0.203	0.185
Number of groups	19	19	19	19	19	19	19	19	19	19	19	19

Note: The dependent variable is de jure government take (low-grade mine), as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unreported constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

Table 8. Robustness results (channels) based on de jure government take in medium-grade mine

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Country risk	0.003 (0.544)	-0.006*** (0.001)	-0.003 (0.510)	0.008 (0.106)	0.017*** (0.004)	-0.004*** (0.001)	0.000 (0.709)	0.019*** (0.000)	0.001 (0.649)	0.009** (0.048)	-0.004*** (0.003)	-0.002 (0.187)
GDP per capita, log	0.018** (0.022)	0.014* (0.068)	0.015** (0.035)	0.017** (0.036)	0.017** (0.038)	0.016** (0.027)	0.016** (0.038)	0.013* (0.089)	0.017** (0.016)	0.014** (0.048)	0.017** (0.024)	0.019** (0.022)
Adoption of EITI	0.020 (0.158)	0.016 (0.133)	0.026*** (0.009)	0.027** (0.015)	0.018 (0.116)	0.019 (0.165)	0.020* (0.077)	0.036*** (0.000)	0.025** (0.047)	0.025** (0.010)	0.022* (0.096)	0.031** (0.020)
Regime durability	0.002* (0.068)	0.002** (0.030)	0.002* (0.053)	0.002* (0.063)	0.002* (0.098)	0.002* (0.055)	0.002* (0.088)	0.003** (0.020)	0.002* (0.064)	0.002* (0.051)	0.002** (0.045)	0.002* (0.083)
Government stability	0.029 (0.212)											
CRISK x Government stability	-0.001 (0.282)											
Socioeconomic conditions		-0.071*** (0.002)										
CRISK x Socioeconomic conditions		0.002*** (0.000)										
Investment Profile			-0.009 (0.716)									
CRISK x Investment profile			0.001 (0.198)									
Internal conflict				0.055** (0.026)								
CRISK x Internal conflict				-0.001** (0.033)								
External conflict					0.085*** (0.002)							
CRISK x External conflict					-0.002*** (0.001)							
Corruption						-0.070** (0.012)						
CRISK x Corruption						0.002*** (0.002)						
Military in politics							0.052*** (0.000)					
CRISK x Military in politics							-0.001*** (0.001)					



Religious tensions								0.193***				
								(0.000)				
CRISK x Religious tensions								-0.005***				
								(0.000)				
Law and order									0.052			
									(0.166)			
CRISK x Law and order									-0.001			
									(0.100)			
Ethnic tensions										0.150***		
										(0.006)		
CRISK x Ethnic tensions										-0.003***		
										(0.004)		
Democratic accountability											-0.026*	
											(0.053)	
CRISK x Democratic accountability											0.000	
											(0.179)	
Bureaucracy quality												0.017
												(0.683)
CRISK x Quality of bureaucracy												-0.000
												(0.984)

Controls variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	304	304	304	304	304	304	304	304	304	304	304	304
R-squared	0.198	0.305	0.235	0.204	0.214	0.217	0.214	0.338	0.201	0.279	0.198	0.205
Number of groups	19	19	19	19	19	19	19	19	19	19	19	19

Note: The dependent variable is de jure government take (in medium-grade mine), as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unrepeated constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

Table 9. Robustness results (channels) based on de jure government take in large-grade mine

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Country risk	0.003 (0.583)	-0.005*** (0.002)	-0.002 (0.572)	0.010* (0.052)	0.022*** (0.001)	-0.004*** (0.004)	0.000 (0.575)	0.018*** (0.000)	0.001 (0.626)	0.009* (0.055)	-0.003** (0.020)	-0.002 (0.282)
GDP per capita, log	0.019** (0.015)	0.014* (0.052)	0.016** (0.022)	0.017** (0.029)	0.017** (0.032)	0.016** (0.019)	0.016** (0.030)	0.013* (0.078)	0.017** (0.011)	0.014** (0.036)	0.018** (0.016)	0.020** (0.015)
Adoption of EITI	0.024 (0.113)	0.020* (0.079)	0.030*** (0.006)	0.031*** (0.005)	0.020* (0.077)	0.022 (0.121)	0.023** (0.046)	0.038*** (0.000)	0.029** (0.029)	0.027*** (0.007)	0.026* (0.063)	0.035*** (0.008)
Regime durability	0.002** (0.047)	0.003** (0.024)	0.003** (0.041)	0.002** (0.044)	0.002* (0.080)	0.002** (0.048)	0.002* (0.067)	0.003** (0.016)	0.002** (0.046)	0.002** (0.037)	0.002** (0.035)	0.002* (0.065)
Government stability	0.029 (0.224)											
CRISK x Government stability	-0.001 (0.296)											
Socioeconomic conditions		-0.060*** (0.006)										
CRISK x Socioeconomic conditions		0.002*** (0.001)										
Investment Profile			-0.004 (0.851)									
CRISK x Investment profile			0.000 (0.282)									
Internal conflict				0.069** (0.012)								
CRISK x Internal conflict				-0.002** (0.014)								
External conflict					0.104*** (0.000)							
CRISK x External conflict					-0.003*** (0.000)							
Corruption						-0.053* (0.051)						
CRISK x Corruption						0.002*** (0.006)						
Military in politics							0.059*** (0.000)					
CRISK x Military in politics							-0.002*** (0.000)					
Religious tensions								0.188*** (0.000)				

CRISK x Religious tensions										-0.005***				
										(0.000)				
Law and order											0.055			
											(0.135)			
CRISK x Law and order											-0.002*			
											(0.076)			
Ethnic tensions												0.145***		
												(0.007)		
CRISK x Ethnic tensions												-0.003***		
												(0.005)		
Democratic accountability													-0.009	
													(0.481)	
CRISK x Democratic accountability													0.000	
													(0.790)	
Bureaucracy quality														0.035
														(0.381)
CRISK x Quality of bureaucracy														-0.000
														(0.677)
Controls variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	304	304	304	304	304	304	304	304	304	304	304	304	304	304
R-squared	0.206	0.307	0.241	0.219	0.235	0.226	0.230	0.344	0.212	0.284	0.200	0.219		
Number of groups	19	19	19	19	19	19	19	19	19	19	19	19	19	19

Note: The dependent variable is de jure government take (in large-grade mine), as a percent share of pre-tax net revenues, based on tax laws and regulations. Robust p-values are in parentheses. Four (4) lags are set as order of autocorrelation. Unreported constant. Significance levels: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

Table 10. List of Countries

1. Afrique du Sud
2. Angola
3. Burkina Faso
4. Cameroun
5. Democratic Republic of Congo
6. Congo, Republic of
7. Cote d'Ivoire
8. Gabon
9. Ghana
10. Guinea
11. Kenya
12. Madagascar
13. Mali
14. Niger
15. Nigeria
16. Senegal
17. Sierra Leone
18. Tanzanie
19. Zimbabwe

Table 11. Correlations between variables of interest

Variables	1	2	3	4	5	6	7
1. Country risk	1.000						
2. GDP per capita, log	0.075 (0.190)	1.000					
3. Adoption of EITI	0.002 (0.975)	-0.007 (0.907)	1.000				
4. Regime durability	-0.401*** (0.000)	-0.016 (0.780)	0.065 (0.256)	1.000			
5. Political regime	-0.134** (0.019)	0.078 (0.172)	-0.058 (0.315)	-0.180*** (0.002)	1.000		
6. Democracy	-0.132** (0.025)	0.034 (0.565)	-0.083 (0.157)	-0.154*** (0.009)	0.979*** (0.000)	1.000	
7. Autocracy	0.068 (0.247)	-0.103* (0.080)	0.041 (0.489)	0.338*** (0.000)	-0.937*** (0.000)	-0.846*** (0.000)	1.000

P-values are given in parentheses. Significance levels: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$