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Mining and quality of public services: The role of local governance and decentralisation

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MINING AND QUALITY OF PUBLIC SERVICES¹:
The role of local governance and decentralisation⁴

Maty Konte§ and Rose Camille Vincent”

Abstract

This paper investigates the effects of mining on the quality of public services – as reported by the citizens – and on people’s optimism about their future living conditions. More particularly, it examines how the quality of local governance and the level of decentralisation may shape the proximity to mine effects. We connect more than 130,000 respondents from the Afrobarometer survey data (2005-2014) to their closest mines based on the geolocation coordinates of the enumeration areas and data on the mines and their respective status from the SNL Metals & Mining. Using a difference-in-difference strategy, the results from the baseline model suggest that residents living within 50 km to an active mine are less likely to approve the government performance in key public goods and services delivery. Compared to the distance to an inactive mine, the geographical closeness to an active mine lowers the likelihood of a positive assessment by 2.2% points on how the government handles improving living standards of the poor, by 2.6% points on job creation, by 1.2% points for both health services and water and sanitation, by 1.9% points on public services as a whole. Living near an active mine also lowers optimism about future living conditions by 1.7% points. Exploring the confoundedness of local governance and decentralisation, the results show that the incidence of bribe payments (effective corruption) at the local level has a negative effect on the relationship between mining and quality of public services. On the other hand, we found that the closeness to a mine tends to have a positive effect in more decentralised countries; however, the positive marginal effects of decentralisation tend to be reduced in an environment with poor quality of local governance, high incidence of bribe payment and low level of trust in local government officials. In communities within 50-km to an active mine, low corruption and high decentralisation is the best-case scenario, while high decentralisation and high corruption constitute the worst scenario.

Keywords: Mining; Public Services; Local Governance; Decentralisation; Africa

JEL Classification : H410 ; H700; O550; Q000

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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, household, and individual data. 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 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 such as child mortality, female empowerment and employment (Kotsadam and Tolonen, 2016; Benshail-Tolonen, 2019) and on 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, countries rich in natural resources 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. Mining activities could, therefore, not only fuel local corruption, as pointed out by Knutsen et al. (2017) but also undermine the quality and provision of public services delivered to nearby local communities. Drawing from these postulates, 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 natural resources 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

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1 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 and cross-country studies have encountered.
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 decentralisation 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 georeferenced data with the SNL Metals and Mining by the S&P that provide time-series information on industrial mines in countries in sub-Saharan 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.2 We exploit the availability of a new dataset on decentralisation – 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 decentralisation since the early 2000s.

2See Knutsen et al. (2017).
We employ a difference-in-difference strategy, similar to that used 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. 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 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 decentralisation. But this positive effect tends to be reduced in environments with poor quality of local governance, high incidences of bribe payments, and high-level of distrust in local public officials. The empirical results on the interplay between local corruption and decentralisation 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

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3 The non-active mines also include the ones defined as “yet to open”, “under mitigation”, “on care and maintenance”, “under rehabilitation”, and “on hold”.
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. (2017) 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 socioeconomic 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 decentralisation reforms that have taken place on the African continent in the last decades. In resource-rich communities, as in others, decentralisation 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 decentralisation 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 decentralisation, sub-national governments taxing rights, and their legal attribution in revenue mobilisation. Therefore, as part of our second contributions, this paper assesses the mediating role of local governance and decentralisation in the relationship between natural resources endowment and local socio-economic outcomes.

3. Data Sources

Our empirical analysis relies on the georeferenced Afrobarometer survey data for the period of 2005 to 2014 and which inform on the geolocation of the enumeration areas (EA or primary sampling unit) where the respondents live. The Afrobarometer surveys are a prominent source of information on local communities and capture the availability and quality of public services such as schools and health centre, the living conditions and the assessment of local communities of their respective local and national government authorities. Moreover, the use of multiple rounds of the Afrobarometer surveys allow us to control for both time (shocks) and country-level heterogeneity. The geospatial coordinates allow us to connect the respondents to their closest mines, which are also georeferenced in the Raw Materials Database (RMD) of SNL Metals and Mining. From the SNL dataset, we extracted all the reported mines, their locations, and the year in which the most recent information on the status of the mine was recorded. If the year of the recorded information on the status of a mine in the SNL Metals and Mining dataset does not correspond to the year of the Afrobarometer survey data collection for a particular country, we match the Afrobarometer with the closest SNL information date which, in all those cases, correspond to the previous or the
subsequent year of the Afrobarometer survey collection. This merging strategy only concerns a small sample of countries: Senegal (Round 3 and Round 4 of the Afrobarometer), Burundi (Round 5), Benin, and E-Swatini (Round 6). In total, we connect more than 130,000 respondents across more than 30 African countries to the closest mines located within 50 km radius of the EAs.

We create two binary variables: the dummy ‘Active’ equals 1 if a respondent is located within 50 km radius from an active mining area and 0 otherwise; and the dummy ‘Inactive’ takes the value of 1 if a respondent lives within 50 km radius from an inactive mining area and 0 otherwise. We define as inactive any mines with one of the following statuses: inactive, care and maintenance, on hold, rehabilitation, and under litigation. Our control group includes all other respondents that live within more than 50 km from active or inactive mines.

Our dependent variables are constructed from the following Afrobarometer 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 considered in this paper 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 Likert-scale and range from very badly to very well. For each of them, we create a dummy variable that takes a value of 1 if the individual responded ‘fairly well’ or ‘very well’ to the question and 0 for the responses ‘bad’ or ‘very bad.’ We coded as missing values other responses such as ‘I don’t know’ or ‘haven’t heard about’ or if the interviewee refused to answer.

In addition to the individual policy matters, we constructed a composite indicator of public services delivery using a polychoric correlation structure and thereby aggerating the respondents’ assessment of these different policy measures. The composite indicator is a reflection of how each respondent evaluates the range of public services provided by the state and listed in the Afrobarometer surveys.

Table (1) below shows the distribution of the respondents for each of these policy matters. We can observe 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 basic health services (57.92%) and addressing educational needs (60.15%) across the whole sample (four rounds of the Afrobarometer survey).

Figures 1 displays, for each mining location (both active and inactive mine), the percentage number of respondents with a positive assessment of government performance in the policy areas of living standards improvement and job creation in the Afrobarometer Round 6. As it can be seen, the percentage of respondents nearby a mine that positively appraises their government’s performance in these policy areas is very low across the continent. The dissatisfaction is particularly striking in communities living nearby an active mine (Figure 2), except in Botswana where a positive appraisal of the government’s work in improving welfare in resource-rich communities tends to be more frequent.

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

<table>
<thead>
<tr>
<th>Policy Area</th>
<th>Percentage</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating jobs</td>
<td>26.90</td>
<td>130,277</td>
</tr>
<tr>
<td>Improving the living standards of the poor</td>
<td>29.86</td>
<td>109,019</td>
</tr>
<tr>
<td>Providing water and sanitation services</td>
<td>44.44</td>
<td>131,280</td>
</tr>
<tr>
<td>Improving basic health services</td>
<td>57.92</td>
<td>132,161</td>
</tr>
<tr>
<td>Addressing educational needs</td>
<td>60.15</td>
<td>131,661</td>
</tr>
</tbody>
</table>
Figure 1: Assessment of Government Performance by Mining Location (Active and Inactive Mines)
Figure 2: Assessment of Government Performance by Mining Location (Active Mines Only)
Living Standards and Job Creation
Another dependent variable in our empirical analysis refers to how pessimistic/optimistic are people about their future life. It is derived from the following 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 dummy variable that equals 1 if the reply of the respondent is ‘better’ or ‘much better’, and 0 for the responses ‘same’, ‘worse’ or ‘much worse’. Since this question is not included in Round 6 of the Afrobarometer, the sample size is significantly reduced. Figure one shows the distribution of those with optimistic and those with pessimistic views. Overall, the optimistic view outweighs the pessimistic one: 79% of the people believe that their living conditions will improve in the near future compared to 21% who expect either a deterioration of or no changes in their living standards.

Figure 3: Optimism: Expectation of living conditions in twelve months

Our estimation models account for the heterogeneity of both individuals and countries. At the individual level, we consider an array of demographic and socioeconomic characteristics, including gender, age, education, employment status, residential area (urban or rural). 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 with food (or water, medicine, cooking fuel)?”. The composite helps proxy the level of poverty and deprivation of the respondents. At the country level, we include a measure of corruption control from the Worldwide Governance Indicators and natural resource rents as a share of GDP from the World Development Indicators.

Local governance is measured through various proxies. First, we constructed an objective measure of corruption based on the incidence of bribe payment. The variables on bribe payment are derived from the following question to which the respondents indicate whether they have bribed government officials in order to obtain certain public services such as school placement, medical services, documents, and others.

“How often, (if ever, have you had to pay a bribe, give a gift, or do a favor to government officials in order to: …”)”

As for the public services composite indicator, we aggregate the respondents’ answers using polychoric correlation and average the resulting indicator at the local level. Unlike the perception of corruption, the incidence of bribe payment points to the real exchange between authorities and the residents. In addition to the incidence of bribe, we also integrate a measure of distrust in local government councillors - measured as the average number of residents that stated to not have any trust in their local government officials. We corroborate the results with a corruption perception indicator, which takes the 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 decentralisation based on a recent dataset on tax and revenue assignment in developing and emerging economies (See Vincent (2019)). 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 archives, 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 a given country. Given that natural resources extraction generates revenues of local authorities, either directly through extraction royalties or indirectly through booming local businesses, this indicator is used as a proxy for the level of decentralisation 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 a given country.1

4. Empirical Strategy

Equation (1) is our baseline model. We denote by \( y_{itcs} \) 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 \( y_{itcs} \) 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 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 distance (50 km) in the baseline model is based on existing research by Knutsen et al. (2017). Our Linear Probability Model takes the following form, in which \( X_{itcs} \) 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.

\[ y_{itcs} = \theta X_{itcs} + W_{cs} + c_c + s_s + \epsilon_{itcs} \]

1 See Appendix B for additional details
\[ y_{itcs} = \beta_0 + \beta_1 NR_{active_{lsc}} + \beta_2 NR_{inactive_{lsc}} + X_{itcs} \theta + W_{cs} \phi + c_c + s_s + \epsilon_{itcs} \quad (1) \]

To assess whether the quality of local governance influences the effect of mining on our different variables of interest, we extend equation (1) to the following specification in which local\_governance\_lsc refers to the quality of local governance at the regional level. Depending on the specification, local governance is captured either through the incidence of bribe payment, the aggregate perception of corruption of local government councils in a region, or the aggregate level of distrust in local authorities.

\[ y_{itcs} = \beta_0 + \beta_1 NR_{active_{lsc}} + \beta_2 NR_{inactive_{lsc}} + \beta_3 local\_governance_{lsc} + \beta_4 NR_{active_{lsc}} \times local\_governance_{lsc} + \beta_5 NR_{inactive_{lsc}} \times local\_governance_{lsc} + X_{itcs} \theta + W_{cs} \phi + c_c + s_s + \epsilon_{itcs} \quad (2) \]

To investigate the role of decentralisation on the relationship between mining and our variables of interest and the role of local governance, we extend equation (2) and include the proxy for decentralisation and its interactions with natural resources (living nearby an active or inactive mine) and local governance.

\[ y_{itcs} = \beta_0 + \beta_1 NR_{active_{lsc}} + \beta_2 NR_{inactive_{lsc}} + \beta_3 local\_governance_{lsc} + \beta_4 decentralization_c + \beta_5 NR_{active_{lsc}} \times decentralization_c + \beta_6 NR_{active_{lsc}} \times decentralization_c \times local\_governance_{lsc} + \beta_7 NR_{inactive_{lsc}} \times decentralization_c \times local\_governance_{lsc} + X_{itcs} \theta + W_{cs} \phi + c_c + s_s + \epsilon_{itcs} \quad (3) \]

5. Results and Discussions

Table (2) presents the results of our baseline model using the individual assessment of how well or badly the government is handling the living standards of the poor. They suggest that residents living within a 50 km radius of an active mine have a lower probability of stating that the government is handling well this policy matter. The probability is lower by 1.8% in our most complete model in specifications (3) and (4). It must be noted that the coefficient remains significant even when we cluster the standard errors at the location of the mine.
The direction and significance level of that coefficient is also corroborated with two alternative probit specifications in columns (5) and (6), whereas the coefficients on the distance to an inactive mine remain insignificant, thereby suggesting no statistically significant differences between living within a 50km radius to an inactive mine and living farther than 50 km radius to either an active or inactive mine (the control group).

In addition, our difference-in-difference 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 state that the government is doing well in improving the living standards of the poor.

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 our estimations, indicating thereby an overall dissatisfaction with governments in countries where mining exploitation is very prevalent. On the other hand, the results indicate that the control of corruption at the national level tends to have a positive effect on how residents perceive public service delivery in that policy area. At the individual level, interest in public affairs tends to have a positive effect on the outcome, whereas the poverty level of the respondents (measured by the proxy on how often they are deprived of basic necessities such as food, water, medicine, and cooking fuel) appears to negatively impact their views.

In Table (3), we consider all other policy areas – water and sanitation, jobs creation, health, education, as well as the composite indicator on public services as a whole, and the respondents’ optimism about future living conditions (their expected living standards in twelve months’ time). 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.\(^2\)

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

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\(^2\) The coefficient on education is only significant at 10\% and insignificant in latter specifications. This can partly be explained by the above 50\% positive appraisal on education as displayed Table 1.
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 optimist about the future.

Exploring the differences-in-differences parameters, we found no statistically significant gap between the local effects of active and non-active mines on individual assessment of government delivery of public services in water and sanitation and education. However, the gap between active and non-active mines is significant for job creation, health services, and the aggregated measure of public services.

The comparison (difference-in-difference) 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 job creation by 2.6% points, in water and sanitation by 1.2% points, in health services by 1.2% points, in public services as 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. In Table (3), 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 previous findings in Table (2).
Table 2: Mining and Assessment of Public Services: Baseline Models

<table>
<thead>
<tr>
<th>Dependent Variables: Government improving living standards of the poor</th>
<th>(1-LPM)</th>
<th>(2-LPM)</th>
<th>(3-LPM)</th>
<th>(4-LPM)</th>
<th>(5-Probit)</th>
<th>(6-Probit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active 50 km</td>
<td>-0.018***</td>
<td>-0.018***</td>
<td>-0.020***</td>
<td>-0.020*</td>
<td>-0.063***</td>
<td>-0.063*</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.010)</td>
<td>(0.021)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Inactive 50 km</td>
<td>0.005</td>
<td>0.002</td>
<td>0.004</td>
<td>0.004</td>
<td>0.011</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.006)</td>
<td>(0.011)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Interest in Public Affairs</td>
<td>0.045***</td>
<td>0.045***</td>
<td>0.045***</td>
<td>0.139***</td>
<td>0.139***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.009)</td>
<td>(0.010)</td>
<td></td>
</tr>
<tr>
<td>Deprivation</td>
<td>-0.051***</td>
<td>-0.050***</td>
<td>-0.050***</td>
<td>-0.156***</td>
<td>-0.156***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td></td>
</tr>
<tr>
<td>Natural Resources Rents (ln)</td>
<td>-0.035***</td>
<td>-0.035***</td>
<td>-0.035***</td>
<td>-0.112***</td>
<td>-0.112***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.010)</td>
<td>(0.021)</td>
<td>(0.021)</td>
<td>(0.030)</td>
<td></td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.155***</td>
<td>0.155***</td>
<td>0.534***</td>
<td>0.534***</td>
<td>0.534***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.022)</td>
<td>(0.044)</td>
<td>(0.044)</td>
<td>(0.071)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.341***</td>
<td>1.301***</td>
<td>1.460***</td>
<td>1.460***</td>
<td>3.016***</td>
<td>3.016***</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.118)</td>
<td>(0.119)</td>
<td>(0.125)</td>
<td>(0.358)</td>
<td>(0.375)</td>
</tr>
</tbody>
</table>

| Difference in Differences | -0.024 | -0.021 | -0.023 | -0.023 | 0.06 | 0.06 |
| F-test: active-inactive = 0 | 11.7 | 8.8 | 10.9 | 4.5 | 112,825 | 109,282 |
| P-value of F-test | 0.00 | 0.00 | 0.00 | 0.03 | 0.06 | 0.06 |
| R-squared | 0.05 | 0.07 | 0.07 | 0.07 | 0.06 | 0.06 |
| Pseudo R-squared | 0.05 | 0.07 | 0.07 | 0.07 | 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:
1: Significance level: * p<0.10, ** p<0.05, ***p<0.01. Robust or clustered (at the geo-localisation of the mine) standard errors in parenthesis.
2: Individual-level control variables are added in specifications (2) to (6): age (ln), age-squared, gender, education, residential area (urban), employment status.
Table 3: Assessment of Public Services: Baseline Models (2)

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>(1-LPM)</th>
<th>(2-LPM)</th>
<th>(3-LPM)</th>
<th>(4-LPM)</th>
<th>(5-LPM)</th>
<th>(6-LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water &amp; Sanitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Active 50 km</td>
<td>-0.023***</td>
<td>-0.029***</td>
<td>-0.018***</td>
<td>-0.010*</td>
<td>-0.019***</td>
<td>-0.042***</td>
</tr>
<tr>
<td>(0.006)</td>
<td>(0.005)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Inactive 50 km</td>
<td>-0.011***</td>
<td>-0.002</td>
<td>-0.006</td>
<td>0.001</td>
<td>-0.001</td>
<td>-0.026***</td>
</tr>
<tr>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Interest in Public Affairs</td>
<td>0.035***</td>
<td>0.041***</td>
<td>0.033***</td>
<td>0.031***</td>
<td>0.041***</td>
<td>0.019***</td>
</tr>
<tr>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Deprivation</td>
<td>-0.085***</td>
<td>-0.043***</td>
<td>-0.069***</td>
<td>-0.057***</td>
<td>-0.068***</td>
<td>-0.056***</td>
</tr>
<tr>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>Natural Resources Rents (ln)</td>
<td>-0.114***</td>
<td>-0.062***</td>
<td>-0.168***</td>
<td>-0.173***</td>
<td>-0.123***</td>
<td>-0.026***</td>
</tr>
<tr>
<td>(0.006)</td>
<td>(0.005)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.138***</td>
<td>0.189***</td>
<td>0.229***</td>
<td>0.239***</td>
<td>0.202***</td>
<td>0.293***</td>
</tr>
<tr>
<td>(0.011)</td>
<td>(0.010)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.838***</td>
<td>1.707***</td>
<td>1.981***</td>
<td>1.768***</td>
<td>2.065***</td>
<td>1.832***</td>
</tr>
<tr>
<td>(0.115)</td>
<td>(0.107)</td>
<td>(0.113)</td>
<td>(0.112)</td>
<td>(0.102)</td>
<td>(0.120)</td>
<td></td>
</tr>
</tbody>
</table>

| 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:
1: Significance level: * p<0.10, ** p<0.05, ***p<0.01. Robust standard errors in parenthesis.
2: Specifications (1) to (4) refers to the respondents’ view of how the government is handling water & sanitation services to the household, job creation, health, and education. The dependent variable in the 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 is specification (6) refers to the expected living standards of the respondent in 12 months after the survey collection. All models are based on the linear probability model described in Section 4.
3: Individual-level control variables are added in all specifications: age (ln), age-squared, 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 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 ways. First, we investigate the confoundedness of local governance. As we’ve described in the data description, we adopted an objective measure of corruption based on the incidence of bribe payment of the respondents, averaged at the regional level, and which point to the effective corrupt attitudes in the immediate environment surrounding the mining locations. We test the robustness of our results by also considering the distrust in local government councillors and the perception of corruption of local officials. These two are measured by taking the average number of residents at the local level, and that identified their local authorities as being corrupt or untrustworthy.

With the incidence of bribe payment as a proxy for effective corruption, the results in Table (4) shows 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. The higher the incidence of bribe payment in a community within 50km 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. A similar direction is observed when we measure the quality of local governance by the level of distrust in local councilors. As it can be seen with the interactive terms, the higher the local distrust in the community, the more negative is the local effects of mining (both active and inactive) on individual satisfaction with government policies, and the more pessimistic are these individuals about their future.

Table (5) reports the estimates using the average perception of corruption of local government officials as an indicator of the quality of local institutions. As for the previous proxies, the findings suggest 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 basic health and education services, and handling public services. The corruption perception
indicator also exacerbates the negative effects of living near an inactive mine on all the outcome variables as suggested by the interaction term.

Both in Table (4) and Table(5), the results suggest that when the incidence of bribe payment, the level of distrust or the perception of corruption of local officials is zero, mining has a positive effect on residents’ satisfaction with poverty reduction-related policies. 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 our hypothesis that the quality of local governance matters in how mining impact on socio-economic outcomes.

5.2. The mediating role of decentralisation

In Table (6), we investigate whether and how decentralisation – 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 decentralisation.

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. Decentralisation 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 decentralisation variables clearly point to the fact that a higher level of decentralisation could, to some extent, alleviate the negative local effects of natural resources on socio-economic outcomes. Yet, as suggested in the literature (Enikolopov and Zhuravskaya, 2007; Lawer et al., 2017), there is also an inherent link between decentralisation 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 decentralisation 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

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>(1-LPM)</th>
<th>(2-LPM)</th>
<th>(3-LPM)</th>
<th>(4-LPM)</th>
<th>(5-LPM)</th>
<th>(6-LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Living standards</td>
<td>Public Services</td>
<td>Optimism</td>
<td>Living standards</td>
<td>Public Services</td>
<td>Optimism</td>
</tr>
<tr>
<td>Active 50 km</td>
<td>0.024** (0.010)</td>
<td>0.028*** (0.009)</td>
<td>-0.022* (0.012)</td>
<td>0.054** (0.023)</td>
<td>0.024 (0.020)</td>
<td>0.035* (0.018)</td>
</tr>
<tr>
<td>Inactive 50 km</td>
<td>0.004 (0.006)</td>
<td>-0.003 (0.005)</td>
<td>0.015** (0.007)</td>
<td>0.048*** (0.010)</td>
<td>0.035*** (0.008)</td>
<td>0.042*** (0.010)</td>
</tr>
<tr>
<td>Bribe</td>
<td>0.007 (0.015)</td>
<td>-0.003 (0.013)</td>
<td>-0.085*** (0.016)</td>
<td>0.007 (0.019)</td>
<td>0.012 (0.026)</td>
<td>-0.180***</td>
</tr>
<tr>
<td>Active 50 km * Bribe</td>
<td>-0.246*** (0.039)</td>
<td>-0.265*** (0.034)</td>
<td>-0.090* (0.049)</td>
<td>-0.392*** (0.020)</td>
<td>-0.415*** (0.017)</td>
<td>-0.177*** (0.020)</td>
</tr>
<tr>
<td>Inactive 50 km * Bribe</td>
<td>-0.006 (0.023)</td>
<td>0.012 (0.019)</td>
<td>-0.180*** (0.026)</td>
<td>0.007 (0.012)</td>
<td>0.012 (0.019)</td>
<td>-0.180***</td>
</tr>
<tr>
<td>Local Government Distrust</td>
<td>0.004 (0.006)</td>
<td>0.029*** (0.007)</td>
<td>-0.022*** (0.007)</td>
<td>-0.013* (0.006)</td>
<td>-0.100*** (0.006)</td>
<td>-0.011* (0.007)</td>
</tr>
<tr>
<td>Active 50 km * Local Government Distrust</td>
<td>-0.122*** (0.039)</td>
<td>-0.065* (0.035)</td>
<td>-0.162*** (0.037)</td>
<td>-0.089*** (0.020)</td>
<td>-0.071*** (0.017)</td>
<td>-0.144*** (0.020)</td>
</tr>
<tr>
<td>Inactive 50 km * Local Government Distrust</td>
<td>-0.006 (0.023)</td>
<td>0.012 (0.019)</td>
<td>-0.180*** (0.026)</td>
<td>-0.007 (0.012)</td>
<td>0.012 (0.019)</td>
<td>-0.180***</td>
</tr>
<tr>
<td>Natural Resources Rents (ln)</td>
<td>-0.033*** (0.007)</td>
<td>-0.121*** (0.006)</td>
<td>-0.022*** (0.007)</td>
<td>-0.013* (0.006)</td>
<td>-0.100*** (0.006)</td>
<td>-0.011* (0.007)</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.156*** (0.014)</td>
<td>0.203*** (0.012)</td>
<td>0.292*** (0.012)</td>
<td>0.080*** (0.014)</td>
<td>0.124*** (0.012)</td>
<td>0.272*** (0.012)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.455*** (0.119)</td>
<td>2.061*** (0.102)</td>
<td>1.836*** (0.119)</td>
<td>1.599*** (0.119)</td>
<td>2.209*** (0.101)</td>
<td>1.885*** (0.120)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.07 (0.07)</td>
<td>0.11 (0.102)</td>
<td>0.12 (0.119)</td>
<td>0.08 (0.119)</td>
<td>0.13 (0.101)</td>
<td>0.12 (0.120)</td>
</tr>
<tr>
<td>Observations</td>
<td>111,565</td>
<td>107,441</td>
<td>81,669</td>
<td>111,565</td>
<td>107,441</td>
<td>81,669</td>
</tr>
<tr>
<td>Country FE</td>
<td>0.07</td>
<td>0.11</td>
<td>0.12</td>
<td>0.08</td>
<td>0.13</td>
<td>0.12</td>
</tr>
<tr>
<td>Round FE</td>
<td>109,282</td>
<td>105,199</td>
<td>80,553</td>
<td>109,282</td>
<td>105,199</td>
<td>80,553</td>
</tr>
</tbody>
</table>

Notes:

1. Significance level: * p<0.10, ** p<0.05, ***p<0.01. Robust standard errors are in parenthesis.
2. Specifications (1) and (4) refers to the respondents’ view on how the government is handling the improvement of living standards of the poor. The dependent variable in the specifications (2) and (5) is a composite indicator constructed through polyphoric correlation and which combines all the respondents’ views on various types of public services and policies. The dependent variable is specification (3), and (6) refers to the expected living standards of the respondent in the near future (12 months after the survey collection). The sample size is reduced due to inconsistent missing patterns across the different assessment variables.
3. Individual-level control variables are added in all specifications: age (ln), age-squared, 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

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

Notes:
1: Significance level: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors are in parenthesis.
2: Specifications (1) and (4) to (7) 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 (2) 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), and (4) to (7). The sample size is reduced due to inconsistent missing patterns across the different assessment variables. The dependent variable is specification (3) refers to the expected living standards of the respondent in the near future (12 months after the survey collection).
3: Individual-level control variables are added in all specifications: age (ln), age-squared, gender, education, residential area (urban), employment status, interest in public affairs and poverty

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### Table 6: Mining and Assessment of Public Services: the role of decentralisation

<table>
<thead>
<tr>
<th>Dependent Variables¹</th>
<th>(1-LPM)</th>
<th>(2-LPM)</th>
<th>(3-LPM)</th>
<th>(4-LPM)</th>
<th>(5-LPM)</th>
<th>(6-LPM)</th>
<th>(7-LPM)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Living standards</td>
<td>Public Services</td>
<td>Water &amp; Sanitation</td>
<td>Jobs</td>
<td>Health</td>
<td>Education</td>
<td>Optimism²</td>
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<tr>
<td>Active 50 km</td>
<td>-0.038***</td>
<td>-0.036***</td>
<td>-0.038***</td>
<td>-0.047***</td>
<td>0.001</td>
<td>0.005</td>
<td>-0.064***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.010)</td>
<td>(0.010)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>Inactive 50 km</td>
<td>-0.013**</td>
<td>-0.037***</td>
<td>-0.043***</td>
<td>-0.011**</td>
<td>-0.023***</td>
<td>-0.028***</td>
<td>-0.032***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Decentralisation³</td>
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<td>-0.223***</td>
<td>-0.056***</td>
<td>-0.230***</td>
<td>-0.267***</td>
<td>-0.297***</td>
<td>-0.019</td>
</tr>
<tr>
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<td>(0.016)</td>
<td>(0.015)</td>
<td>(0.017)</td>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.017)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Active 50 km * Decentralisation</td>
<td>0.267***</td>
<td>0.306***</td>
<td>0.205***</td>
<td>0.205***</td>
<td>0.081</td>
<td>0.192***</td>
<td>0.082</td>
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<tr>
<td></td>
<td>(0.069)</td>
<td>(0.066)</td>
<td>(0.064)</td>
<td>(0.056)</td>
<td>(0.067)</td>
<td>(0.068)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Inactive 50 km * Decentralisation</td>
<td>0.298***</td>
<td>0.492***</td>
<td>0.366***</td>
<td>0.073**</td>
<td>0.382***</td>
<td>0.516***</td>
<td>-0.033</td>
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<td></td>
<td>(0.037)</td>
<td>(0.032)</td>
<td>(0.036)</td>
<td>(0.032)</td>
<td>(0.036)</td>
<td>(0.036)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>Natural Resources Rents (ln)</td>
<td>-0.005**</td>
<td>-0.026***</td>
<td>-0.030***</td>
<td>0.008***</td>
<td>-0.036***</td>
<td>-0.053***</td>
<td>0.068***</td>
</tr>
<tr>
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<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.078***</td>
<td>0.035***</td>
<td>0.067***</td>
<td>0.039***</td>
<td>0.024***</td>
<td>0.015***</td>
<td>0.092***</td>
</tr>
<tr>
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<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Constant</td>
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<td>1.710***</td>
<td>1.354***</td>
<td>1.402***</td>
<td>1.497***</td>
<td>1.280***</td>
<td>1.540***</td>
</tr>
<tr>
<td></td>
<td>(0.102)</td>
<td>(0.107)</td>
<td>(0.120)</td>
<td>(0.112)</td>
<td>(0.121)</td>
<td>(0.120)</td>
<td>(0.131)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.035</td>
<td>0.057</td>
<td>0.064</td>
<td>0.022</td>
<td>0.038</td>
<td>0.042</td>
<td>0.057</td>
</tr>
<tr>
<td>Observations</td>
<td>101,349</td>
<td>97,765</td>
<td>118,081</td>
<td>117,455</td>
<td>118,786</td>
<td>118,392</td>
<td>68,527</td>
</tr>
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<td>Country FE</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Round FE</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes:**

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

²: Specifications (1) and (3) to (6) 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 water and sanitation and job creation. The dependent variable in the specification (2) 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 dependent variable is specification (7) refers to the expected living standards of the respondent in the near future (12 months after the survey collection).

³: Individual-level control variables are added in all specifications: age (ln), age-squared, gender, education, residential area (urban), employment status, interest in public affairs and deprivation (poverty level)

⁴: Decentralisation is measured by the discretionary power of sub-central governments to decide over the fiscal space.
5.3. The interplay of decentralisation and quality of local governance

In Table (7), we report the coefficient estimates on the interplay between decentralisation 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 analyse how the negative marginal effect of the incidence of bribe payment (Table 5) and the positive marginal effect of decentralisation (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 decentralisation 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 decentralisation.

Figure (4) and (5) illustrate the local effects of active mining and the interplay of decentralisation 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 moderator (decentralisation 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 15 (StataCorp., 2017).

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 decentralisation (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 decentralisation is preferable. By extension, when decentralisation is low, a lower incidence of bribe payment is preferable. The pairwise comparison of these slopes is confirmed by the graphical analyses.
Regarding the government’s improving living standards of the poor, the tendency is also confirmed when we consider the sub-sample of respondents living nearby an active mine. The probability of a positive appraisal of government performance in resource-rich communities is the highest when the level of decentralisation is high and the incidence of corruption being low. Like in Figure (4), 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.

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. The interplay between the incidence of bribe payments and the legal attribution of taxing powers to sub-national authorities contributes to empirically sustain our 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 local communities nearby.
### Table 7: Mining and Assessment of Public Services: the interplay of decentralisation and corruption

<table>
<thead>
<tr>
<th>Dependent Variables&lt;sup&gt;1&lt;/sup&gt;</th>
<th>(1-LPM)</th>
<th>(2-LPM)</th>
<th>(3-LPM)</th>
<th>(4-LPM)</th>
<th>(5-LPM)</th>
<th>(6-LPM)</th>
<th>(7-LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Living standards</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active 50 km</td>
<td>-0.033***</td>
<td>-0.032***</td>
<td>-0.064***</td>
<td>-0.053***</td>
<td>-0.047***</td>
<td>0.000</td>
<td>0.003</td>
</tr>
<tr>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.011)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td></td>
</tr>
<tr>
<td>Inactive 50 km</td>
<td>-0.016***</td>
<td>-0.036***</td>
<td>-0.032***</td>
<td>-0.043***</td>
<td>-0.012**</td>
<td>-0.023***</td>
<td>-0.028***</td>
</tr>
<tr>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.006)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td></td>
</tr>
<tr>
<td>Bribe</td>
<td>-0.089***</td>
<td>-0.051***</td>
<td>0.003</td>
<td>-0.014</td>
<td>-0.027**</td>
<td>-0.001</td>
<td>-0.040***</td>
</tr>
<tr>
<td>(0.012)</td>
<td>(0.010)</td>
<td>(0.014)</td>
<td>(0.012)</td>
<td>(0.011)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td></td>
</tr>
<tr>
<td>Decentralisation&lt;sup&gt;4&lt;/sup&gt;</td>
<td>-0.065***</td>
<td>-0.234***</td>
<td>-0.024</td>
<td>-0.068***</td>
<td>-0.232***</td>
<td>-0.275***</td>
<td>-0.317***</td>
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<tr>
<td>(0.016)</td>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.017)</td>
<td>(0.016)</td>
<td>(0.018)</td>
<td>(0.018)</td>
<td></td>
</tr>
<tr>
<td><strong>Optimism</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active 50 km * Decentralisation</td>
<td>0.600***</td>
<td>0.717***</td>
<td>0.180*</td>
<td>0.384***</td>
<td>0.298***</td>
<td>0.466***</td>
<td>0.646***</td>
</tr>
<tr>
<td>(0.090)</td>
<td>(0.075)</td>
<td>(0.093)</td>
<td>(0.081)</td>
<td>(0.073)</td>
<td>(0.082)</td>
<td>(0.081)</td>
<td></td>
</tr>
<tr>
<td>Inactive 50 km * Decentralisation</td>
<td>0.168***</td>
<td>0.503***</td>
<td>0.050</td>
<td>0.525***</td>
<td>0.053</td>
<td>0.511***</td>
<td>0.751***</td>
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<tr>
<td>(0.044)</td>
<td>(0.038)</td>
<td>(0.050)</td>
<td>(0.044)</td>
<td>(0.040)</td>
<td>(0.045)</td>
<td>(0.044)</td>
<td></td>
</tr>
<tr>
<td>Active 50 km * Decentralisation * Bribe</td>
<td>-2.817***</td>
<td>-3.244***</td>
<td>-0.487</td>
<td>-1.130***</td>
<td>-0.678**</td>
<td>-2.553***</td>
<td>-2.972***</td>
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<td>(0.364)</td>
<td>(0.324)</td>
<td>(0.373)</td>
<td>(0.331)</td>
<td>(0.294)</td>
<td>(0.333)</td>
<td>(0.331)</td>
<td></td>
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<tr>
<td>Inactive 50 km * Decentralisation * Bribe</td>
<td>0.870***</td>
<td>-0.087</td>
<td>-0.362**</td>
<td>-0.895***</td>
<td>0.123</td>
<td>-0.702***</td>
<td>-1.298***</td>
</tr>
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<td>(0.172)</td>
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<td>(0.161)</td>
<td>(0.150)</td>
<td>(0.128)</td>
<td>(0.151)</td>
<td>(0.148)</td>
<td></td>
</tr>
<tr>
<td>Natural Resources Rents (ln)</td>
<td>-0.006**</td>
<td>-0.027**</td>
<td>0.068***</td>
<td>-0.030***</td>
<td>0.008***</td>
<td>-0.036***</td>
<td>-0.052***</td>
</tr>
<tr>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.066***</td>
<td>0.024***</td>
<td>0.089***</td>
<td>0.059***</td>
<td>0.036***</td>
<td>0.017***</td>
<td>-0.000</td>
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<tr>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
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<td>1.542***</td>
<td>1.361***</td>
<td>1.402***</td>
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<td>1.294***</td>
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<tr>
<td>(0.124)</td>
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<td>(0.120)</td>
<td>(0.112)</td>
<td>(0.121)</td>
<td>(0.120)</td>
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</tr>
</tbody>
</table>

**Notes:**

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

2: Specifications (1), and (4) and (7) 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 (2) 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).

3: Individual-level control variables are added in all specifications: age (ln), age-squared, gender, education, residential area (urban), employment status, interest in public affairs and deprivation (poverty level)

4: Decentralisation is measured by the discretionary power of sub-central governments to decide over the fiscal space.
Figure 4: Government improving living standards: the interplay of decentralisation and effective corruption

![Predictive Margins (Living Standards) 95%CI](image)

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

<table>
<thead>
<tr>
<th></th>
<th>Decentralisation</th>
<th>Bribe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Case 2</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Case 3</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Case 4</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

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

Notes:
1: dy/dx for factor levels is the discrete change from the base level
2: Individual- and country-level covariates, time and country fixed-effects are controlled for. Estimations are performed with robust standards errors.
Table 9: Government delivering public services: the interplay of decentralisation and effective corruption
Pairwise comparison of average marginal effects (with Bonferroni correction)

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Decentralisation</th>
<th>Bribe</th>
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<tr>
<td>Case 2</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Case 3</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Case 4</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

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

Notes:
1: $dy/dx$ for factor levels is the discrete change from the base level
2: Individual- and country-level covariates, time, and country fixed-effects are controlled for. Estimations are performed with robust standards errors.
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 decentralisation, 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 decentralisation issued from a dataset on tax and revenue assignment, which covers developing and emerging economies. The measure of decentralisation 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, 2019).

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 estimated 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 (-1.8%), jobs creation (-2%), health services (-1.5%), and public services delivery (-1.6%). In addition, they are also less likely to be optimistic about their future living standards (-4.2%). 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 (-1.1%) and a decrease in optimism about the future (-2.6%).

In comparison to non-active mine, active mining reduces the probability of approving the government performance on improving living standards by 2.2% points, on job creation by 2.6% points, on health services by 1% point, on public services as a whole by 1.6% points. In addition, the active status of a nearby mine also decreases optimism about the future by 1.6% points.

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 decentralisation and effective corruption in how they jointly influence the local effects of mining. The results indicate that a higher level of decentralisation 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 decentralisation and local government, we found that, regardless of the level of decentralisation (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 decentralisation 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 high level of corruption alongside high level of decentralisation constitutes the worst-case scenario. On the other hand, when the incidence of bribe payment is very low, higher level of decentralisation translates into more positive appraisal of welfare policies.

Our paper is not without limitations. As we use survey data, we rely on perception rather than effective service delivery of government. Going forward, future research could re-assess these effects by using administration data and concrete and coherent measurement of government provisions of public services at the local level. While the geographical location of the mines is exogenous, their exploitation (active or inactive) could be the result of numerous factors that we are unable to control for in the empirical estimations.

References


## Appendix A: Summary Statistics and Description

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
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<th>Max</th>
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### Observations

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Appendix B: Decentralisation Indicator

The indicator of decentralisation is developed as part of a doctoral dissertation project (Vincent, 2019). 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 sources of information are summarized as follows:

<table>
<thead>
<tr>
<th>Table 11: Sources of information – A summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legal Provision</strong></td>
</tr>
<tr>
<td><strong>Scientific and Grey Literature</strong></td>
</tr>
<tr>
<td><strong>Existing Databases</strong></td>
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</tbody>
</table>

**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, 2019) and from this [online source](#).
Table 12: Illustration of Coding and Scoring Procedures

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<tr>
<td>Base</td>
<td>0.11</td>
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<td>Rate</td>
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<td>Administration</td>
<td>0.46</td>
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Author's Matrix design originally from the World Bank Qualitative Decentralisation Indicators.
2019-01 From "destructive creation" to "creative destruction": Rethinking Science, Technology and innovation in a global context by Luc Soete
2019-02 Do young innovative companies create more jobs? Evidence from Pakistani textile firms by Waqar Wadho, Micheline Goedhuys and Azam Chaudhry
2019-03 What gains and distributional implications result from trade liberalization? by Maria Bas and Caroline Paunov
2019-04 FDI, multinationals and structural change in developing countries by André Pineli, Rajneesh Mohamed Narula and Rene Belderbos
2019-05 The race against the robots and the fallacy of the giant cheesecake: Immediate and imagined impacts of artificial intelligence Wim Naudé
2019-06 The middle-technology trap: The case of the automotive industry in Turkey by Ibrahim Semih Akçomak and Serkan Bürken
2019-07 The impact of a mathematics computer-assisted learning platform on students' mathematics test scores by Marcelo Perera and Diego Aboal
2019-08 Health insurance and self-employment transitions in Vietnam by Nga Le, Wim Groot, Sonila M. Tomini and Florian Tomini
2019-09 Knowledge economy and economic development in the Arab region by Samia Mohamed Nour
2019-10 Migration of higher education students from the North Africa region by Samia Mohamed Nour
2019-12 The breadth of preferential trade agreements and the margins of exports by Rod Falvey and Neil Foster-McGregor
2019-13 What a firm produces matters: diversification, coherence and performance of Indian manufacturing firms by Giovanni Dosi, Nanditha Mathew and Emanuele Pugliese
2019-14 Brazilian exporters and the rise of Global Value Chains: an empirical assessment by Caio Torres Mazzi
2019-15 How has globalisation affected the economic growth, structural change and poverty reduction linkages? Insights from international comparisons by Aradhna Aggarwal
2019-16 R&D, innovation and productivity by Pierre Mohnen
2019-17 Domestic intellectual property rights protection and exports: Accessing the credit channel by Gideon Ndubuisi
2019-18 The role of early-career university prestige stratification on the future academic performance of scholars by Mario Gonzalez-Sauri and Giulia Rossello
2019-20 Embodied and disembodied technological change: the sectoral patterns of job-creation and job-destruction by G. Dosi, M. Piva, M. E. Virgillito and M. Vivarelli
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2019-28 Imported intermediates, technological capabilities and exports: Evidence from Brazilian firm-level data by Caio Torres Mazzi and Neil Foster-McGregor

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2019-33 The Potential for innovation in mining value chains. Evidence from Latin America by Michiko Iizuka, Carlo Pietrobelli and Fernando Vargas

2019-34 Enforcing higher labour standards within developing country value chains: Consequences for MNEs and informal actors in a dual economy by Rajneesh Narula

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2019-38 Regulation and innovation under Industry 4.0: Case of medical/healthcare robot, HAL by Cyberdyne by Michiko Iizuka and Yoko Ikeda

2019-39 The future of work and its implications for social protection and the welfare state by Franziska Gassmann and Bruno Martorano

2019-40 Return, circular, and onward migration decisions in a knowledge society by Amelie F. Constant

2019-41 Mining and quality of public services: The role of local governance and decentralisation by Maty Konte and Rose Camille Vincent