

# Mining and the Quality of Public Services

## The Role of Local Governance and Decentralization

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## Abstract

This paper investigates the local effects of mining on the quality of public services and on people's optimism about their future living conditions. It also assesses the mediating role of local institutions and local governments' taxing rights in shaping the proximity-to-mine effects. The empirical framework connects more than 130,000 respondents from the Afrobarometer survey data (2005–2015) to their closest mines based on the geolocation coordinates of the enumeration areas (EA) and data on the mines and their respective status from the SNL Metals & Mining. The geo-referenced data are matched with new indicators on local governments' taxing rights across the African continent. The results suggest that citizens living near an active mine are less likely to approve government performance

in key public goods and services—including health, job creation and improving living standards of the poor. On the mediating role of local governance and local taxing rights, the findings point to a negative effect of local corruption, yet a positive effect of local authorities' discretion over tax and revenues. However, the positive marginal effect of local taxing powers tends to reduce in environments with poor quality of local governance, high incidence of bribe payment and low level of trust in local government officials. Residents of mining communities with low corruption and comparatively high-level of raising revenue ability have the highest rate of positive appraisal compared to the other scenarios.

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**Mining and the Quality of Public Services:  
The Role of Local Governance and Decentralization**

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## 1. Introduction

The question of whether natural resources hinder or boost development has been extensively investigated in the literature, but it is only recently that the focus has shifted to disaggregated and subnational-level analyses (Cust and Poelhekke, 2015). The increasing availability of geo-referenced data on subnational entities provides a unique opportunity to link geographical features of local areas in resource-rich countries to administrative, households, and individual data. This new approach has also enabled scholars to overcome some of the common identification issues such as endogeneity, measurement errors, and misspecifications, that macro-level cross-country studies have encountered. As a result, recent publications set forth empirical estimates on the effects of mining on local development indicators such as health, wealth, poverty, and inequality (Loayza and Rigolini, 2016; Goltz and Barnwal, 2019). In Africa more particularly recent contributions have also shed light on the local effects of mining on economic activity and public service delivery (Mamo et al., 2019), on socio-economic indicators (Kotsadam and Tolonen, 2016; Benschaul-Tolonen, 2019) and local conflict and corruption (Lujala, 2010; Maystadt et al., 2013; Berman et al., 2017).

These studies rely on two opposing postulates. On the one hand, mining communities are prone to benefit from their exploitation primarily through rents which could be used to finance public goods and services, through the employment of the local labour force in mining industries and the emergence of local businesses. On the other hand, rent opportunities from the mining sector may create the wrong incentives for local government officials and deviate their attention from handling local needs to seeking personal gains, fuelling local corruption (Knutsen et al. (2017)). Yet, to date, the mediating role of local institutions has been relatively neglected in the subnational resource curse literature (Gilberthorpe and Papyrakis, 2015; Lawer et al., 2017). The existing evidence regarding Africa so far considers institutional quality as an outcome rather than an intermediate factor (Berman et al., 2017; Knutsen et al., 2017).

In this paper, we argue that the quality of local governance and the capability of local authorities to raise and capture revenues, either through the mining sector or other means, are likely to be key confounding factors of how mining could benefit or hinder local development. Our objectives in this paper are threefold. First, we investigate whether individuals living near a mining zone and those living afar have different perceptions of how *well* or *badly* their governments are handling the living standards of citizens and the delivery of public goods and services such as job creation, water, education and health. In addition, we investigate whether these different groups of individuals have different levels of optimism about their future living conditions. Second, we examine whether and how the local institutional environment in places such as incidence of bribe payment, (dis)trust in and perceived level of corruption among local

government officials shape the relationship between mining and the assessment of government performance in resource-rich communities. Third, we explore whether the legal rights or the discretionary power of subnational governments over the tax and revenue system matters in the analysis of the effects of natural resources on the provision of local public goods and services. Although royalties from mining industries are mostly controlled by central government authorities, mining-related or induced business generate rents and revenue opportunities that can be exploited by local authorities.

To date, and to the best of our knowledge, there is little evidence on the mediating role of institutions, local governance, and decentralization in the relationship between natural resources and development at the local level. Most of the existing evidence on such confoundedness is provided in macro-level studies where it has been shown that the quality of institutions and governance are key explanatory factors of why natural resources might be a curse for some countries and a blessing for others (van der Ploeg, 2011). Our paper, then, makes a significant contribution to the growing literature on the local effects of mining in Africa.

For our analysis, we match the Afrobarometer survey geo-referenced data with the SNL Metals and Mining by the S&P that provide time-series information on industrial mines in countries in Africa. The SNL Metal and Mining data are provided annually, which facilitates the merging with multiple rounds of Afrobarometer surveys and the identification of residents who live within a certain distance to a mine, be it active or non-active at the time of the survey. We follow existing publications by considering a 50 km radius to a mine as the reference value.<sup>1</sup> We exploit the availability of a new dataset on decentralization – mainly the decision-making power of subnational governments over tax and revenue instruments, which, unlike existing works, covers a range of African countries as well as those that have been implementing decentralization since the early 2000s.

We employ a difference-in-differences strategy, similar to that used in recent studies (Knutsen et al. (2017); Goltz and Barnwal, 2019) to study the gap between the effects of living within a 50 km radius of an active mine versus a non-active mine, and the gap between each of these categories and living afar a mining zone.<sup>2</sup> Furthermore, the use of multiple rounds of the Afrobarometer surveys allows us to control for both time (shocks) and country-level heterogeneity. The results show a negative impact of living near active mining areas on the perceived performance of government authorities and the assessment of how *well* or *badly* they handle living standards of

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<sup>1</sup> See Knutsen et al. (2017).

<sup>2</sup> The non-active mines also include the ones define as “yet to open”, “under mitigation”, “on care and maintenance”, “under rehabilitation”, and “on hold”.

the people and the delivery of public services. Proximity to a mine also decreases the expectations of better living conditions in the future.

More interesting is that the findings confirm that the quality of local governance matters. We found that the poor quality of local governance has a negative impact on the effects of mining on government performance. Notwithstanding, the results suggest that the marginal effects of mining on the performance assessment of governments are positive in countries that have a higher level of decentralization. Nevertheless, this positive effect tends to be reduced in environments with poor quality of local governance, high incidence of bribe payments, and high-level of distrust in local public officials. The empirical results on the interplay between local corruption and decentralization sustain our hypothesis that both the quality of local institutions and the inter-governmental fiscal arrangements regarding taxes and revenue collection matter for how mining activities translate into welfare improvement in local communities.

The rest of the paper is structured as follows. Section 2 provides a review of the existing literature. Section 3 presents the data description, gathering, and merging process. Section 4 details our empirical strategy. Section 5 presents and discusses the main findings. Concluding remarks are found in Section 6.

## **2. Related literature**

This paper is closely related to two strands of the literature. First, it contributes to the existing research on the local effects of mining on socio-economic and political indicators. Pioneers in evaluating the local impact of natural resources initially paid attention to the case of Latin America (Aragón and Rud, 2013; Caselli and Michaels, 2013; Loayza and Rigolini, 2016; Santos, 2018). Because of the availability of reliable disaggregated data in Africa, there has been a growing interest in exploring how mining affects the living standards of people living close to the mining areas in this part of the world.

For instance, using a large sample that covers more than 3,600 districts across 42 African countries, Mamo et al. (2019) show that mining has a positive impact on local economic activity measured by night-lights density but mixed effects on living standards and public services provision. The study by Chuhan-Pole et al. (2015) also confirms the positive impact of mines on economic activity in Ghana. The authors find that gold mining has improved access to employment and cash earnings of local communities and yield a positive impact on household expenditure. However, it is worth noting that mining may also reduce school enrolment and increase child labour, as illustrated by Zabsonré et al. (2018) in the case of Burkina Faso. This latter finding reinforces the argument that despite an increase in employment and poverty reduction in the short-run, a slowdown in human capital accumulation as a result of mining

activities may have adverse effects in the longer term. Ahlerup et al. (2020) also show that the income earned by child workers from mining activities did not compensate for the long-term benefits of education.

While these previous studies provide evidence on the creation of employment for the mining community, the scale of mining operations may contrast this effect. Pokorny et al. (2019) show that the accessible nature of artisanal mining is able to generate jobs and cash for the local population, but industrial mining fails to do so due to its capital-intensive nature. This entanglement becomes even more relevant for the case of Africa, where substantial mining activities are now operated by Chinese companies. In addition to being capital-intensive, these operations rely almost exclusively on Chinese human capital, leaving few low skilled jobs suffering from poor working conditions for the African population.

Besides directly impacting household socio-economic outcomes, natural resources can negatively affect the immediate environment of the households by increasing the incidence of conflicts and bribery. Berman et al. (2017) have provided evidence that higher financial capabilities of fighting groups, generated through resource extraction, tend to spread conflicts across territory and time. On the corruption side, Knutsen et al. (2017) find that local corruption tends to increase after mine openings in Africa since local police and officials request more bribes with the anticipation that the local residents can better afford to pay them. These empirical results, therefore, hint to the potential duality and opposing direction of the impact of mining in the short- and long-term and which calls for additional research.

Second, this paper contributes to the literature on the mediating role of institutions and institutional arrangements on the relationship between natural resources and economic development. Some of the existing literature argues that natural resources exercise a negative effect on economic growth through their negative impact on institutional quality, mainly through the rent-seeking behaviours induced by the exploitation of these resources (Badeeb et al., 2017; Dauvin and Guerreiro, 2017). For instance, Sala-i-Martin and Subramanian (2003) empirically confirm this indirect causation in the case of Nigeria; yet, Bhattacharyya and Hodler (2010) suggest that this effect might also be contrasted depending on the initial level of institutional quality. In the same vein, other literature advocates that the assumed exogenous quality of institution determines whether a country experiences a resource curse or blessing (Dauvin and Guerreiro, 2017).

Mehlum et al. (2006) distinguish between two types of institutions influencing the impact of natural resources. On the one hand, producer-friendly institutions promote rent-seeking and production as complementary activities, thereby promoting the allocation of investments into productive activities, and subsequently stimulating growth. On the other hand, grabber friendly

institutions endorse rent-seeking and production as competing activities, leading investments to be allocated into unproductive activities, hence, resulting in poor growth performance. This channel of causation has not only been empirically supported by the authors, but also by others using different measures of institutional quality and natural resources endowment (Boschini et al., 2013).

While institutional quality may either operate indirectly or interactively with resource wealth on economic performance, the role of local institutions has relatively been neglected in the resource curse debate (Lawer et al., 2017). Notwithstanding, local institutions have borne increasing responsibilities since the wave of decentralization reforms that have taken place on the African continent in the last decades. In resource-rich communities, as in others, decentralization is intended to strengthen local authorities as they complement national authorities in ensuring that these communities benefit from resource revenues through improved welfare. As advanced by Mitton (2016), the distinction between national and sub-national entities is important to consider, as they may not operate the same way. Even though national policies may promote accountability and transparency of resource revenues, Lawer et al. (2017), in a qualitative analysis, denotes that decentralization and by extension local government institutions do not necessarily improve living standards in mining communities, but rather gives more rooms for rent-seeking behaviours when local institutions are weak in nature.

To date, and to the best of our knowledge, no empirical and quantitative studies have explored the local effects of natural resources through the lens of decentralization, sub-national governments taxing rights, and their legal attribution in revenue mobilization. Therefore, as part of our second contributions, this paper assesses the mediating role of local governance and decentralization in the relationship between natural resources endowment and local socio-economic outcomes.

### **3. Data Description and Sources**

Our empirical analysis relies on geo-referenced Afrobarometer surveys data for the period of 2005 to 2014. The Afrobarometer constitutes a large pool of public opinion surveys and a reliable source of information on various political and socio-economic characteristics of residents and local communities in Africa. The surveys capture the availability and residents' appraisal of their perceived quality of public goods and services in local communities -- these latter identified by the enumeration areas (primary sampling unit). The geospatial coordinates of the enumeration areas facilitate the merging the Afrobarometer surveys data with the records of the Raw Materials Database (RMD) of SNL Metals and Mining by S&P. Each enumeration area and their corresponding respondents in the surveys are matched with its closest mine based on a cut-off distance value (Picard, 2010).

### 3.1. Merging and Matching Process

The Raw Materials Database (RMD) of SNL Metals and Mining inform on the geolocation and the status of several mines in Africa. The database also informs on the year in which the most recent information was recorded. The two datasets are merged by first matching the spatial point coordinates (GPS) of the mines and primary sampling units (enumeration areas or districts or townville) in the survey data; and second, by matching the year of the survey data collection to the reference year for the latest information update on the mine. In cases where the year of the latest update does not correspond to the year of the Afrobarometer survey data collection, this latter is matched with the closest date in the SNL Metals and Mining data which in all accuracy corresponds to the previous or subsequent year. This consideration only applies to a few countries: Senegal (Round 3 and Round 4 of the Afrobarometer), Burundi (Round 5), Benin and E-Swatini (Round 6). In countries where the enumeration area is not coded in the Afrobarometer dataset, the districts or Townsville GPS coordinates are used to set the geographical boundaries.

From a cluster centre point, it is measured the distance to a mine and create a binary variable *'Active'* that equals to 1 if the sampling unit or district is located within 50 kilometres radius from an active mine. For the remaining units, it is created another binary variable *'Inactive'* which points to all respondents that reside within 50-km radius from an inactive mine. *'Inactive'* refers to any mine with one of the following statuses: inactive, care and maintenance, on hold, rehabilitation, and under litigation. The pseudo control group thus include all enumeration areas located farther than 50 km radius from a mine (be it active or inactive). As the individual data are identified by their enumeration areas or districts or Townsville, it is feasible to relate their responses to their residential location at the time of the survey.

### 3.2. Dependent Variables

The dependent variables are (a) the residents' appraisal of public goods and services, and (b) their self-reported optimism about the future. The first set is operationalized from the following survey question.

*"How well or badly would you say the current government is handling the following matters, or haven't you heard enough to say? "*

The different matters are: (i) improving living standards of the poor, (ii) creating jobs, (iii) improving basic health services, (iv) addressing educational needs, and (v) providing water and sanitation services. For each of these items, the possible answers are on a four-step Likert-scale and range from *'very badly'* to *'very well'*. For policy matter, it is created a binary variable that takes the value of 1 if the individual responded *'fairly well'* or *'very well'* to the question and 0 for the responses *'bad'* or *'very bad'*. Other responses such as *'I don't know'* or *'haven't heard about it'*,

or any refusal to answer are coded as missing values. To capture the overall appraisal of each respondent, it is also constructed a composite indicator of public services delivery by aggregating each respondent's appraisal of all individual public services through polychoric correlation structure of the categorical responses (Lee et al., 1995; Holgado-Tello et al., 2008). The composite indicator is thus a reflection of how each respondent evaluates the range of public services provided by the state.

Table 1 shows the distribution of the respondents for each of these policy matters. It can be observed that less than one-third of the interviewees agreed with the statement that the government is handling very well or fairly well the living standards of the poor and creating jobs, although more than half appear to approve their respective government's performance in improving essential health services (57.92%) and addressing educational needs (60.15%) across the whole sample (four rounds of the Afrobarometer survey).

Self-reported optimism is derived from the survey question: "Looking ahead, do you expect the following to be better or worse: Your living conditions in twelve months' time?". The responses range from 'much worse' to 'much better'. We create a binary variable that equals 1 if the reply of the respondent is 'better' or 'much better' and 0 otherwise. As this question is not included in Round 6 of the Afrobarometer survey, the corresponding estimations thus incorporate data from Round 3 to Round 5. Table 1 shows that approximately 79% of the survey respondents expect an improvement in their living conditions in the twelve months following the survey data collection.

**Table 1: Distribution of respondents in the category fairly well and well**

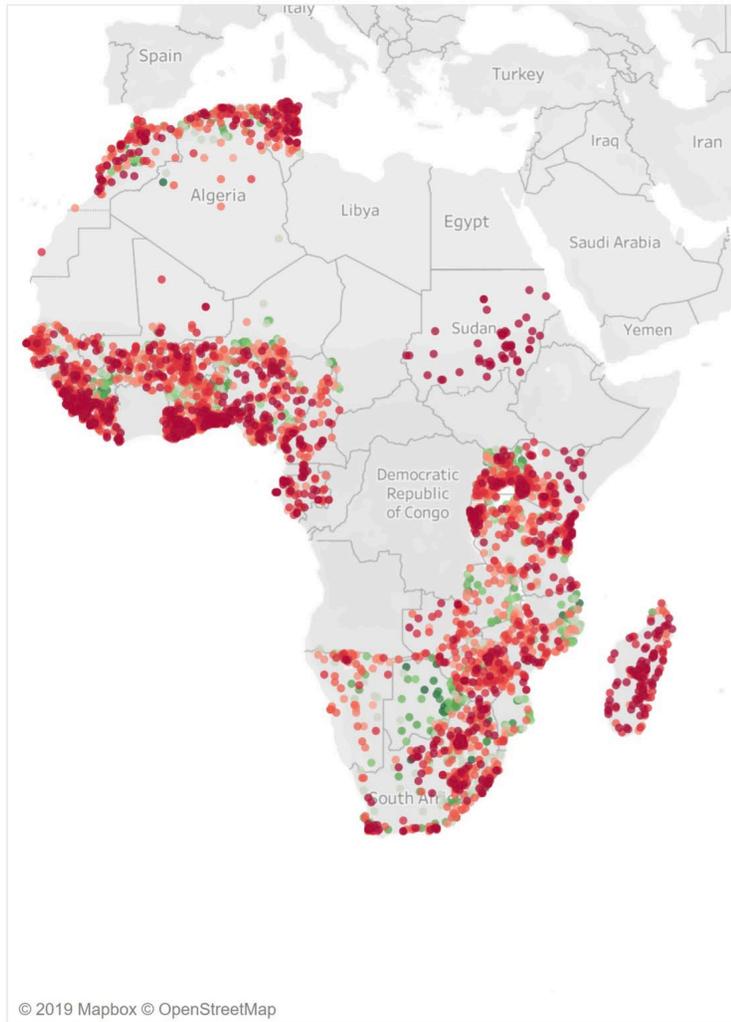
	Percentage	Observations
<i>Creating jobs</i>	26.90	130,277
<i>Improving the living standards of the poor</i>	29.86	109,019
<i>Providing water and sanitation services</i>	44.44	131,280
<i>Improving basic health services</i>	57.92	132,161
<i>Addressing educational needs</i>	60.15	131,661
<i>Optimism (Expectation of living conditions in 12 months)</i>	78.59	91,200

Figure 1 displays, for each mining location (both active and inactive mine), the percentage of respondents with a positive assessment of government authorities' performance in improving the living standards of the poor and job creation in Round 6 of the Afrobarometer survey. Such percentage is very low across the whole continent. The dissatisfaction is particularly striking in local communities near active mines, except for Botswana, where the average appraisal on government pro-poor policies tends to be positive on average (Figure 2).

**Figure 1: Assessment of Government Performance by Mining Location (Active and Inactive Mines)**

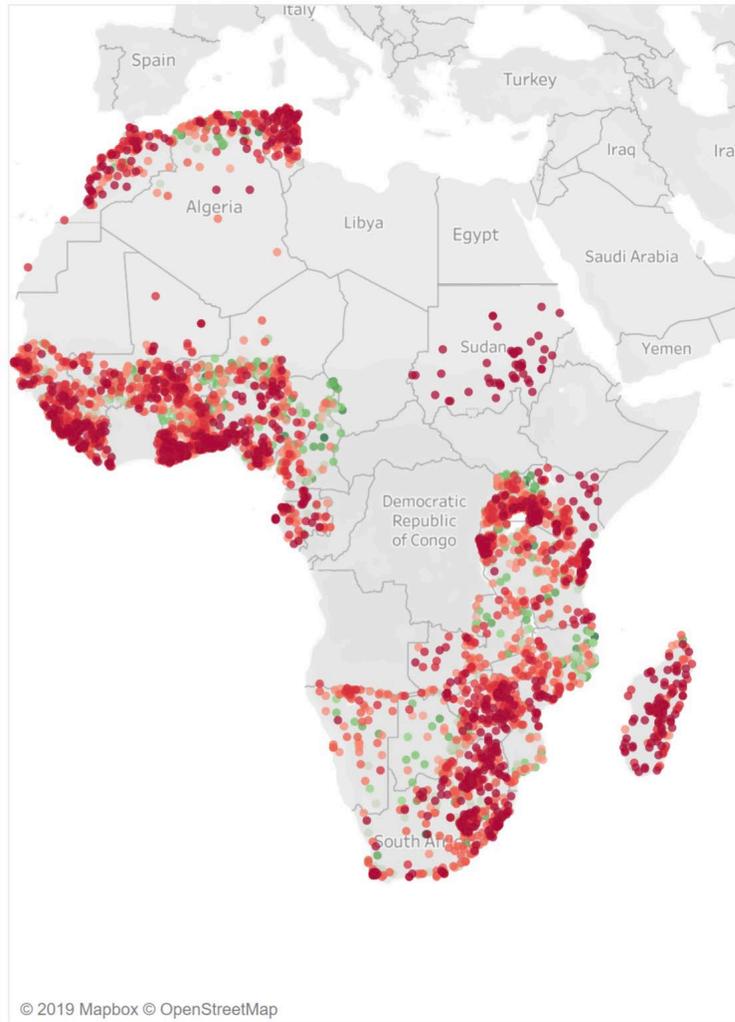
**Government Handling Living Standards of the Poor**

Percentage of respondents with "fairly well" & "very well" by mine location



**Government Handling Job Creation**

Percentage of respondents with "fairly well" & "very well" by mine location

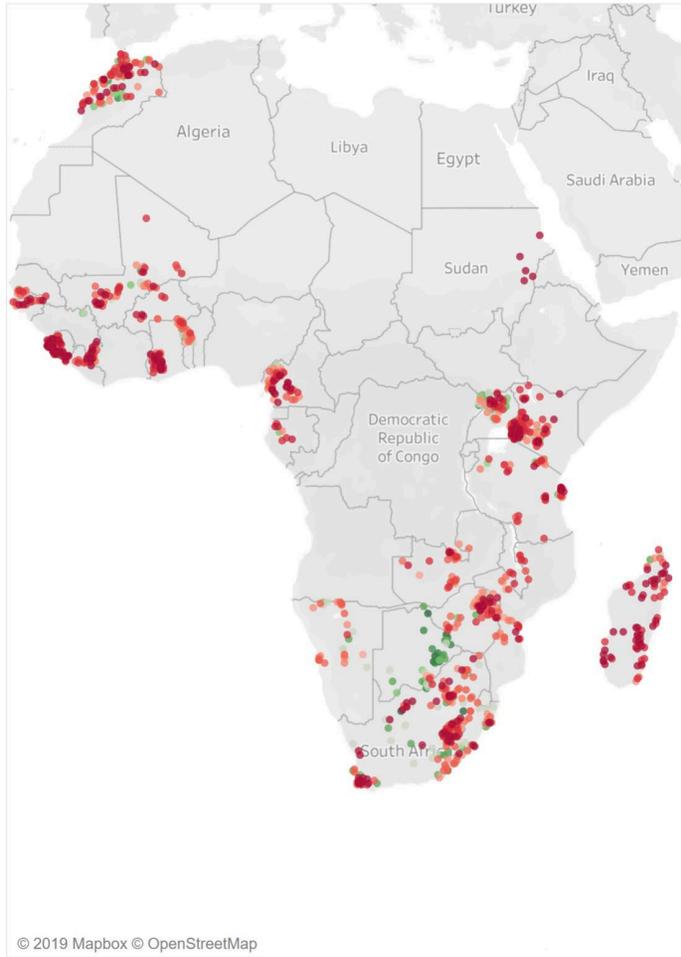


Scale

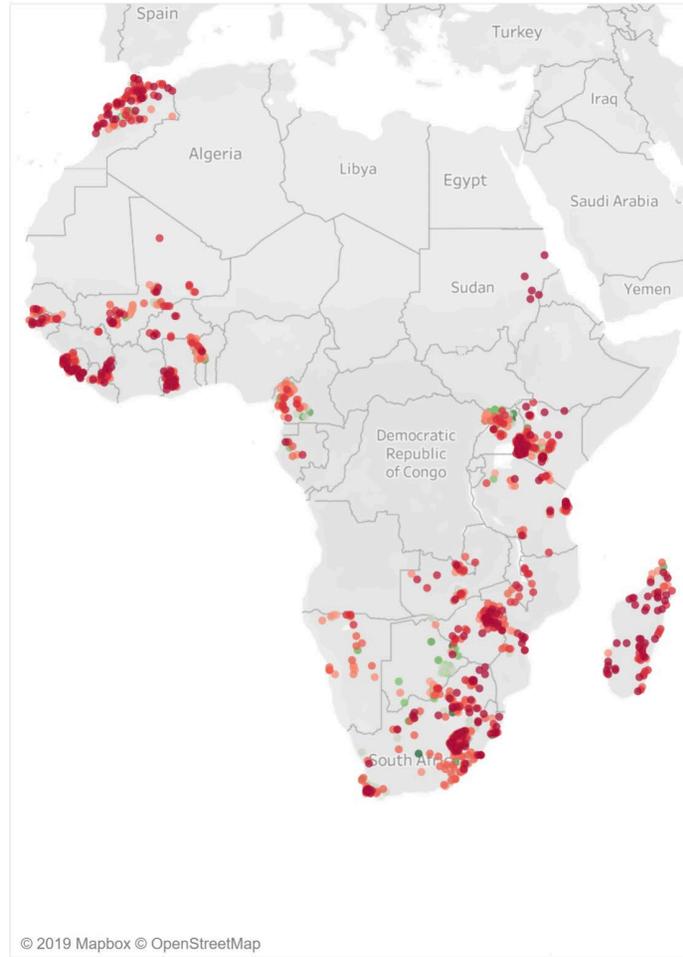


**Figure 2: Assessment of Government Performance by Mining Location (Active Mines Only)**  
**Living Standards and Job Creation**

**Government Handling Living Standards of the Poor**  
Percentage of respondents with "fairly well" & "very well" by mine location (active)



**Government Handling Job creation**  
Percentage of respondents with "fairly well" & "very well" by mine location (active)



### 3.3. Measuring the Quality of Local Governance and Decentralization

The quality of local institutions and local governance is measured through various proxies. First, we constructed an objective measure of corruption based on the incidence of bribe payment in three steps. In the first step, we derived a binary indicator from answers to the question *"How often, (if ever, have you had to pay a bribe, give a gift, or do a favour to government officials in order to..."*, to which the respondents indicate whether they have bribe government officials in order to obtain public services such as school placement, medical services, official documents, household services and police help. In the second step, the binary indicators are then aggregated using polychoric correlation to create an indicator of the tendency of bribe payment at the individual level. In the third step, the individual estimates are averaged at the local community level. Unlike the individual perception of corruption, the incidence of bribe payment points to an objective exchange between authorities and residents. Second, we measure the quality of local governance by averaging the individual distrust in local government councillors at the regional level. Lastly, we corroborate the results with a corruption perception indicator, which also takes the regional average number of residents that perceive their local governments as being corrupt.

As per our third contribution to the literature, we introduce a measure of decentralization based on the legal assignment of tax-related decisions to local governments issued from a new dataset on tax and revenue assignment in developing and emerging economies.<sup>1</sup> The dataset provides comprehensive information on the vertical decision-structure over the tax system across government tiers. It was constructed through in-depth reviews of legal and policy documents, scientific and grey literature, as well as fiscal archives from the International Bureau of Fiscal Documentation (IBRD, Access: 2015-2017), which inform on the discretionary power of central and local governments over deciding on tax-related matters. Based on the legal and policy information and using a pre-defined matrix, the discretionary power of all government tiers is coded for each significant revenue instrument and across four decision components which refer to the legal ability of local and central authorities to (i) introduce new instruments or altering existing ones, (ii) define the base, (iii) set the rates and (iv) collect and administer the revenues.

For each decision component, a score is calculated by taking the ratio of subnational governments' involvement across the number of identified revenue instruments. An overall index is then computed by taking the average of scores on the four decision components. This aggregated indicator reflects the overall discretionary power of subnational governments over the fiscal space or their level of taxing rights in each country. Given that natural resources extraction generates revenues for local authorities, either directly through extraction royalties or

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<sup>1</sup> See Vincent (2020).

indirectly through booming local businesses, this indicator is used as a proxy for the level of decentralization or the extent to which sub-national governments are involved in raising revenues or deciding over parameters of the tax system. We thereby estimate whether the assessment of government performance of respondents living near a mining area varies according to the level of taxing rights granted to sub-national authorities in each country.<sup>2</sup>

Measuring the variables of interest respectively at the regional (local institutions) and national level (local government taxing rights) reduces the probability of a bi-directional relationship between these variables and individual assessment of public goods and services.

### 3.4. Additional Covariates

The empirical estimations account for countries, regional and individual heterogeneity. At the individual level, we consider an array of demographic and socio-economic characteristics, including gender, age, education, employment status, residential area (urban or rural) which are likely to shape their views on public services. Since the Afrobarometer surveys do not include the income level of the respondents, we create a composite index of living standards by relying on questions such as “*How often have you gone without food (or water, medicine, cooking fuel)?*”. The question points to the level of deprivation of essential public goods and services, including food, water, medication, cooking fuel and cash. The answers are on a Likert-scale as follows: *0=never, 1=just once or twice, 2=several times, 3=many times, 4=always*. The categorical variables are aggregated using polychoric correlation to derive a single indicator which reflects the level of poverty and neediness of each respondent's in basic necessities.

At the regional or local community level, the models also account for regional fixed-effects in addition to the local quality of institutions described above. At the country level and in addition to the measurement of decentralization, the empirical models include proxies for the overall corruption control with data from the World Governance Indicator and the share of natural resources rents as a percentage of GDP from the World Development Indicators.

## 4. Empirical Strategy

Equation (1) is our baseline model. We denote by  $y_{ilcs}$  the response of an individual  $i$  living in locality  $l$  of country  $c$  and which has been interviewed in survey round  $s$ . Depending on the specification, the variable  $y_{ilcs}$  indicates the assessment of how *well* or *badly* does the government handle public services or the expectation of an individual regarding his/her future living conditions.  $NR\_active$  is a binary variable that takes the value of 1 if the respondent is located

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<sup>2</sup> See Appendix B for additional details

within a 50-km radius from an active mining zone, and 0 otherwise; and  $NR\_inactive$  is also a binary variable that equals 1 if the individual is located within a 50 km radius from an inactive mining zone and 0 otherwise. Our choice of 50-km as the cut-off distance is based on previous research by Knutsen et al. (2017).  $X_{ilcs}$  represent a vector of individual-level variables with their respective coefficients  $\theta$ ,  $W_{cs}$  a vector of country-level co-variates,  $c_c$  the country fixed effects and  $s_s$  the time (survey round) fixed effects.

$$y_{ilcs} = \beta_0 + \beta_1 NR_{active}_{lsc} + \beta_2 NR_{inactive}_{lsc} + X_{ilcs}\theta + W_{cs}\phi + c_c + s_s + \varepsilon_{ilcs} \quad (1)$$

Equation (1) is estimated using a linear probability approach for the binary outcome variables and multi-variate OLS for the composite indicator on public services. Interpreting the coefficient for active mine solely assumes that the respondents' residence nearby an active mine is uncorrelated with other individual, socio-demographic, or institutional characteristics such as access to new infrastructure (in active mining areas) or employment opportunities. This would indeed be a strong assumption, even though the baseline specification accounts for an array of control variables. By including inactive mine, the baseline model facilitates the comparison between responses of individuals in mining areas (both active and inactive) with those from non-mining areas. Non-mining areas consist of all individuals who live farther than a 50-km radius to a mine – thus a pseudo control group (Knutsen et al., 2017). The coefficient on 'inactive mine' can be interpreted in isolation and reflects the differences in the outcome variables between a non-mining area and an inactive mining area. While it is not the standard difference-in-differences approach, it results in a difference-in-differences estimate which accounts for the time-invariant characteristics that may influence an individual residential decision, and factors which may have contributed to shaping living conditions within the 50-km radius community and even prior to the discovery of a mine.

To assess whether the quality of local governance influences the effect of mining on different variables of interest, Equation (1) is extended to the following specification in which  $localgovernance_{lc}$  refers to the quality of local governance at the regional level. An interaction term is added between the quality of local governance and the status of the mine (active or inactive) to test whether the variation in local institutions influences how mining affects the appraisal of public goods and services by residents in nearby areas. The interaction term facilitates the identification of how the institutional environment influences the individual assessment of public goods through the quality of local governance. Depending on the specification, local governance is captured either through the incidence of bribe payment, the aggregate perception of corruption of local government councillors or the aggregate level of distrust in local authorities.

$$y_{ilcs} = \beta_0 + \beta_1 NR_{active_{lsc}} + \beta_2 NR_{inactive_{lsc}} + \beta_3 localgovernance_{lsc} + \beta_4 (NR_{active_{lsc}} \times localgovernance_{lsc}) + \beta_5 (NR_{inactive_{lsc}} \times localgovernance_{lsc}) + \mathbf{X}_{ilcs}\theta + \mathbf{W}_{cs}\phi + c_c + s_s + \varepsilon_{ilcs} \quad (2)$$

To investigate the relevance of decentralization, we substitute  $localgovernance_{lc}$  by  $decentralization_c$  in Equation (2). The resulting model thus tests whether the responses vary according to the design of intergovernmental tax arrangements. Lastly, to test the interplay between the quality of local governance and institutions and decentralization, we introduce interaction terms between the proxy for decentralization, local governance and natural resources endowment (living nearby an active or inactive mine) as edified in Equation (3).

$$y_{ilcs} = \beta_0 + \beta_1 NR_{active_{lsc}} + \beta_2 NR_{inactive_{lsc}} + \beta_3 localgovernance_{lsc} + \beta_4 decentralization_c + \beta_5 (NR_{active_{lsc}} \times decentralization_c) + \beta_6 (NR_{active_{lsc}} \times decentralization_c) + \beta_7 (NR_{inactive_{lsc}} \times decentralization_c \times localgovernance_{lsc}) + \beta_8 (NR_{inactive_{lsc}} \times decentralization_c \times localgovernance_{lsc}) + \mathbf{X}_{ilcs}\theta + \mathbf{W}_{cs}\phi + c_c + s_s + \varepsilon_{ilcs} \quad (3)$$

## 5. Results and Discussions

Table 2 presents the results of the baseline model using the individual assessment of how well or badly the government is handling the living standards of the poor. The coefficient estimates suggest that residents living within a 50 km radius of an active mine have a lower probability of a positive appraisal of government performance in that policy area. The probability is lower by 2% in the most complete model in specifications (3) and (4) – this latter being estimated with clustered standard errors. The direction and significance level of that coefficient is also corroborated with two alternative probit specifications in columns (5) and (6). The difference-in-differences estimate points show a statistical difference between residents living near an active mine and those living near an inactive on how they evaluate the government performance in improving the living standards of the poor. Compared to individuals in communities located near an inactive mine, those living near an active mine are 2.3% less likely to report a positive appraisal of the government performance.

At the country level, it is noted that the higher the ratio of natural resources rents in GDP, the lower the likelihood of a positive appraisal by the respondents. The direction and significance of the coefficients on natural resources rents are consistent throughout all the estimations, indicating thereby an overall dissatisfaction with governments in countries where mining extraction is very significant. However, the results indicate that the control of corruption at the national level tends to have a positive effect on how residents perceive the government's performance in that area. At

the individual level, interest in public affairs tends to have a positive effect on the outcome. In contrast, the poverty level of the respondents (measured by the proxy on how often they are deprived of necessities such as food, water, medicine, and cooking fuel) appears to impact their views negatively.

In Table 3, we consider all other policy areas (water and sanitation, jobs creation, health, education), respondents' optimism about future living conditions (their expected living standards in twelve months' time) and the composite indicator on access to public goods and services. We found a negative and significant impact of living nearby a 50 km radius of an active mine on the perception of government performance in all individual policy areas as well as the aggregated public services measure.

Those living near an active mine are also rather pessimistic about the future. Residents near active mines are 2.3% less likely to positively appraise the government's performance in improving water and sanitation services, 2.9% less likely to approve their performance in job creation, 1.8% less likely to approve health services provision, and 4.2% more pessimistic about the future. Residents near inactive mines are 1.1% less likely to be satisfied with water and sanitation services, and by 2.6% less likely to be optimistic about the future.

The differences-in-differences point estimates suggest a statistically significant gap between the local effects of active and non-active mines on individual assessment of government delivery in the listed policy areas. The comparison (difference-in-differences) between active and non-active mining shows that living near an active mine reduces the probability of positively assessing the performance of the government in water and sanitation by 1.2% points, in job creation by 2.6% points, in health services by 1.2% points, in education by 1.1% points and in public services as a whole by 1.9% points. In addition, the active status of a nearby mine also decreases optimism about the future by 1.7% points compared to living nearby an active mine. The direction and significance of the coefficients on individual interest in public affairs, individual poverty level, country-level natural resources rents (% of GDP), and control of corruption are consistent with the results of Table 2.

**Table 2: Mining and Assessment of Public Services: Baseline Models**

<i>Dependent Variables: Government improving living standards of the poor</i>						
	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-Probit)	(6-Probit)
Active 50 km	-0.018*** (0.006)	-0.018*** (0.007)	-0.020*** (0.007)	-0.020* (0.010)	-0.063*** (0.021)	-0.063* (0.032)
Inactive 50 km	0.005 (0.004)	0.002 (0.004)	0.004 (0.004)	0.004 (0.006)	0.011 (0.011)	0.011 (0.017)
Interest in Public Affairs		0.045*** (0.003)	0.045*** (0.003)	0.045*** (0.003)	0.139*** (0.009)	0.139*** (0.010)
Deprivation		-0.051*** (0.001)	-0.050*** (0.001)	-0.050*** (0.002)	-0.156*** (0.004)	-0.156*** (0.005)
Natural Resources Rents (ln)			-0.035*** (0.007)	-0.035*** (0.010)	-0.112*** (0.021)	-0.112*** (0.030)
Control of Corruption			0.155*** (0.014)	0.155*** (0.022)	0.534*** (0.044)	0.534*** (0.071)
Constant	0.341*** (0.010)	1.301*** (0.118)	1.460*** (0.119)	1.460*** (0.125)	3.016*** (0.358)	3.016*** (0.375)
Difference in Differences	-0.024	-0.021	-0.023	-0.023		
F-test: active-inactive = 0	11.7	8.8	10.9	4.5		
P-value of F-test	0.00	0.00	0.00	0.03		
R-squared	0.05	0.07	0.07	0.07		
Pseudo R-squared					0.06	0.06
Observations	112,825	109,282	109,282	109,282	109,282	109,282
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Robust/Cluster std	Robust	Robust	Robust	Cluster	Robust	Cluster

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust or clustered (at the geo-localization of the mine) standard errors in parenthesis.

<sup>2</sup>: Individual-level control variables are added in specifications (2) to (6): age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status.

**Table 3: Mining and Assessment of Public Services: Baseline Models (2)**

	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-OLS)	(6-LPM)
<i>Dependent Variables</i>	Water & Sanitation	Jobs	Health	Education	Public Services	Optimism
Active 50 km	-0.023*** (0.006)	-0.029*** (0.005)	-0.018*** (0.006)	-0.010* (0.006)	-0.019*** (0.006)	-0.042*** (0.007)
Inactive 50 km	-0.011*** (0.003)	-0.002 (0.003)	-0.006 (0.003)	0.001 (0.003)	-0.001 (0.003)	-0.026*** (0.004)
Interest in Public Affairs	0.035*** (0.003)	0.041*** (0.002)	0.033*** (0.003)	0.031*** (0.003)	0.041*** (0.002)	0.019*** (0.003)
Deprivation	-0.085*** (0.001)	-0.043*** (0.001)	-0.069*** (0.001)	-0.057*** (0.001)	-0.068*** (0.001)	-0.056*** (0.001)
Natural Resources Rents (ln)	-0.114*** (0.006)	-0.062*** (0.005)	-0.168*** (0.006)	-0.173*** (0.006)	-0.123*** (0.006)	-0.026*** (0.007)
Control of Corruption	0.138*** (0.011)	0.189*** (0.010)	0.229*** (0.011)	0.239*** (0.011)	0.202*** (0.012)	0.293*** (0.012)
Constant	1.838*** (0.115)	1.707*** (0.107)	1.981*** (0.113)	1.768*** (0.112)	2.065*** (0.102)	1.832*** (0.120)
Difference in Differences	-0.012	-0.026	-0.012	-0.011	-0.019	-0.017
F-test: active-inactive = 0	3.9	23.7	4.3	3.5	9.4	5.7
P-value of F-test	0.05	0.00	0.04	0.06	0.00	0.02
R-squared	0.09	0.05	0.09	0.10	0.11	0.12
Observations	131,659	130,751	132,511	132,001	105,199	80,553
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust standard errors in parenthesis.

<sup>2</sup>: Specifications (1) to (4) refers to the respondents' view of how the government is handling water & sanitation services to the households, job creation, health, and education. The dependent variable in specification (5) is a composite indicator constructed through polychoric correlation and which combines all the respondents' views on various types of public services and policies, including those in specifications (1) to (4). The sample size is reduced due to inconsistent missing patterns across the different assessment variables. The dependent variable in specification (6) refers to the expected living standards of the respondent in 12 months after the survey collection. Individual-level control variables are added in all specifications: age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status.

### 5.1. The mediating role of local governance

As stated in the introduction and section 2, our contribution also explores whether the quality of institutions at the local level influences the relationship between natural resources endowment and individual assessment of public goods and services. We do so in two different ways. First, we adopt an objective measure of corruption based on the incidence of bribe payment of the respondents, averaged at the regional level. This measure points to the prevalence of corrupt attitudes in the immediate environment surrounding the mining locations. Second, we test the robustness of the results by also considering the distrust in local government councillors and the perception of corruption of local officials. These two are also derived by averaging individual responses on whether local authorities are corrupt or untrustworthy.

With the incidence of bribe payment as a proxy for effective corruption, the results in Table 4 (columns 1-3) show that the incidence of bribe payments has a negative effect on how the distance to an active mine affects the perceived performance of the government – as depicted by the coefficient of the interaction terms. The higher the incidence of bribe payment in a community within 50-km distance from an active mine, the higher the likelihood of citizens being dissatisfied with government performance in improving their living standards and in public services delivery. The incidence of bribe payment also renders the respondents even more pessimistic about the future, be they located nearby an active or an inactive mine. Similar outcomes are observed when the quality of local governance is measured by the level of distrust in local government councillors (columns 4-6). The higher the local distrust in local community leaders, the more negative is the local effects of mining (both active and inactive) on individual assessment with government policies, and their optimism about their future living conditions.

Table 5 reports the coefficient estimates using the average perception of corruption of local government officials as an indicator of the quality of local institutions. In line with Table 4, it is suggested that a high level of perceived corruption of local officials has a negative effect on the relationship between mining and assessment of government performance in improving living standards of the poor, improving essential health and education services, and handling public services. The corruption perception indicator also exacerbates the adverse effects of living near an inactive mine on all the outcome variables as suggested by the interaction terms.

To sum up, the findings of Table 4 and Table 5 suggest that when the incidence of bribe payment or the level of distrust or the perception of corruption of local officials is zero, mining has a positive effect on residents' satisfaction with poverty sensitive-related policies (how government improve living standards of the poor). These findings are particularly insightful in this (African) context where poverty reduction policies are crucial to the households and local communities, especially in resource-rich areas. They indicate that there might be some local benefits to living

nearby an active mine, but that those benefits are carried away by poor governance and high-level of corruption, which corroborates the above hypothesis that the quality of local governance matters in how mining impact on socio-economic outcomes.

## **5.2. The mediating role of decentralization**

In Table 6, we investigate whether and how decentralization – measured by the subnational discretionary power over tax and revenue instruments – influences the relationship between natural resources endowments and socio-economic outcomes. More precisely, we test whether the variation in individual assessments of government performance in delivering all the ranges of public services depends on the level of decentralization.

The results indicate that the level of taxing rights of sub-national governments have a positive marginal effect on how residents in both active and inactive mining area assess the delivery of public services by the state, be it in the areas of improving living standards, job creation, health and education services and the combination of all these public services. Decentralization does however not seem to impact on pessimism, as the distance to the mines appears to predominantly be a driver of a negative outlook on life.

The coefficient estimates on the distance and decentralization variables clearly point to the fact that a higher level of decentralization could, to some extent, alleviate the negative local effects of natural resources on socio-economic outcomes. However, as suggested in the literature (Enikolopov and Zhuravskaya, 2007; Lawer et al., 2017), there is also an inherent link between decentralization and the quality of local governance. Hence, in the following sub-section, we explore, empirically, whether the level of local governance has an adverse effect on the potential benefits that decentralization entails for residents in resource-rich communities.

**Table 4: Mining and Assessment of Public Services: the role of corruption (bribe payment) and trust in local governments**

	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-LPM)	(6-LPM)
<i>Dependent Variables</i>	Living standards	Public Services	Optimism	Living standards	Public Services	Optimism
Active 50 km	0.024** (0.010)	0.028*** (0.009)	-0.022* (0.012)	0.054** (0.023)	0.024 (0.020)	0.035* (0.018)
Inactive 50 km	0.004 (0.006)	-0.003 (0.005)	0.015** (0.007)	0.048*** (0.010)	0.035*** (0.008)	0.042*** (0.010)
Bribe	0.007 (0.015)	-0.003 (0.013)	-0.085*** (0.016)			
<i>Active 50 km * Bribe</i>	-0.246*** (0.039)	-0.265*** (0.034)	-0.090* (0.049)			
<i>Inactive 50 km * Bribe</i>	-0.006 (0.023)	0.012 (0.019)	-0.180*** (0.026)			
Local Government Distrust				-0.392*** (0.012)	-0.415*** (0.010)	-0.177*** (0.013)
<i>Active 50 km * Local Government Distrust</i>				-0.122*** (0.039)	-0.065* (0.035)	-0.162*** (0.037)
<i>Inactive 50 km * Local Government Distrust</i>				-0.089*** (0.020)	-0.071*** (0.017)	-0.144*** (0.020)
Natural Resources Rents (ln)	-0.033*** (0.007)	-0.121*** (0.006)	-0.022*** (0.007)	-0.013* (0.007)	-0.100*** (0.006)	-0.011* (0.007)
Control of Corruption	0.156*** (0.014)	0.203*** (0.012)	0.292*** (0.012)	0.080*** (0.014)	0.124*** (0.012)	0.272*** (0.012)
Constant	1.455*** (0.119)	2.061*** (0.102)	1.836*** (0.119)	1.599*** (0.119)	2.209*** (0.101)	1.885*** (0.120)
R-squared	0.07	0.11	0.12	0.08	0.13	0.12
Observations	109,282	105,199	80,553	109,282	105,199	80,553
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust standard errors are in parenthesis.

<sup>2</sup>: Specifications (1) and (4) refers to the respondents' view of how the government is improving the living conditions of the poor. The dependent variable in specification (2) and (5) is a composite indicator constructed through polychoric correlation and which combines all the respondents' views on various types of public services and policies. The dependent variable in specification (3) and (6) refers to the expected living standards of the respondent in 12 months after the survey collection. Individual-level control variables are added in all specifications: age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status, interest in public affairs and deprivation (poverty level).

**Table 5: Mining and Assessment of Public Services: the role of local corruption**

<i>Dependent Variables:</i>	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-LPM)	(6-OLS)	(7-LPM)
	Living standards	Water & Sanitation	Jobs	Health	Education	Public Services	Optimism
Active 50 km	0.106* (0.055)	0.011 (0.034)	-0.068** (0.029)	0.074** (0.033)	0.046 (0.030)	0.130 (0.095)	-0.075** (0.038)
Inactive 50 km	0.127*** (0.026)	0.033 (0.022)	0.066*** (0.021)	0.064*** (0.021)	0.080*** (0.020)	0.186*** (0.040)	0.010 (0.021)
Local Corruption	-0.317*** (0.017)	-0.109*** (0.017)	-0.216*** (0.015)	-0.200*** (0.017)	-0.227*** (0.017)	-0.389*** (0.028)	-0.119*** (0.016)
<i>Active 50 km * Local Corruption</i>	-0.141** (0.061)	-0.039 (0.039)	0.046 (0.034)	-0.109*** (0.038)	-0.066* (0.036)	-0.174* (0.106)	0.039 (0.046)
<i>Inactive 50 km * Local Corruption</i>	-0.144*** (0.029)	-0.052** (0.026)	-0.081*** (0.024)	-0.081*** (0.025)	-0.093*** (0.024)	-0.219*** (0.046)	-0.043* (0.025)
Natural Resources Rents (ln)	-0.033*** (0.007)	-0.112*** (0.006)	-0.056*** (0.005)	-0.160*** (0.006)	-0.165*** (0.006)	-0.281*** (0.011)	-0.024*** (0.007)
Control of Corruption	0.136*** (0.014)	0.153*** (0.011)	0.208*** (0.010)	0.242*** (0.011)	0.258*** (0.011)	0.336*** (0.024)	0.306*** (0.012)
Constant	1.675*** (0.121)	1.921*** (0.116)	1.860*** (0.108)	2.097*** (0.115)	1.895*** (0.114)	2.700*** (0.197)	1.935*** (0.120)
R-squared	0.08	0.09	0.05	0.09	0.10	0.12	0.12
Observations	106,968	129,349	128,481	130,201	129,706	102,970	80,553
Country FE	Yes						
Round FE	Yes						

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust standard errors are in parenthesis.

<sup>2</sup>: Specifications (1-5) refer to the respondents' view on how the government is handling the improvement of living standards of the poor, water and sanitation services, job creation, health, and education. The dependent variables in specification (6) is a composite indicator constructed through polychoric correlation and which combines all the respondents' view on various types of public services and policies, including those in specifications (1-5). The dependent variable in specification (7) refers to the expected living standards of the respondent in the near future (12 months after the survey collection). Individual-level control variables are added in all specifications: age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status, interest in public affairs and poverty

**Table 6: Mining and Assessment of Public Services: the role of decentralization**

	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-LPM)	(6-OLS)	(7-LPM)
<i>Dependent Variables:</i>	Living standards	Water & Sanitation	Jobs	Health	Education	Public Services	Optimism
Active 50 km	-0.038*** (0.009)	-0.038*** (0.009)	-0.047*** (0.008)	0.001 (0.010)	0.005 (0.010)	-0.036*** (0.009)	-0.064*** (0.011)
Inactive 50 km	-0.013** (0.005)	-0.043*** (0.005)	-0.011** (0.005)	-0.023*** (0.005)	-0.028*** (0.005)	-0.037*** (0.005)	-0.032*** (0.006)
Decentralization	-0.057*** (0.016)	-0.056*** (0.017)	-0.230*** (0.015)	-0.267*** (0.018)	-0.297*** (0.017)	-0.223*** (0.015)	-0.019 (0.018)
<i>Active 50 km * Decentralization</i>	0.267*** (0.069)	0.205*** (0.064)	0.205*** (0.056)	0.081 (0.067)	0.192*** (0.068)	0.306*** (0.066)	0.082 (0.069)
<i>Inactive 50 km * Decentralization</i>	0.298*** (0.037)	0.366*** <sup>4</sup> (0.036)	0.073** (0.032)	0.382*** (0.036)	0.516*** (0.036)	0.492*** (0.032)	-0.033 (0.037)
Natural Resources Rents (ln)	-0.005** (0.002)	-0.030*** (0.002)	0.008*** (0.002)	-0.036*** (0.002)	-0.053*** (0.002)	-0.026*** (0.002)	0.068*** (0.002)
Control of Corruption	0.078*** (0.003)	0.067*** (0.003)	0.039*** (0.003)	0.024*** (0.003)	0.015*** (0.003)	0.035*** (0.003)	0.092*** (0.003)
Constant	1.479*** (0.124)	1.354*** (0.120)	1.402*** (0.112)	1.497*** (0.121)	1.280*** (0.120)	1.710*** (0.107)	1.540*** (0.131)
R-squared	0.035	0.064	0.022	0.038	0.042	0.057	0.057
Observations	101,349	118,081	117,455	118,786	118,392	97,765	68,527
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust standard errors are in parenthesis.

<sup>2</sup>: Specifications (1-5) refer to the respondents' view on how the government is handling the improvement of living standards of the poor, water and sanitation services, job creation, health, and education. The dependent variables in specification (6) is a composite indicator constructed through polychoric correlation and which combines all the respondents' view on various types of public services and policies, including those in specifications (1-5). The dependent variable in specification (7) refers to the expected living standards of the respondent in the near future (12 months after the survey collection). Decentralization is measured by the discretionary power of sub-central governments to decide over the fiscal space. Individual-level control variables are added in all specifications: age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status, interest in public affairs and poverty.

### 5.3. The interplay of decentralization and local governance

In Table 7, we report the coefficient estimates on the interplay between decentralization and corruption, and their confoundedness in explaining how natural resources endowment affects citizens' perception of the state's delivery of public goods and services. More precisely, we analyze how the negative marginal effect of the incidence of bribe payment (Table 5) and the positive marginal effect of Decentralization (Table 6) comes into play in the relationship between natural resources endowment and citizens' perception of government performance as well as their outlook on the future.

For residents living near active mines, the results indicate that the positive marginal effect of decentralization is reduced by the incidence of corruption on the perception of government performance on improving living standards, improving water & sanitation, job creation, health and education, and public services as a whole. The incidence of bribe payment statistically and significantly reduces the positive marginal effects of decentralization.

Figure 3 and Figure 4 illustrate the local effects of active mining and the interplay of decentralization and the incidence of bribe payment. We illustrate these effects and the interplay for the individual assessment of government performance in improving living standards and public services delivery. We do so by following the methods prone by Dawson and Richter (2006). We first compute the slope of the dependent variable (improving living standards or public services delivery) on the independent variable (active 50 km) when the moderators (decentralization and bribe) are held constant at different combinations of high and low values. In addition, we test the differences among all pairs of slopes by using the *'pwcompare(effects)'* option of the *'margins'* command in Stata 16 (StataCorp., 2019).

The results of the pairwise comparisons are reported in Table 8 and Table 9. For both outcome variables, we found that, regardless of the level of decentralization (high or low), a high incidence of bribe payment leads to the worse impact of natural resources on individual perception of government performance. On the other hand, when corruption is low, a higher level of decentralization is preferable. By extension, when decentralization is low, a lower incidence of bribe payment is preferable. The pairwise comparison of these slopes is confirmed by the graphical analyses.

Poverty alleviation is the prime focus of the policy agenda in most African countries. Natural resources and the extractive industries have the potential of providing significant revenues for the government to implement pro-welfare policies, especially within resource-rich communities. Figure 5 further illustrates the interplay of local institutions and local taxing rights for both active and inactive mining areas. The probability of a positive appraisal of government performance in resource-rich communities more generally is the highest when the level of local taxing rights is

high, and the incidence of bribe payment low. Like in Table 8 and Table 9 the worst scenario is the case where both the incidence of corruption and the ability of sub-national governments to decide over the tax system are high. The interplay between the incidence of bribe payments and the legal attribution of taxing powers to sub-national authorities contributes to empirically sustain the hypothesis that the quality of local institutions and the inter-governmental fiscal arrangements regarding taxes and revenue collection matter for how mining activities translate into welfare improvement for the nearby local communities.

**Table 7: Mining and Assessment of Public Services: the interplay of decentralization and corruption**

	(1-LPM)	(2-LPM)	(3-LPM)	(4-LPM)	(5-LPM)	(6-OLS)	(7-LPM)
<i>Dependent Variables</i> <sup>1</sup> :	Living standards	Water & Sanitation	Jobs	Health	Education	Public Services	Optimism
Active 50 km	-0.033*** (0.009)	-0.039*** (0.009)	-0.047*** (0.008)	0.000 (0.009)	0.003 (0.009)	-0.032*** (0.008)	-0.064*** (0.011)
Inactive 50 km	-0.016*** (0.005)	-0.043*** (0.005)	-0.012** (0.005)	-0.023*** (0.005)	-0.028*** (0.005)	-0.036*** (0.005)	-0.032*** (0.006)
Bribe	-0.089*** (0.012)	-0.014 (0.012)	-0.027** (0.011)	-0.001 (0.012)	-0.040*** (0.012)	-0.051*** (0.010)	0.003 (0.014)
Decentralization <sup>4</sup>	-0.065*** (0.016)	-0.068*** (0.017)	-0.232*** (0.016)	-0.279*** (0.018)	-0.317*** (0.018)	-0.234*** (0.015)	-0.024 (0.018)
<i>Active 50 km * Decentralization</i>	0.600*** (0.090)	0.384*** (0.081)	0.298*** (0.073)	0.466*** (0.082)	0.646*** (0.081)	0.717*** (0.075)	0.180* (0.093)
<i>Inactive 50 km * Decentralization</i>	0.168*** (0.044)	0.525*** (0.044)	0.053 (0.040)	0.511*** (0.045)	0.751*** (0.044)	0.503*** (0.038)	0.050 (0.050)
<i>Active 50 km * Decentralization * Bribe</i>	-2.817*** (0.364)	-1.130*** (0.331)	-0.678** (0.294)	-2.553*** (0.333)	-2.972*** (0.331)	-3.244*** (0.324)	-0.487 (0.373)
<i>Inactive 50 km * Decentralization * Bribe</i>	0.870*** (0.172)	-0.895*** (0.150)	0.123 (0.128)	-0.702*** (0.151)	-1.298*** (0.148)	-0.087 (0.139)	-0.362** (0.161)
Natural Resources Rents (ln)	-0.006** (0.002)	-0.030*** (0.002)	0.008*** (0.002)	-0.036*** (0.002)	-0.052*** (0.002)	-0.027*** (0.002)	0.068*** (0.002)
Control of Corruption	0.066*** (0.004)	0.059*** (0.003)	0.036*** (0.003)	0.017*** (0.003)	-0.000 (0.003)	0.024*** (0.003)	0.089*** (0.004)
Constant	1.482*** (0.124)	1.361*** (0.120)	1.402*** (0.112)	1.504*** (0.121)	1.294*** (0.120)	1.711*** (0.107)	1.542*** (0.131)
R-squared	0.04	0.06	0.02	0.04	0.04	0.06	0.06
Observations	101,349	118,081	117,455	118,786	118,392	97,765	68,527
Country FE	Yes						
Round FE	Yes						

**Notes:**

<sup>1</sup>: Significance level: \* p<0.10, \*\* p<0.05, \*\*\*p<0.01. Robust standard errors are in parenthesis.

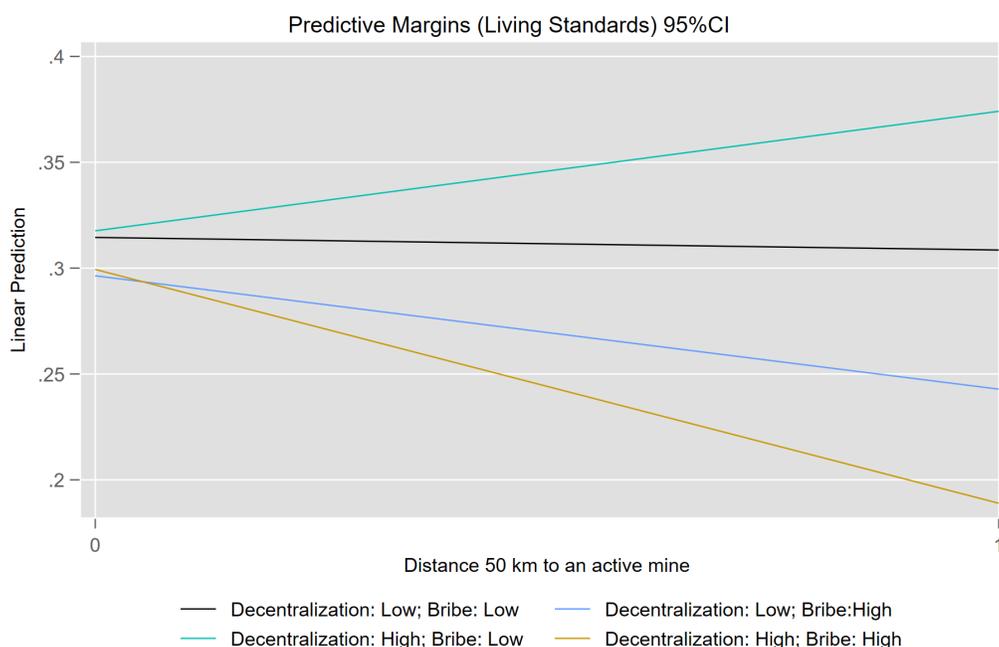
<sup>2</sup>: Specifications (1) to (5) refer to the respondents' view on how the government is handling the improvement of living standards of the poor and other public services such as in health, water and sanitation. The dependent variable in specification (6) is a composite indicator constructed through polychoric correlation and which combines all the respondents' views on various types of public services and policies. The sample size is reduced due to inconsistent missing patterns across the different assessment variables. The outcome variable in specification (7) refers to the expected living standards of the respondent in the near future (12 months after the survey collection). Decentralization is measured by the

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discretionary power of sub-central governments to decide over the fiscal space. Individual-level control variables are added in all specifications: age (ln), the square of the logarithm of age, gender, education, residential area (urban), employment status, interest in public affairs and deprivation (poverty level).

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**Figure 3: Government improving living standards: the interplay of decentralization and effective corruption**



**Table 8: Government improving living standards: the interplay of decentralization and effective corruption**  
**Pairwise comparison of average marginal effects (with Bonferroni correction)**

	<i>Decentralization</i>	<i>Bribe</i>				
<i>Case 1</i>	High	High				
<i>Case 2</i>	High	Low				
<i>Case 3</i>	Low	High				
<i>Case 4</i>	Low	Low				

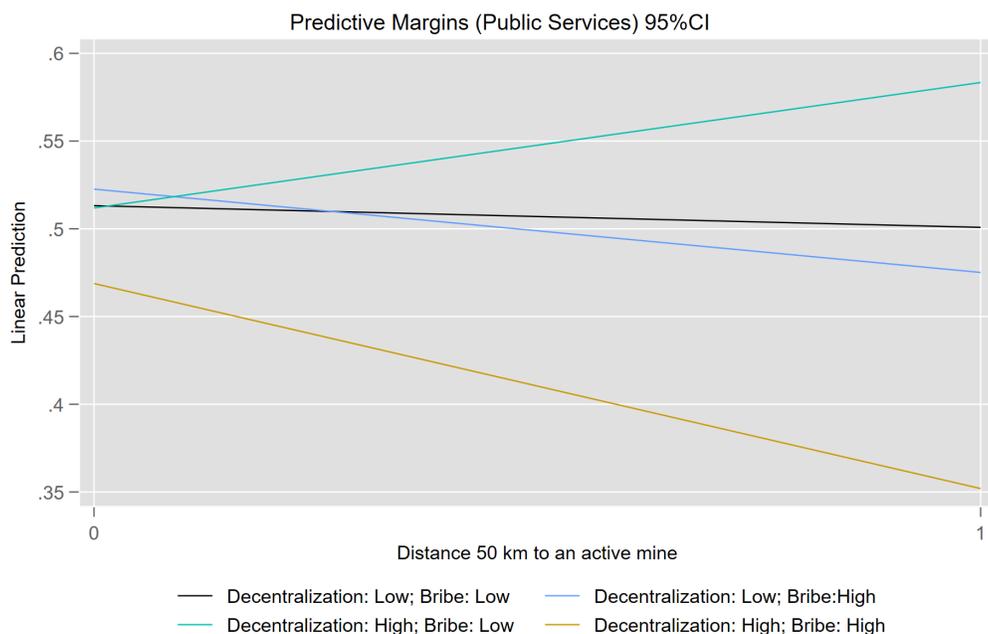
  

At	Contrast dy/dx	Std. Error	t	P> t	95% Conf Interval	
<i>Case 2 vs Case 1</i>	0.057	0.023	2.510	0.072	-0.003	0.117
<i>Case 3 vs Case 1</i>	0.167	0.026	6.380	0.000	0.098	0.236
<i>Case 4 vs Case 1</i>	0.104	0.022	4.710	0.000	0.046	0.163
<i>Case 3 vs Case 2</i>	0.110	0.017	6.400	0.000	0.065	0.155
<i>Case 4 vs Case 2</i>	0.048	0.017	2.830	0.028	0.003	0.092
<i>Case 4 vs Case 3</i>	-0.062	0.023	-2.670	0.045	-0.124	-0.001

**Notes:**

dy/dx for factor levels is the discrete change from the base level. We control for individual- and country-level covariates, as well as time and country fixed-effects. Estimations are performed with robust standards errors.

**Figure 4: Public Services Delivery: the interplay of decentralization and effective corruption**



**Table 9: Government delivering public services: the interplay of decentralization and effective corruption**  
**Pairwise comparison of average marginal effects (with Bonferroni correction)**

	<i>Decentralization</i>	<i>Bribe</i>
<i>Case 1</i>	High	High
<i>Case 2</i>	High	Low
<i>Case 3</i>	Low	High
<i>Case 4</i>	Low	Low

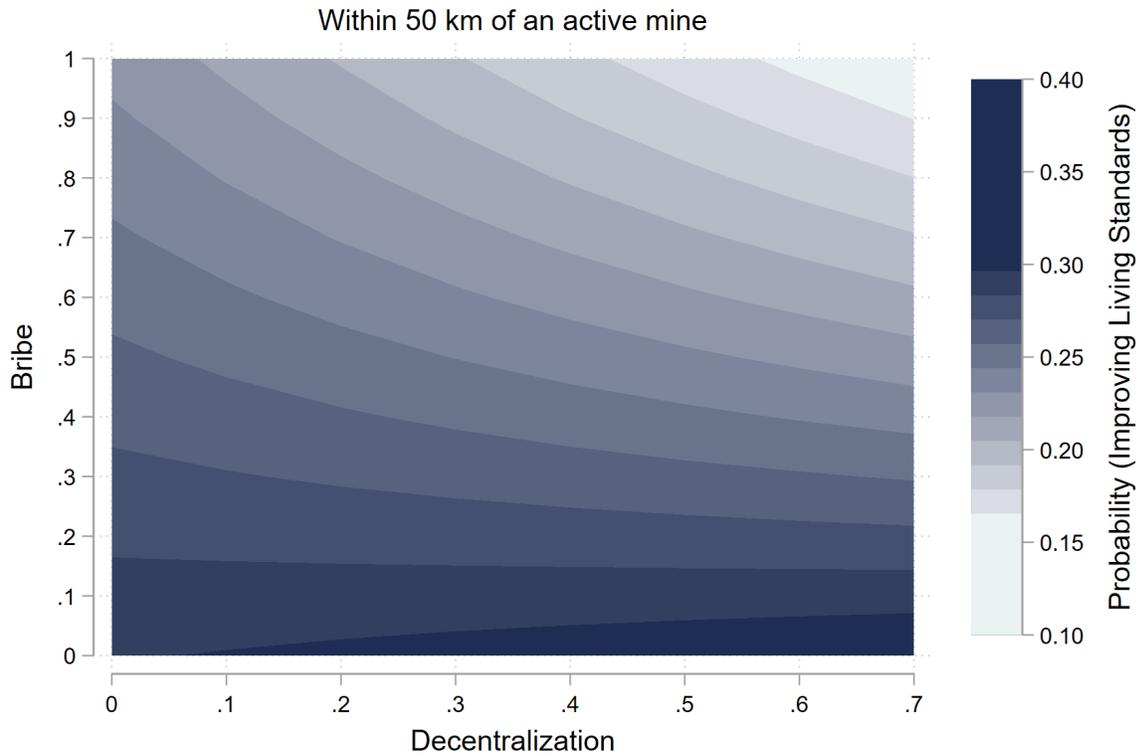
  

At	Contrast dy/dx	Std. Error	t	P> t	95% Conf Interval	
<i>Case 2 vs Case 1</i>	0.188	0.023	8.060	0.000	0.127	0.250
<i>Case 3 vs Case 1</i>	0.069	0.022	3.140	0.010	0.011	0.128
<i>Case 4 vs Case 1</i>	0.104	0.021	4.990	0.000	0.049	0.160
<i>Case 3 vs Case 2</i>	-0.119	0.015	-8.070	0.000	-0.158	-0.080
<i>Case 4 vs Case 2</i>	-0.084	0.020	-4.250	0.000	-0.136	-0.032
<i>Case 4 vs Case 3</i>	0.035	0.015	2.370	0.108	-0.004	0.074

**Notes:**

dy/dx for factor levels is the discrete change from the base level. We control for individual- and country-level covariates, as well as time and country fixed-effects. Estimations are performed with robust standards errors.

**Figure 5: Interplay of Decentralization and Effective Corruption in Resource-Rich Communities**



## 6. Concluding remarks

In this paper, we investigated the effects of mining on the quality of local public services as reported by citizens, and on people's expectations of their future living conditions in more than 30 countries in Africa. The contributions of the paper were twofold. First, we contributed to the growing literature on the micro-impact of natural resources endowment and exploitation on local communities and local socio-economic outcomes. Second, we provided empirical evidence of the confoundedness of local quality of institutions and decentralization, which, to be best of our knowledge, has been so far missing in the literature.

Our empirical analysis relied on a rich combination of datasets. Owing to the geospatial information in the Afrobarometer surveys, we were able to match individuals in small communities in many African countries to their nearest mine with information on mining industries provided by the SNL Metals and Mining Dataset. To this, we added a new measure of decentralization issued from a dataset on tax and revenue assignment, which covers developing and emerging economies. The measure of decentralization captures the legal assignment of

decision-making power to subnational governments and their legal ability to raise revenues from different instruments in a country (Vincent, 2020).

With these combined datasets, we estimated how individuals living within a 50 km radius from an active or an inactive mine assess government performance in several public policy areas, including improving living standards, job creation, health and education services, as well as a composite indicator of public services as a whole. We also investigated how the geographical closeness to a mine affects the individual expectation of their living standards in the future (referred to as optimism).

The results from the baseline suggested that residents living within a 50 km radius to an active mine are less likely to approve government performance in improving living standards, jobs creation, health services, and public services delivery. In addition, they are also less likely to be optimistic about their future living standards. While the results are more mitigated for the distance to an inactive mine, they point to the dissatisfaction of nearby with the government handling water and sanitation and a decrease in optimism about the future.

In comparison to non-active mine, active mining statistically reduces the probability of approving government performance in the afore-mentioned policy areas and public services as a whole. In addition, the '*active*' status of a nearby mine also decreases the optimism of the respondents in the Afrobarometer surveys.

We then moved onto exploring the effects of local governance. The results confirm our hypothesis on the confoundedness of the quality of local institutions. We found that effective corruption, measured by the incidence of bribe payment at the local level and the sentiment of distrust in local government councillors, amplifies the negative effects of the geographical closeness to an active mine. The higher the incidence of bribe payment or level of distrust in local governments in a community located within a 50km radius from an active mine, the higher the likelihood of citizens being dissatisfied with government performance. Both variables also render the respondents even more pessimistic about the future.

Finally, we examined the interplay between decentralization and effective corruption in how they jointly influence the local effects of mining. The results indicate that a higher level of decentralization could, to some extent, alleviate the adverse local effects of natural resources on socio-economic outcomes. However, these positive marginal effects considerably diminish in the presence of corruption. Exploring the interplay of Decentralization and local government, we found that, regardless of the level of decentralization (high or low), a high incidence of bribe payment leads to the worse impact of natural resources on individual perception of government performance. On the other hand, when corruption is low, a higher level of decentralization is preferable.

As governments everywhere in Africa are delved into natural resources extraction, our paper contributes to the growing evidence that the quality of local institutions matters for how mining activities could translate into local welfare for nearby communities. In addition, we demonstrate that inter-governmental fiscal arrangements regarding taxes and revenues are of utmost importance in the way that natural resources may affect local socio-economic outcomes. More specifically, for communities within 50-km to an active mine, the results indicate that a high level of corruption alongside a high level of decentralization constitutes the worst-case scenario. On the other hand, when the incidence of bribe payment is very low, the higher level of decentralization translates into the more positive appraisal of welfare policies.

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## Appendix A: Summary Statistics and Description

	<b>Variables</b>	<b>Definition</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>	<b>Primary Data Source</b>
<i>Dependent variables</i>	Living Standards	Government Handling of: Improving living standards of the poor	109019	0.30	0.46	0	1	Afrobarometer - Round 4, 5, 6
	Water & Sanitation	Government Handling of: Water and sanitation to households	131280	0.44	0.50	0	1	Afrobarometer - Round 3, 4, 5, 6
	Jobs	Government Handling of: Job creation	130277	0.27	0.44	0	1	Afrobarometer - Round 3, 4, 5, 6
	Health	Government Handling of: Improving educational needs	132161	0.58	0.49	0	1	Afrobarometer - Round 3, 4, 5, 6
	Education	Government Handling of: Basic health services	131661	0.60	0.49	0	1	Afrobarometer - Round 3, 4, 5, 6
	Public Services	Composite measure of how government is handling public services listed	104699	0.50	0.39	0	1.14	Afrobarometer - Round 3, 4, 5, 6
	Optimism	Expected living standards in 12-month time	79300	0.79	0.41	0	1	Afrobarometer - Round 3, 4, 5, 6
<i>Variables of interest</i>	Active 50 km	Distance 50 km or less to an active mine	136727	0.07	0.25	0	1	SNL Metal & Mining by S&P
	Inactive 50 km	Distance 50 km or less to an inactive mine	136727	0.22	0.42	0	1	SNL Metal & Mining by S&P
	Local corruption	Average perception of corruption at the local level	134327	0.85	0.13	0.12	1	Afrobarometer - Round 3, 4, 5, 6
	Bribe	Incidence of bribe payment - averaged at the local level	136727	0.21	0.15	0	0.94	Afrobarometer - Round 3, 4, 5, 6
	Distrust in local governments	Average distrust level in local government councillors	136727	0.48	0.19	0	1	Afrobarometer - Round 3, 4, 5, 6
	Decentralization	Measure of the discretionary power of subnational governments over tax and revenue instruments	123539	0.13	0.11	0	0.61	Vincent (2020)
<i>Control variables</i>	Age (ln)	Age (natural logarithm)	135473	3.53	0.38	2.89	4.87	Afrobarometer - Round 3, 4, 5, 6
	Age <sup>2</sup>	Age squared	135473	12.63	2.70	8.35	23.69	Afrobarometer - Round 3, 4, 5, 6
	Gender	Gender of the respondent	136727	1.50	0.50	1	2	Afrobarometer - Round 3, 4, 5, 6
	Education	Education (primary and above)	136350	0.80	0.40	0	1	Afrobarometer - Round 3, 4, 5, 6
	Urban	Urban area	136727	0.39	0.49	0	1	Afrobarometer - Round 3, 4, 5, 6
	Employed	Employed at the time of the survey	136161	0.36	0.48	0	1	Afrobarometer - Round 3, 4, 5, 6
	Interest in Public Affairs	Interest in public affairs	135361	0.61	0.49	0	1	Afrobarometer - Round 3, 4, 5, 7
	Deprived	Respondents lack basic necessities - higher/worse	134991	1.45	1.09	0	4.59	Afrobarometer - Round 3, 4, 5, 8
	Natural Resources Rents (ln)	Natural resources rents (%GDP) (natural logarithm)	136727	2.21	0.71	0.89	3.92	World Development Indicators
	Natural Resources Rents	Natural resources rents (%GDP)	136727	11.62	8.81	2.43	50.25	World Development Indicators

Control of Corruption	World Governance Indicator - Control of Corruption Estimate	136727	-0.55	0.56	-1.49	1.16	World Governance Indicators
Number of countries		34					
Number of survey rounds		4					
<b><i>Observations</i></b>		<b><i>136727</i></b>					

**Table 10: Afrobarometer Country Sample**

<i>Survey Rounds</i>	<b>Round3</b>	<b>Round4</b>	<b>Round5</b>	<b>Round6</b>
<i>Countries</i>	<i>2005-2006</i>	<i>2008-2009</i>	<i>2001-2013</i>	<i>2014-2015</i>
Algeria	No	No	Yes	Yes
Benin	Yes	Yes	Yes	Yes
Botswana	Yes	Yes	Yes	Yes
Burkina Faso	No	Yes	Yes	Yes
Burundi	No	No	Yes	Yes
Cameroon	No	No	Yes	Yes
Cape Verde	Yes	Yes	Yes	No
Egypt	No	No	Yes	No
Gabon	No	No	No	Yes
Ghana	Yes	Yes	Yes	Yes
Guinea	No	No	Yes	Yes
Kenya	Yes	Yes	Yes	Yes
Lesotho	Yes	Yes	Yes	Yes
Liberia	No	Yes	Yes	Yes
Madagascar	Yes	Yes	Yes	Yes
Malawi	Yes	Yes	Yes	Yes
Mali	Yes	Yes	Yes	Yes
Mauritius	No	No	Yes	No
Morocco	No	No	Yes	Yes
Mozambique	Yes	Yes	Yes	Yes
Namibia	Yes	Yes	Yes	Yes
Niger	No	No	Yes	Yes
Nigeria	Yes	Yes	Yes	Yes
Senegal	Yes	Yes	Yes	Yes
Sierra Leone	No	No	Yes	Yes
South Africa	Yes	Yes	Yes	Yes
Sudan	No	No	Yes	Yes
Swaziland	No	No	Yes	No
Tanzania	Yes	Yes	Yes	Yes
Togo	No	No	Yes	Yes
Tunisia	No	No	Yes	Yes
Uganda	Yes	Yes	Yes	Yes
Zambia	Yes	Yes	Yes	Yes
Zimbabwe	Yes	Yes	Yes	Yes

## Appendix B: Decentralization Indicator

The indicator of decentralization is developed as part of a doctoral dissertation project (Vincent, 2020). The dataset informs on the discretionary power of sub-national and central governments over the tax system. It is built through in-depth reviews of more than two thousand legal and policy documents that inform on the distribution of power over the tax system across layers of government in each given country. The dataset considers the latest information available for each country based on the publication or ratification date of the most recent legal provisions on local taxation or the general tax codes. As such, not all countries listed in Table 10 are included in estimations with the decentralization variable. For instance, Benin is included in all rounds provided that the Afrobarometer was conducted as the primary law on local finance dates back to 1998 (Law No. 98-007). On the other hand, Madagascar's intergovernmental tax system is most recently defined by 2014 on local government finance and is therefore excluded from the analysis using the local government taxing rights variables. The sources of information are summarized as follows:

**Table 11: Sources of information – A summary**

Legal Provision	Tax Codes, Local Government Acts, Laws and Decrees on Local Public Finance and Taxation, Constitutions
Archives and Policy Documents	Archives from the International Bureau of Fiscal Documentation (IBRD, Access: 2015-2017), Decentralisation Policy Document, Territorial and Public Administration Reforms documents, Development Strategies, Public Financial Reports, Regional and Local Council Reports
Scientific and Grey Literature	Peer-reviewed publications, edited volumes, working papers and multilateral organization reports (IMF, World Bank, UCLG, UN, ...)
Existing Databases	OECD Tax Autonomy, Regional Authority Index, Local Public Finance Datasets (when available); IMF Government Finance Statistics Manuals (Institutional Structure of Government)

### Coding Procedures

Using the following matrix (Table 12), the discretionary power of each layer of government is coded for each identified tax and revenue source, and across four types of decisions: instrument, base, rates and administration.

- a. *Instrument* refers to the ability of each government tier to establish or alter an existing instrument.
- b. *Base* indicates which layer of government is involved in defining the taxable base or granting relief. While the tax bases are often defined single-handedly by central

authorities, there are cases where the base is jointly assessed and defined by upper and lower-tier authorities.

- c. *Rate* refers to the discretionary power over the setting of the rates. In cases where central authorities define an interval for the tax rates, and sub-central authorities set the appropriate rate for their respective jurisdictions, the coding reflects a joint decision.
- d. *Administration* refers to the involvement of subnational authorities in tax and revenue administration.

The three most common layers of governments are identified as “*C*” for the central government, “*I*” for an intermediate level of authorities, and “*L*” for local government. A full discretion by one government layer is identified as such by a single letter referring to that layer, whereas a joint decision carried out by more than one layer is identified as such through a combination of letters.

### **Scoring Procedures**

For each type of decision, a score is calculated by taking the linear ratio of lower-tier governments’ involvement over the total number of identified instruments. We define  $(L) = (I, L) = 1$  for a single-handed decision and  $(C, L) = (C, I, L) = 1/2$  for a joint decision with the central authority. A score is calculated for each decision component -- instrument, base, rate, administration by first summing up the involvement of the sub-national governments across the range of tax instruments (based on the weights above) and divided by the number of instruments. The “tax assignment index” is then calculated by taking the average for the four decision components. This measure proxy the legal decision-making power of subnational authorities over the fiscal space – herein defined as the range of tax and revenue instruments. Further details on the dataset are to be found in a forthcoming working paper (Vincent, 2020) and from this [online source](#).

**Table 12: Illustration of Coding and Scoring Procedures**

<b>Scoring</b>																
	Income				Property		Consumption			Others					Scores	
	Corporate Income Tax	Business Tax	Personal Income Tax	Payroll/Withholding	Property	Transfers of Property	Sales/VAT/Turnover	Excise	Fuel	Industry and Trade	Vehicles	Gambling	Stamps	Natural Resources	Decision Score	Tax Assignment Index
<b>Country Name</b>																<b>0.22</b>
<i>Instrument</i>	C	C	C	C	C	C	C	C	C	C, I	C	C	C	C		<b>0.04</b>
<i>Base</i>	C	C	C	C	C, I	C, L	C	C	C	C, I	C	C	C	C		<b>0.11</b>
<i>Rate</i>	C	C	C	C	I, L	I, L	C	C	C	C, I, L	C, I	I, L	C	C		<b>0.29</b>
<i>Administration</i>	C	L	C	C, I	I, L	L	C	C	C	C, I, L	I, L	L	C, L	C		<b>0.46</b>

**Notes:** Author's. Matrix design originally from the World Bank Qualitative Decentralisation Indicators. The Tax Assignment Index is used to proxy the level of decentralization in this paper