At Africa's Expense?
Disaggregating the Employment Effects of Chinese Mining Operations in Sub-Saharan Africa

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Abstract

China's increasing investments in African countries have attracted considerable media attention and are the subject of scholarly debate. However, the socioeconomic impacts of China's presence in Africa remain poorly understood. While some case studies maintain that Chinese pro-jects have an enclave character and have largely failed to promote economic spillovers and local employment, others claim that Chinese activities have in fact encouraged infrastructural development and local economic activity. Focusing on the labor market effects of foreign mining investments in Africa, this paper examines whether Chinese-controlled companies generate fewer local jobs compared to non-Chinese mining operations. Theoretically, we argue that—due to a competitive advantage in the employment of expatriate workers and a lower readiness to invest in local skill formation—Chinese firms are less likely to foster regional employment. Relying on novel data on the control-rights regimes of diamond, gold, and copper mines and georeferenced information from Afrobarometer surveys, we test the effect of mining contractors' nationality on local employment rates. Our individual-level logistic models show that respondents living close to Chinese mining areas are more likely to report being unemployed compared to individuals living in the vicinity of non-Chinese mining operations. Times-series cross-sectional estimations employing district-level data from the Demographic and Health Surveys for 20 sub-Saharan countries over the period 1997–2015 corroborate these findings. Furthermore, we find evidence that negative perceptions of China among indigenous populations are largely driven by the belief that Chinese workers are crowding out local employment.

Keywords: Natural Resources; Sub-Saharan Africa; China; Mining; Unemployment

1. Introduction

Over the past decade, Chinese companies have invested heavily in the resource sectors of many developing nations. According to recent estimates, approximately half of China's total outbound investments in the years from 2005 to 2016 went into the energy and mining sectors of foreign countries. Of these investments in the resource sector, sub-Saharan countries attracted approximately one-third of the funds (Scissors, 2017). Mining of metals and energy resources attracted the largest share of these outbound investments, followed by the construction sector (e.g. Tang 2016; Sow, 2018). Driven by its hunger for resources and new markets, China now operates mining facilities in several sub-Saharan countries, including the Democratic Republic of the Congo, Namibia, South Africa, and Zambia. Some authors note that China even exclusively targets African economies with abundant natural resources when making investment decisions (Kolstad & Wiig, 2011).

While bringing much-needed capital and technology for the development of mining operations, Chinese activities often also cause discontent among local communities in host countries. African miners have protested against insufficient payment and poor working conditions at Chinese-operated mines in Chad, Namibia, Niger, and Zambia (Ghosh, 2013; Jamasmie, 2013; Kabemba, 2012; Reuters, 2014; Shinn, 2016; D. Smith, 2011), contributing to the often poor reputation of Chinese-owned mines in many host regions (e.g. Armony & Velásquez, 2015; Geerts, Xinwa & Rossouw, 2014).

Particularly the alleged loss of jobs to Chinese employees, who are ferried in project by project, appears to be a key driver of protests around different mining regions in countries such as Nigeria, Namibia, and Zambia (Knaup, 2010; Larmer, 2017; Magistad, 2011). As a consequence of protests and riots among coal and copper miners in Zambia, former president Michael Sata, for example, asked the Chinese government to observe limits on how many expatriate workers Chinese companies bring into the country (Magistad, 2011). According to some authors, Sata was elected largely on the basis of his attacks on the employment of Chinese expatriate workers (e.g. Wood, Mazouz, Yin & Cheah, 2014, p. 185).

The seemingly high number of expatriate workers has been largely criticized by various authors, who claim that Chinese mining operations have an enclave character and do not contribute to local socioeconomic development (Gadzala, 2010; Lee, 2009). Whether Chinese companies in fact rely on more expatriate workers and create fewer local jobs compared to other firms is disputed. Some qualitative, fieldwork-based studies suggest that Chinese companies prefer to bring in their own workforce and that local hiring is confined to low-skill workers (Cooke, 2014; Cooke, Wood & Horwitz, 2015; Rui, Zhang & Shipman, 2017; Smith, 2013; Zhao, 2014). Other scholars maintain that the rate of local employment by Chinese companies is largely contingent on local skill availability and is highly sector-specific (c.f. Tang 2010). According to Mohan (2013), more empirical evidence is needed to prove conventional wisdom surrounding Sino-African relations, especially concerning China's impact on local labor markets.

Contradictory findings on the employment effects of Chinese operations in Africa are not particularly surprising given that previous qualitative work has mostly focused on certain regions and failed to fully account for country-specific variations and differences between economic sectors. Systematic studies relying on quantitative and fine-grained data that enable broader comparisons beyond specific cases seem particularly warranted (c.f. Ado & Su, 2016). Employing a comparative quantitative design and focusing on mining as a key sector for Chinese foreign direct investment in Africa, this paper is the first attempt to compare local labor market effects of Chinese vs. non-Chinese companies for a large sample of sub-Saharan African countries at the disaggregated level of analysis. By doing so, our analysis contributes to a growing number of studies investigating the local socioeconomic effects of mining in developing countries (Aragón & Rud, 2013; Kotsadam & Tolonen, 2016; Loayza & Rigolini, 2016; Mamo, Bhattacharyya, Moradi & Arezki, 2017; Von der Goltz & Barnwal, 2018). In line with recent contributions highlighting the importance of institutional contexts, regulatory frameworks, and governance structures (c.f. Chuhan-Pole, Dabalen, Land, Lewin, Sanoh, Smith & Tolonen, 2017; Diaz-Rioseco, 2016; Libman, 2013; Spiegel 2012a), we show that natural resource control rights should be accounted for when addressing the local resource curse.

Theoretically, we argue that while large-scale mining is commonly linked to poor labor market outcomes (c.f. Gamu, Le Billon & Spiegel, 2015), Chinese-controlled mining operations have a particularly detrimental effect on local employment, for two main reasons. First, Chinese companies have a competitive advantage in the use of expatriate labor and therefore import more foreign labor than Western companies when faced with a shortage of indigenous skilled labor. This advantage mainly rests on lower Chinese labor costs and the availability of a centralized and collective expatriation management system that provides a pool of disciplined and hardship-tolerant workers. Second, Chinese firms' greater reliance on foreign labor together with language barriers go hand in hand with a lower necessity and readiness to upskill and train local labor, thereby potentially limiting the potential for economic spillovers. Taken together, these characteristics of Chinese-led mining operations may partly explain the anti-Chinese resentment often reported in the media.

Combining novel data on the control rights of copper, diamond, and gold mines in sub-Saharan Africa with survey data from two Afrobarometer rounds, we test the effect of respondents' proximity to Chinese and non-Chinese controlled mines on local employment rates and anti-Chinese resentments. Our logistic regressions employing country and deposit fixed effects show that Chinese majority ownership of mines can be associated with higher levels of local unemployment. In contrast, domestic or international non-Chinese mining operations have either no significant impact or a weak negative impact on unemployment. Furthermore, we find that the presence of Chinese mining firms may instigate anti-Chinese resentment particularly because of a perceived lack of job opportunities for the local population. To check the robustness of these findings, we perform linear two-way fixed effects estimations using district-level data from the Demographic and Health Surveys (DHS).[i]

This paper is organized as follows: The next section discusses why Chinese mining firms are expected to have negative effects on local employment. We elaborate on our core claim that Chinese-controlled mining operations rely less on the employment and training of locals, thus possibly hindering potential linkages with the local economy. This discussion is followed by the description of our research design

and the presentation of the empirical findings. The conclusion highlights further areas for potential research.

2. Chinese mining operations and the limits of local employment: The arguments

Existing studies discuss manifold reasons why internationally controlled mining projects may lead to conflict within local communities (e.g. Calvano, 2008; Wegenast & Schneider, 2017). In addition to the negative impacts on the natural environment, extractive industries often have a detrimental effect on the social and economic order of local communities and destroy traditional ways of living (c.f. Brain, 2017). Yet, mining operations may also promote local development through various channels, including fiscal transfers, employment effects, the development of economic activities outside the mining sector, and extractive industries' investments in public goods, either as a side effect of mining operations or out of social-responsibility-related considerations (Gamu, Le Billon & Spiegel, 2015, pp. 167-170).

Review articles provide mixed support for the existence of a local resource curse (c.f. Badeeb, Lean & Clark, 2017; Cust & Poelhekke, 2015; Gamu, Le Billon & Spiegel, 2015; Marchand & Weber, 2018; Ploeg & Poelhekke, 2017). Research on the connection between extractive industries and poverty, for example, shows that industrial mining is more often linked with growing levels of poverty, whereas small-scale artisanal mining has an alleviating effect on poverty (Gamu, Le Billon & Spiegel, 2015).[ii] In fact, some quantitative studies exploring within-country evidence show that resource-producing regions are often characterized by poverty; underemployment; a neglect of public services such as health care, education, security, or basic utilities; and reduced community well-being (see also Deaton & Niman, 2012; Jensen, Yang & Muñoz, 2012; Lawrie, Tonts & Plummer, 2011; Slack & Jensen, 2004; Stedman, Parkins & Beckley, 2004; Tonts, Plummer & Lawrie, 2012). Regarding the effect of resource extraction on the demand for local jobs in the US, Slack and Jensen (2004) find that workers in extractive

industries experience higher rates of underemployment compared to the employees of other major industrial sectors (see also Perdue & Pavela, 2012). It is often argued that extractive activities promote economic enclaves with no linkages to other regions or economic sectors. An enclave economy is associated with a lack of production, of consumption, and of fiscal backward or forward linkages (c.f. Hirschman, 1981).

Yet, other studies provide evidence of positive socioeconomic effects of resource extraction via, for example, increases in local income and employment, households' asset wealth, or the increased dynamism of small businesses and overall economic activity as measured by night-time lights (Cust & Poelhekke, 2015; Mamo, Bhattacharyya, Moradi & Arezki, 2017; von der Goltz & Barnwal, 2018). For instance, Aragón and Rud (2013) conducted an econometric study of the Yanacocha gold mine in Peru and found positive effects on income levels for the local population living within 100 km of the mine. The authors assume that the mine's demand for local inputs (the so-called backward-linkage channel) explains these welfare effects. In a similar vein, Lippert (2014) finds that Zambians have benefited from mining in the Copperbelt region through mines' backward linkages. Employing survey data and a constituency-level panel, the author shows that an increase in local copper output improves measures of living standards. Similar results are reported by Loayza and Rigolini (2016), who use variation in mining across Peruvian districts. Studying how large-scale gold mining affects local livelihoods and communities in Ghana, Mali, and Tanzania, Chuhan-Pole et al. (2017, p. xviii) also find that in addition to well-known negative externalities such as environmental degradation, health risks, and social dislocations, "mining communities experience positive yet limited welfare benefits."

According to the above research, one important factor determining the kind of impact mining activities have on local economic welfare relates to the generation of direct and indirect employment opportunities in the mining district. Research also finds that the overall impact of resource extraction on local well-being appears to be largely contingent on sociopolitical institutions and linkages with the rest of the economy (Havranek, Horvath & Zeynalov, 2016; Papyrakis, 2017). We contribute to these studies by

underscoring the importance of one particular contextual variable that might moderate the effect of mining on local employment and socioeconomic development: the nationality of mining companies. We argue that Chinese companies perform differently than non-Chinese (and mainly Western) enterprises in terms of providing local employment opportunities, and thus differ in their potential to bolster communal economic wealth. While disaggregated quantitative studies have shown that mining companies may bring about new job opportunities for the local population (Kotsadam & Tolonen, 2016), we expect that employment effects are lower for Chinese mining operations compared to non-Chinese controlled projects for two main reasons: the relatively low degree of workforce localization and the lower readiness to upskill and train local labor.

A common narrative is that Chinese companies bring in their own workforce rather than hiring locally. According to several authors, this practice is not limited to managerial positions and higher-skilled jobs but also extends to semi-skilled and labor-intensive tasks (Smith, 2013, pp. 178, 195; Zhao, 2014, p. 1044). Alden (2005) shows that the deployment of Chinese labor rather than the hiring of local workers in Chinese-sponsored projects in Ethiopia, Sudan, and Namibia has been criticized locally and, according to Adisu et al. (2010), African labor has not benefited from Chinese investment.

Providing jobs abroad for Chinese citizens is commonly regarded as one solution to China's own problem of domestic rural unemployment (Zhao, 2014, p. 1043). The availability of relatively cheap labor at home makes the use of expatriate labor—particularly during the initial phase of an operation—a sensible strategy for Chinese companies in host countries where local labor costs are high, when facing a shortage of indigenous skilled labor, and to overcome "regulatory, language and cultural constraints" (Cooke, Wood, Wang & Veen, 2018, p. 12). As mentioned above, the exact extent of Chinese companies' workforce localization is a contentious issue and the available data differs between countries and industry sectors. Overall, official Chinese data suggest that approximately 50 percent of the workforce employed by Chinese multinational enterprises abroad consists of locals, while the other half are Chinese (Rui, Zhang & Shipman, 2017, p. 1). This ratio has been supported by surveys conducted among a sample of Chinese multinational companies operating in different regions and sectors, including

transport and electricity infrastructure work, oil extraction, house construction, and the telecommunication sector (e.g. Tang, 2010). According to the research by Rui, Zhang, and Shipman (2017, p. 5), this result is driven by the use of large numbers of "operational expatriates" (e.g. skilled and semi-skilled labor) in the infrastructure sector. For the African construction sector, similar numbers have been reported (Chen, Goldstein & Orr, 2009).[iii] Besides these numbers, of particular importance in the context of this study is the observation that overall Chinese companies' human resource management practices differ from Western multinational companies operating in Africa (and South/Southeast Asia). While the latter companies traditionally assign only managerial and technical tasks to expatriate labor, Chinese enterprises more often deploy expatriate workers for semi-skilled and manual jobs as well (Cooke, 2014, pp. 890-891).

Compared to Western enterprises, Chinese firms have the comparative advantage of deploying expatriate workers at both the managerial and operational levels. In a given mining district, non-Chinese companies also face similar labor- and skill-shortage problems. Bringing their own labor, however, is arguably more often cost-efficient for Chinese firms than for firms originating from industrialized countries with higher wage levels. While the average Chinese wage level has been rising rapidly in recent years, indicators for Chinese labor costs suggest that the country still has a rather large pool of relatively cheap labor (Plekhanov, 2017). Mines operated by resource companies from Canada, the United States, South Africa, and Great Britain, for instance, face approximately three to five times higher unit-labor costs in their country of origin than Chinese companies, thus making the employment of expatriate labor far costlier (Ceglowski & Golub, 2012, p. 16). For these companies, workforce localization and, when facing local skill shortages, investments in the training of locals for semi-skilled and unskilled jobs might more quickly become a cost-efficient strategy than is the case for Chinese companies. Given the lower labor costs, Chinese multinationals have greater incentives to import expatriate labor. Also, when compared to many sub-Saharan African countries, China's relative unit-labor costs in the labor-intensive manufacturing sector are lower, suggesting that importing labor from China might be a reasonable strategy at least at the beginning of a new project (Golub, Ceglowski, Mbaye & Prasad, 2018). Moreover, evidence exists that even in cases where Chinese employees earn more in their host countries than locals

(e.g. in Angola), up to a certain point the deployment of expatriate workers might be more cost-efficient due to higher productivity levels (Tang, 2010, p. 355).

According to several studies, another important motivation for Chinese managers to deploy expatriate workers is the facilitation of communication and the overcoming of cultural and regulatory constraints. Managers of Western companies with longer experience operating in African host economies and lower language barriers might find it easier to address such challenges. Researching Chinese construction projects in Angola, Corkin (2012, p. 480) reports evidence that Chinese managers often regard Chinese workers as more reliable and hard-working than local employees (see also Cooke, Wood & Horwitz, 2015; Gadzala, 2010; Rui, Zhang & Shipman, 2017). Due to cultural and linguistic similarities and the fact that expatriate laborers often live on compounds near the industry site, Chinese employees are also easier to manage than local employees commuting to the workplace. In addition, Chinese managers regard co-ethnic workers as more willing to work long shifts, more disciplined, and more adaptive to working conditions (Cooke, 2014, p. 885). Rui, Zhang, and Shipman (2017, p. 11) further argue that because Chinese expatriates working overseas for large multinational companies often do not bring their families and children, collective management is facilitated and closer collaboration between managers and workers is encouraged, contributing to higher work performance overall. In addition to management- and performance-related (instrumental) reasons for the use of co-ethnic workers, research on the employment practices of large state-owned and small and medium-sized Chines enterprises in Zambia highlights the role of culture. According to Gadzala (2010, pp. 43, 50), "traditional Chinese notions of [interpersonal] trust and networking in overseas Chinese businesses" contribute to the "continued use of compatriots as a key source of labour, even where large numbers of indigenous workers […] exist."

Chinese firms' greater reliance on expatriate labor goes hand in hand with a lower readiness to upskill and train local labor, thereby possibly limiting the potential for economic spillovers and the ability to provide job opportunities for locals lacking the required skills (Jackson, 2014). In general, the reliance on expatriate labor due to reasons of cost-efficiency is expected to curb knowledge transfers in particular (Rui, Zhang & Shipman, 2017). In host countries with lower wage levels, where local capacity building

and skill formation is economically more viable, two factors may constrain Chinese managers' willingness to train locals (Tang, 2016, p. 116): On the one hand, on-site training by Chinese technicians is hampered by language barriers. Their limited command of English, let alone of local languages, makes the explanation of complex skills and work processes difficult. On the other hand, once local employees are trained by Chinese staff, they might seek employment with companies that offer better payment and working conditions. In some cases, this has reportedly lowered Chinese managers' willingness to engage in the costly training of local workers. While companies from other countries of origin may face similar challenges, "[t]hese problems may be more obvious in Chinese companies because their investments are relatively new and some companies currently have strict control of wage level" (Tang, 2016, p. 117).

While evidence on the wages payed by Chinese mining companies compared to other employers is rare and inconclusive (see, .e.g. González-Vicente, 2013, pp. 53, 59-60; Sanborn & Chonn, 2015, pp. 18-19; Sautman & Yan, 2014, p. 1089), media and nongovernmental organizations regularly point to widespread wage-related grievances among domestic employees of Chinese mining facilities in sub-Saharan Africa. Some studies argue that Chinese state-owned enterprises in particular favor cost-efficient short-term strategies, which might also have a dampening effect on paid wages (Haglund, 2009). Moreover, Chinese companies frequently face criticism related to racism in the workplace, poor working conditions, and substandard safety records in extractive activities. This seems particularly applicable in Africa and Latin America, and has led to negative views of Chinese employers in various countries' resource sectors (Irwin & Gallagher, 2013; Lee, 2009; Sautman & Yan, 2016, p. 2152), reducing the overall attractiveness of Chinese companies as employers.

The reliance on larger shares of expatriate labor in operational and managerial positions and a lower preparedness to upskill and train local labor is not only expected to reduce the direct labor effects of Chinese mines; it also bears the risk of increasing the alleged enclave character of Chinese (mining) operations in sub-Saharan Africa since the lack of direct job opportunities deprives local communities of additional income and limits potential spillover effects. Large Chinese-run projects in developing countries are often viewed as "enclaves" with poor integration in the host regions' economies, which in

turn limits the communal welfare effects (Gadzala, 2010; Lee, 2009; Mohan, 2013). In general, mining can provide financial assets for state and private actors, not only for investments in the non-extractive industries of host economies but also for the establishment of higher-value mining-related industries such as processing and refinement facilities at a national scale. More importantly in the context of our argument, industrial mining is also expected to generate positive effects on non-mining economic activities in the producing communities, creating many indirect jobs related to the mining operations through the spending of mine workers, particularly in the service sector (e.g. Chuhan-Pole, Dabalen, Land, Lewin, Sanoh, Smith & Tolonen, 2017; Kotsadam & Tolonen, 2016; Remy & MacMahon, 2002). The reality of Chinese activities in Africa, though, might be different, as illustrated by Mohan (2013, p. 1262) in the case of a Chinese dam project in Africa. He finds that supplies for the construction sites ranging from heavy trucks to cooking oil and cigarettes for the workers are imported from China, and that even vegetables are grown on-site.

Similar observations have also been made by other studies, and also regarding the mining sector, calling into question the idea of a straightforward economic linkage effect of Chinese extractive industries on host communities (e.g. G. Smith, 2013). For instance, in contrast to traditional mining companies from Western countries, Chinese copper-mining enterprises in Zambia have not established long-term relationships with local firms to a similar degree and have thus not supported the development of suppliers to the same extent (Fessehaie & Morris, 2013). As observed by Gadzala (2010, pp. 45-46), the surroundings at the Chambishi mine in Zambia are populated by Chinese entrepreneurs and their "small-scale groceries, restaurants, and (Chinese) medical clinics, all of which cater to the needs of the Chinese workers employed in the mine." While these studies suggest that Chinese mines indeed operate like enclaves, more research and robust evidence are needed to gain a better understanding of the linkages between Chinese mines and local industries.

Taken together, we expect that Chinese firms' frequent reliance on expatriate labor, their lower preparedness to train local labor, and the resulting limitation of spillover effects (i.e. backward linkages) hamper the overall impact of Chinese-run mining projects on local job creation and potential welfare gains

in local communities in particular. The next section describes the research design chosen to test our hypothesis.

3. Empirical strategy and data

To test our arguments that Chinese mining operations generate less local employment opportunities compared to non-Chinese firms, we draw on a new dataset containing mine-level information on the ownership structure of companies operating copper, gold, and diamond mines within 38 sub-Saharan countries between 1997 and 2015 (c.f. Wegenast & Schneider, 2017). We decided to concentrate on these three minerals for two main reasons. First, in contrast to other natural resources such as chromium or cobalt, which are concentrated within a few African states, deposits of copper, diamonds, and gold are spread widely across sub-Saharan Africa (c.f. Markwitz, Kim & Miller, 2016). Second, China has disproportionately invested in the extraction of these particular resources (c.f. Sharaky, 2011). We exclude oil from our analysis as its extraction is less labor intensive and therefore has an even lower capacity to generate direct jobs compared to most minerals. The locational details provided by our data allow us to geographically link each extraction site to individuals living in its proximity. In order to quantify the employment status of these nearby residents and their attitudes towards China, we employ rounds 5 and 6 of the Afrobarometer as well as time-series cross-sectional data from the Demographic and Health Surveys.

3.1 Dependent variables: Measuring the socioeconomic impact of Chinese mining

The Afrobarometer surveys public attitudes and is one of the most comprehensive data sources on the socioeconomic development of more than 30 African countries.[iv] The Afrobarometer's national samples comprise either 1,200 or 2,400 face-to-face interviews with randomly selected respondents older than 18 years. To guarantee representativeness, the Afrobarometer uses a stratified, multi-stage area probability design. Stratification is based on the main subnational unit of government (state, province, or

region) and urban and rural location. The smallest geographic unit for which reliable population data is available constitutes the primary sample unit (PSU). In every PSU, eight survey respondents are combined into one cluster. To account for household size and over- or under-sampling of the data, some national surveys are additionally weighted.

Afrobarometer has recently provided subnational geocoded data for all rounds. We joined point coordinates from our mine-level dataset with the geo-location of Afrobarometer respondents through spatial proximity using the software QGIS. To this end, we first calculated 25, 40, and 50 km buffer zones around the centroids of the survey clusters following and expanding the procedure applied by Knutsen et al. (2017), who argue that 50 km constitutes a commutable distance in Africa. Information on the number and ownership of mines was added in a second step, which is outlined below.

In our empirical analysis, we chose rounds 5 and 6 of Afrobarometer for their temporal coverage and prompted information.[v] Given that Chinese investments in Africa's mining sector mainly started in the early part of this century and the number of Chinese mines did not surpass 30 before 2010 (see Figure A1 in the Online Appendix), it makes little theoretical sense to employ earlier rounds of Afrobarometer to measure our dependent variables. Both rounds also inquire about the employment status of a comparable sample,[vi] asking if interviewees have a job that pays in cash.[vii] We code unemployment as a binary variable taking the value "1" when individuals report being unemployed and either actively looking or not looking for a job and "0" otherwise. In addition, round 6 contains respondents' attitudes towards China, which is valuable for testing our hypotheses. Specifically, respondents were asked whether they have a rather negative view of China because they believe that China takes jobs, resources, and/or land.[viii] Using this information, we generated three dichotomous variables measuring respondents' perceptions on China. These variables take the value "1" when respondents report that China has a negative image because it takes jobs from their countries or extracts resources from Africa, or because Chinese individuals or businesses grab land.

To check the robustness of our results, we rely on socioeconomic variables from 52 Demographic and Health Surveys (DHS) containing district-level data on national household surveys in 21 sub-Saharan countries during the period 1996–2014. In order to create a disaggregated dataset with a panel structure, we focused on countries that underwent at least two survey waves within this period of analysis and for which the geo-location of respondents was available. We interpolated values for missing years linearly. Applying these benchmarks, we were able to include 21 sub-Saharan countries. Three survey rounds were available for a total of 10 countries,[ix] while two rounds were available for the remaining states.[x]

The district information was assigned to the coordinates of each survey cluster using GIS software and spatial data from the Global Administrative Unit Layers (GAUL).[xi] Following the strategy of Fjelde and Østby (2014), the coordinates from DHS survey clusters were matched with district information from GAUL polygons using the software QGIS. The district information was then assigned to surveyed households by merging both with a designated DHS cluster identifier variable. This enabled us to compute the percentage of unemployed respondents per district in a given year.

3.2 Independent variables of interest

The new dataset on mineral deposits uses information from Infomine (2013) and the U.S. Geological Survey (USGS). The first database provides details on the location, production, and status of extraction facilities as well as the percentages controlled by participating companies. Data from the USGS and the relevant mining companies' websites was gathered to fill in missing information. Using these indications in combination with the firm reports provided, we were able to code the ownership structures of 328 gold mines, 125 diamond mines, and 85 copper mines. Yearly observations from 1997 to 2015 depict the shares held by private domestic, state-owned domestic, private international, and state-owned international natural resource companies.

The distribution of natural resource mines appears to be quite uneven among countries. South Africa hosts as many as 146 gold mines, followed by Zimbabwe with 62. Other countries have a maximum of 25 (Ghana) and a minimum of one (e.g. Zambia). South Africa is also the country with the most diamond

mines (70), with other countries harboring 14 at the most (Angola) or one at the least (e.g. Cameroon). When it comes to copper mines, the Democratic Republic of Congo ranks at the top with 39 and is followed by Zambia with 20. Other countries have as many as nine (Botswana) or only one (e.g. Angola). Figure 1 below shows the location of Chinese-controlled and non-Chinese-controlled mines as well as the respondents of Afrobarometer's round 6. Our estimations exploit respondents' proximity to mines in order to estimate the effect of the Chinese presence on our different dependent variables.[xii]

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Figure 1 about here

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A look at the spatial distribution of Chinese mineral companies reveals a concentration in four host countries: Zambia, Zimbabwe, South Africa, and the Democratic Republic of Congo. The highest number of mineral mines with Chinese ownership can be found in South Africa, which hosts as many as 20. The Democratic Republic of Congo is home to 12 mines of this type and is closely followed by Zambia with 10. Figure A1 in the Online Appendix plots the temporal dynamics of Chinese resource extraction. It reveals that Chinese foreign investment in Africa's mining sector increased considerably after the year 2000. In 2015, a total of 46 mines were owned by Chinese companies.

Every mine is dummy coded as majority controlled by Chinese companies if Chinese firms hold at least 66 percent of the shares. The idea behind this threshold value is that a company's effects should prevail where its influence on the decision-making of joint-venture boards could be decisive. Alternatively, we also provide extensive robustness checks using a 51 percent majority threshold. Our main independent variable of interest captures the number of mines that are predominantly controlled by Chinese investors. To isolate the specific influence of Chinese mineral extraction from that of other ownership structures, we furthermore distinguish between non-Chinese mines that are predominantly controlled by foreign firms and those that belong to domestic companies.

Making use of the latitude and longitude coordinates collected during the coding phase, we calculated the number of Chinese-controlled versus non-Chinese-controlled mines in 25, 40, and 50 km buffer zones around Afrobarometer respondents. Since rounds 5 and 6 of Afrobarometer were surveyed in 2011–2013 and 2014–2015, respectively, we calculated mean control shares for each active mine for the corresponding periods: 2009–2013 and 2011–2015.[xiii] Figures A2 and A3 provide the respective number of individuals covered by Afrobarometer round 6 living within a distance of 25, 40 and 50 km from Chinese- and non-Chinese-controlled active mines over the period 2011–2015. For our district-level analysis employing DHS data, we assigned each mine to its host district. As a result, we were able to obtain the number of mines controlled predominantly by Chinese or non-Chinese operators for each district-year.

In addition to considering contractors' ownership structure, we also control for the corresponding deposit type of each mine. We apply the universal classification of host rocks that categorize the formation of ores into three main types: igneous, hydrothermal, and surficial. We connect each mine to its closest deposit, using data on global major mineral deposits from the USGS.[xiv] Controlling for the deposit type is important since deposits differ significantly in their degree of extraction difficulty and economic value. As surficial deposits are more easily extractable than igneous or hydrothermal formations, their exploitation is less skill and capital intensive (c.f. Zientek & Orris, 2005, p. 6). In addition, surficial deposits commonly stretch over vast areas, making their recovery less profitable for industrial mining companies (c.f. Robb, 2013). For these reasons, gold, diamond, and copper originated from igneous and hydrothermal deposits have a greater potential to promote backward economic linkages compared to minerals stemming from surficial deposits.

3.3 Control variables

To minimize potential problems stemming from omitted variable bias, we selected control variables that might jointly influence a mine's control-rights structure and our dependent variables. When assessing how the proximity of Chinese-operated mines impacts respondents' employment status, we mainly con-

trol for individuals' socioeconomic status, including whether they have attained at least secondary education (*Education*), regard themselves as economically better off compared to the rest of the country (*Living conditions*), or belong to an ethnic group that experiences discrimination (*Discrimination*). In addition, we include several neighborhood characteristics and indicators of institutional quality in our models. *Crime* is a dummy variable indicating whether respondents feel unsafe walking in their neighborhood, and *Urban* indicates whether respondents live in an urban area. *Democracy* measures the perceived level of democracy within the respondents' country.[xv] We also account for local state capacity by including a dummy variable in which respondents report that government manages the provision of sanitation services sufficiently (*State capacity*). Finally, we add the variable *Local corruption*, which takes the value "1" when respondents indicate that most or all local government councilors are corrupt and "0" otherwise. We expect personal wealth, educational level, and local state capacity (proxied by access to sanitation) to be negatively linked to unemployment. In contrast, respondents living in unsafe and corrupt areas or belonging to groups that are discriminated against should have an increased risk of being unemployed. Whether democracies reduce unemployment levels is unclear (c.f. Fishman, 2010). The effect of an urban residence on unemployment is also not clear-cut. While cities might offer more job opportunities, respondents living in rural areas are likely to be self-employed in the agricultural sector.

When estimating the effect of mines' property rights on respondents' perception of China, we keep the control variables *Education* and *Urban* and add unemployment to the socioeconomic control variables. The latter indicator is added to assure that negative views on China are independent of respondents' employment status. We expect more educated individuals to be better informed about potential adverse effects of China's economic involvement in their country. Since urban populations are less exposed to possible land expropriation or mining, they may be less likely to report that a negative view of China is based on Chinese grabbing of land or natural resources. In contrast, we expect that individuals living in urban areas are more likely to report that Chinese workers are taking local jobs. Furthermore, we include two additional control variables measuring respondent's views on *Protectionism* and negative attitudes towards foreign neighbors (*Xenophobia)*. We thereby account for unfavorable perceptions of China

stemming from individuals' general views on globalization and migration. Lastly, we capture the extent to which respondents consume news to ascertain that interviewees can more critically discern conventional wisdom propagated in the public discourse from the actual socioeconomic effects of Chinese investments.

As previously noted, we check the robustness of our results by using alternative district-level survey data. Unfortunately, not all the control variables described above are available from the Demographic and Health Surveys. When estimating the effect of Chinese-operated mines on unemployment levels using DHS information, we rely on the following control variables: the regional equivalent of gross domestic product (in USD) based on the Geographical-based Economic Data (G-Econ) v4.0 (c.f. Nordhaus et al., 2006), to proxy for local economic activity; the share of individuals that have not completed primary education; the percentage of the population with access to electricity (as a proxy for local state capacity); districts' population density; and the average number of acts of one-sided violence with at least 25 casualties perpetuated by government or rebels against civilians, taken from the UCDP-GED database (Sundberg & Melander 2013).[xvi]

4. Estimation technique

As previously noted, we construct buffer zones with different sizes around each respondent and calculate the location and average ownership structure of all active mines for the five years previous to each Afrobarometer survey round (i.e. 2009–2013 for round 5 and 2011–2015 for round 6). This way, we are able to estimate individuals' risk of being unemployed among respondents living close to Chinese- or non-Chinese-controlled mines. Our empirical strategy is a threefold assessment: We compare the effects of Chinese, domestic, and non-Chinese international mining companies on local unemployment. To do justice to the differential nature of our two datasets, we analyze two separate equations. In estimating

the geographically disaggregated effects of mines on Afrobarometer respondents' employment status, we fit the logistic regression below:

$$U_i = \beta_0 + \beta_1 * Chinese\ Mines_i + \beta_2 * Domestic\ Mines_i + \beta_3 * International\ Mines_i + \beta_4 * X_i + \eta_c + \varepsilon_i$$

Ui reports the employment status of individual *i*. *Chinese Mines, Domestic Mines*, and *International Mines* each indicate the total number of mining facilities resting upon igneous or hydrothermal mineral deposits operated by the relevant company type in buffers around individual *i*. *Xi* denotes a vector of control variables referring to individual *i*. With ηc we additionally control for country fixed effects. ε*i* is the error term. As observations within the same country are unlikely to be independent, we use standard errors clustered around countries in all reported models.

Figure 2 illustrates the research design employed. Drawing on round 6 from Afrobarometer, it shows the location of mines predominantly operated by Chinese or non-Chinese companies and the location of respondents aggregated into enumeration areas[xvii] (with their corresponding 50 km buffer zone) for South Africa. In addition, the map depicts the share of respondents within each enumeration area reporting being unemployed. The results from the cross-sectional logistic estimations described below reveal that there is a systematic variation in respondents' employment status that can be explained by mining companies' nationalities across African countries.

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Figure 2 about here

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For the district-level DHS data, we employ a panel regression method with the following components:

$$U_{d,t} = \beta_0 + \beta_1 * Chinese\ Mines_{d,t} + \beta_2 * Domestic\ Mines_{d,t} + \beta_3 * International\ Mines_{d,t} + \beta_4 * X_{d,t} + \zeta_t + \eta_c + \varepsilon_{d,t}$$

Ud,t indicates the percentage of unemployed residents in district *d* at time *t*. The indicators *Chinese Mines, Domestic Mines* and *International mines* again total the number of differently controlled mines in district *d* at time *t*. *Xd,t* incorporates a battery of control variables. ζt and ηc are time and country fixed effects and $\varepsilon d,t$ is the error term. In both equations the main coefficient of interest $\beta 1$ estimates the association between Chinese mineral exploitation and local unemployment. The appendix additionally reports robustness checks with mineral and deposit fixed effects and an interaction of time, country, and deposit fixed effects (tables A10–A12.)

5. Empirical findings

Table 1 below reports the effect of the mean number of active mines predominantly controlled by Chinese or non-Chinese companies for the period 2009–2013 (Afrobarometer round 5, models 1–3) and 2011–2015 (Afrobarometer round 6, models 4–6). As described in the last section, the exploitation of igneous or hydrothermal mineral deposits is more capital and skill intensive compared to surficial formations and thus more likely to generate economic spillovers. For this reason, we exclude the latter from our estimations. Throughout all models, respondents living in the vicinity of Chinese-controlled mines appear to face a higher risk of being unemployed. Moreover, the models show that the closer respondents live to Chinese mining operations, the higher their risk of being unemployed. The effect size appears to be quite large. Marginal effects at the means calculated for model 4 show that as we move from the minimum (0) to the maximum (5) number of Chinese-controlled mines within one buffer zone, the probability of an individual facing unemployment increases by approximately 18 percentage points. In contrast, proximity to non-Chinese mining operations, either domestically or internationally controlled, shows no statistical significantly effect on interviewees' risk of reporting unemployment.

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Table 1 here

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The effect of the control variables is largely in line with our expectations: respondents who enjoy better economic conditions compared to the rest of the country, who have completed at least secondary education, or who live in urban areas show a reduced risked of being unemployed through all models. Respondents living in regions with higher state capacity (as proxied by access to sanitation) also show a reduced unemployment risk when only the results of Afrobarometer round 5 (models 1–3) are considered. Surprisingly, higher levels of local corruption also seem to reduce unemployment among respondents, but only when round 5 is considered. The remaining variables have no robust effect across models.

To assess the consistency of our findings, we perform several robustness checks. First, we use alternative time frames (4 and 6 years) when calculating the average control-rights structure of active mines in order to regress them on the unemployment status of respondents from both Afrobarometer rounds (see tables A6 and A7). We also employ a different threshold (51 percent instead of 66 percent) when defining a mine as predominantly Chinese-controlled or non-Chinese-controlled (Table A8). Finally, instead of limiting our sample to igneous and hydrothermal mineral formations, we include the outlined deposit types as dummy variables as well as binary mineral indicators within our models (tables A10 and A11). As can be noted, our results are robust to these modifications.

To increase the reliability of our findings, we also employ an alternative research design that makes use of alternative data. For this purpose, we compile a district-level, time-series cross-sectional dataset using georeferenced information from the Demographic and Health Surveys as described in the previous section. In order to assess the impact of Chinese and non-Chinese mining operations on districts' unemployment rates, we use a linear estimator with both country and year fixed effects and standard errors clustered around countries. For the reasons explained above, we limit our sample to hydrothermal and igneous deposit types.

Table 2 below largely corroborates our previous findings. The two-way fixed-effects linear models show that while Chinese-controlled mines increase the level of unemployment within districts, non-Chinese mining projects have either no significant or even a negative effect. The effect magnitude is considerable: one additional Chinese-controlled mine increases districts' average unemployment rates by approximately 2 percent (models 2 and 4). Concerning the control variables, the estimations suggest that districts with higher economic activity exhibit lower levels of unemployment, while districts hosting a large share of individuals without formal education are more affected by unemployment. The finding that higher levels of access to electricity is equally associated with more unemployment appears counterintuitive at first glance. This may be explained by the lower electricity coverage in rural areas in which the population are subsistence farmers and not formally employed. As a robustness check, we include deposit-type fixed effects into our models and interact these with country and year fixed effects (see Table A12 in the appendix). The results remain qualitatively unchanged.

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Table 2 here

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The results discussed above provide consistent evidence that Chinese mining operations may indeed generate fewer local employment opportunities compared to mines controlled by non-Chinese companies. As noted in previous sections, this may promote anti-Chinese resentment within affected mining communities (c.f. Kopiński & Polen, 2011, pp. 187-188). In order to explore whether the lack of local job creation constitutes a key motive for negative views on China, we rely on detailed information from round 6 of Afrobarometer. Relying on logit estimations summarized in Table 3 below, we investigate whether respondents living close to Chinese mining operations are more likely to report to have a negative image of China because of Chinese investors taking their jobs (models 1–3) and their resources (models 4–6). In Table 4 we examine the effect of Chinese resource extraction on the likelihood that interviewees perceive China negatively because they feel deprived of their land (models 1–3).

Tables 3 and 4 demonstrate that having Chinese-controlled mines in the vicinity is in fact a good predictor of anti-Chinese resentment due to respondents' perceptions that China's presence leads to fewer local jobs and more grabbing of natural resources and land. Note that—of the three motives for anti-Chinese sentiment—the perception that China is taking local jobs has the strongest effect. Having an additional Chinese-run mine within a distance of 25 km increases respondents' likeliness to report that China's presence is crowding out local employment by 38 percent, while it increases perceptions that China is grabbing resources and land by 6 percent and 26 percent respectively. Furthermore, the results remain qualitatively robust when the same robustness checks reported for previous models are applied using unemployment as a dependent variable (see tables A13–A18).

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Tables 3 and 4 here

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One potential concern regarding the findings presented above is the possible self-selection of Chinese-operated mines in areas exhibiting weaker regulatory capacity and worse political institutions.[xviii] Although we control for local state capacity in our models, our findings may be driven by the assumption that Chinese investments in Africa's extractive industries may be biased towards institutionally weaker regions. Contrary to the view that Chinese firms are mostly present in countries from which Western governments have shied away, recent empirical findings suggest that China's engagement is not limited to countries with poor economic and political institutions. Chen, Dollar, and Tang (2015), for example, show that Chinese investment is not concentrated in countries with weak rule of law and that the biggest recipient is South Africa. Cheung, de Haan, Qian, and Yu (2014) also find that host-country characteristics such as corruption or political instability are hardly related to the number of Chinese engineering projects in the country (see also Asongu & Ssozi, 2016, pp. 38-39).

To analyze whether our results may suffer from endogeneity issues, we explore the temporal dynamics within our dataset by comparing the levels of legal inequality and local governments' capacity to create jobs[xix] before the opening of mines controlled by either Chinese or non-Chinese companies. For this

purpose, we assess all mine openings between 2009 and 2016 and employ data from Afrobarometer round 4 (surveyed in 2008) in order to assess potential differences in regional legal equality and state capacity.[xx] Our analysis shows that while an average of 37 percent of people living in areas that would subsequently experience the opening of a mine controlled by a non-Chinese company believed that people are never treated equally under the law, this number was slightly higher (39 percent) for citizens inhabiting regions that would receive a Chinese-controlled mine. Similar small differences are evident regarding state capacity: while an average of 26 percent of interviewees living close to future mines that would be operated by non-Chinese firms were satisfied with local governments' job-creation performance, 23 percent of individuals who would experience a Chinese mining investment shared this belief. T-tests show that these differences are not statistically significant. Figures A4 and A5 show box plots summarizing the reported descriptive statistics that do not suggest that our results may be biased due to self-selection.

Conclusion

The empirical evidence on the local socioeconomic effects of extractive industries is inconclusive. The conditions under which mineral or oil extraction may benefit local communities remain poorly understood. This paper has contributed to recent research underscoring the importance of considering institutional contexts, regulatory frameworks, and governance structures when analyzing the local resource curse (c.f. Chuhan-Pole, Dabalen, Land, Lewin, Sanoh, Smith & Tolonen, 2017; Diaz-Rioseco, 2016; Libman, 2013; Spiegel, 2012a); it has explored the role of mining contractors' nationality in shaping local employment opportunities in sub-Saharan Africa. In particular, we have investigated the assertion commonly expressed in media reports and qualitative case studies that Chinese mining companies fail to promote local employment and thus generate grievances within African countries.

Our empirical analysis represents an initial attempt to examine this claim in a quantitative and comparative way. In a nutshell, we have argued that—compared to other mining companies—Chinese firms create fewer local jobs, for two main reasons. First, due to the comparatively low Chinese labor costs and the existence of a centralized expatriation management system that provides a steady pool of disciplined workers, Chinese investors can more easily import labor (e.g. when facing skill shortages or higher labor costs within African countries). Potential language barriers and cultural differences may be further reasons driving Chinese firms to rely more on expatriate workers. Second, this competitive advantage in the use of foreign labor may decrease incentives to invest in local skill formation. Consequently, Chinese mining companies are less likely to hire locally and possibly also less likely to encourage backward linkages.

Our regression analyses find consistent evidence for the expected negative effect of Chinese-controlled mineral extraction on the local employment level. Relying on two rounds of Afrobarometer, our logistic estimations show that individuals living close to a Chinese-operated mine have a higher risk of being unemployed compared to respondents living in the vicinity of non-Chinese mining operations. Linear estimation of time-series, cross-sectional data using country, year and deposit fixed effects substantiate these findings: districts hosting Chinese-controlled mineral production show higher unemployment rates. Furthermore, we find that respondents living close to Chinese-run mining projects are more likely to have a negative image of China based on the belief that Chinese investors are taking local jobs.

Our findings raise several questions that warrant further investigation. While our analysis shows that Chinese mining operations are associated with more local unemployment, the precise mechanisms behind this association remain unclear. In order to better understand the channels linking contractors' nationalities to local employment opportunities, future research should collect more comprehensive data on companies' employment of expatriate workers and their readiness to invest in local skill formation. Also, more quantitative and qualitative evidence on whether Chinese investors are in fact less able to promote backward economic linkages within host countries is needed. Given that the local welfare effects of resource extraction are largely contingent on mines' demand for local inputs (c.f. Aragón &

Rud, 2013; Lippert, 2014), we need to advance our understanding of what type of natural resource governance encourages economic spillovers.

Another important issue that warrants further investigation concerns the operation time of Chinese mining companies in Africa. The limited overall impact of Chinese mining companies on local job markets due to low degrees of workforce localization or training may be partly explained by the relatively new operational presence of Chinese enterprises within African states. Some authors have shown that, for various reasons, Chinese companies often have strong incentives to import their own labor instead of hiring locally particularly during the initial years of a new project in Africa (Tang, 2016, p. 110). Survey data on the operations of Chinese companies within different industrial sectors of the DRC, for example, show that while one-third of total employees are Chinese citizens in the first five years of operation, this number is reduced by half thereafter (Tang, 2010, pp. 361-362). Therefore, it seems possible that the detrimental labor market effects of Chinese mining companies wear off or are even reversed when longer operation cycles are considered. Given the relatively new presence of Chinese mining firms in Africa (see Figure A1), we need longer time horizons to better investigate this alternative hypothesis.

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Figures

FIGURE 1. Location of Chinese- and non-Chinese controlled mines and respondents of Afrobarometer data (round 6)

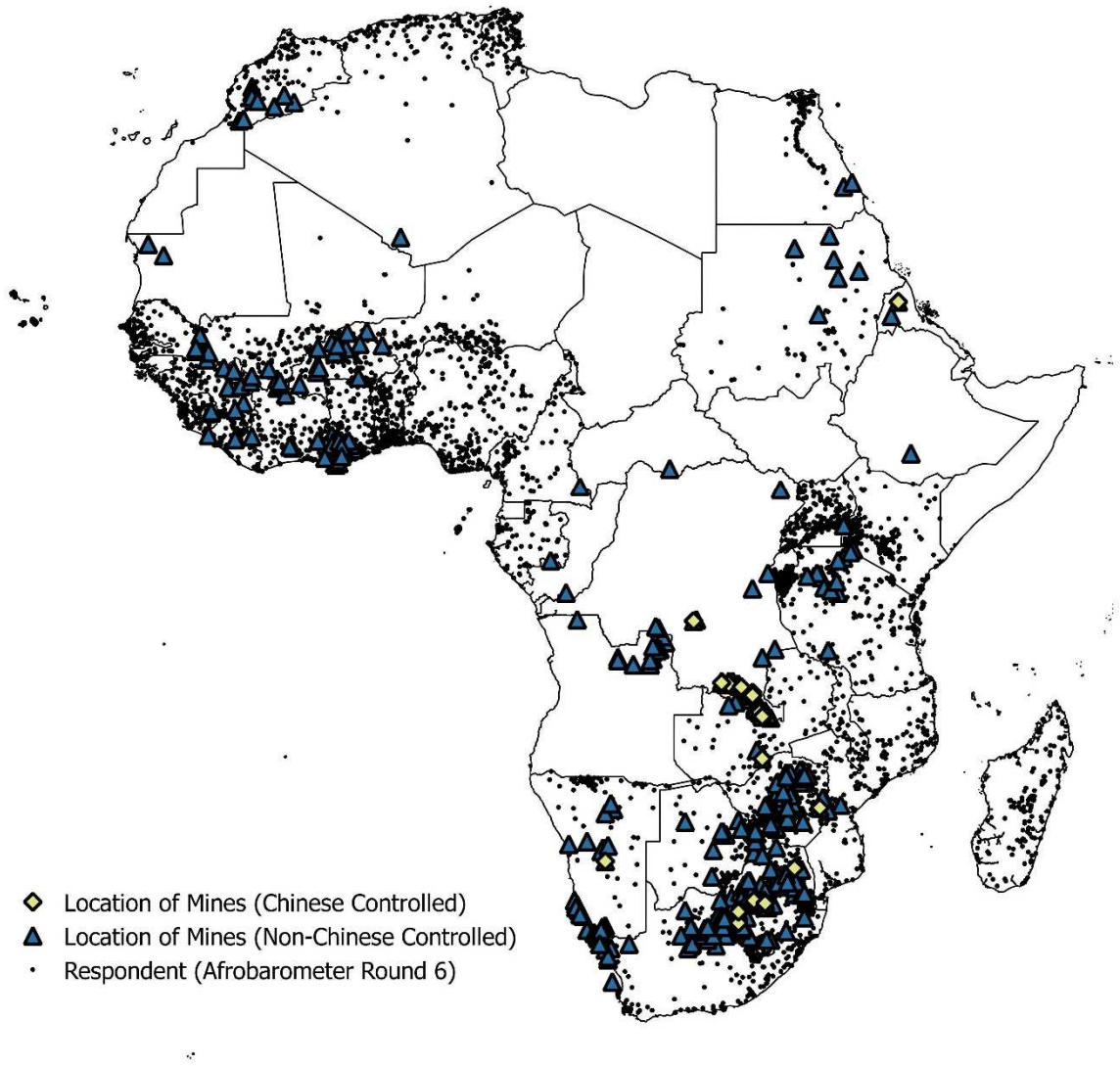
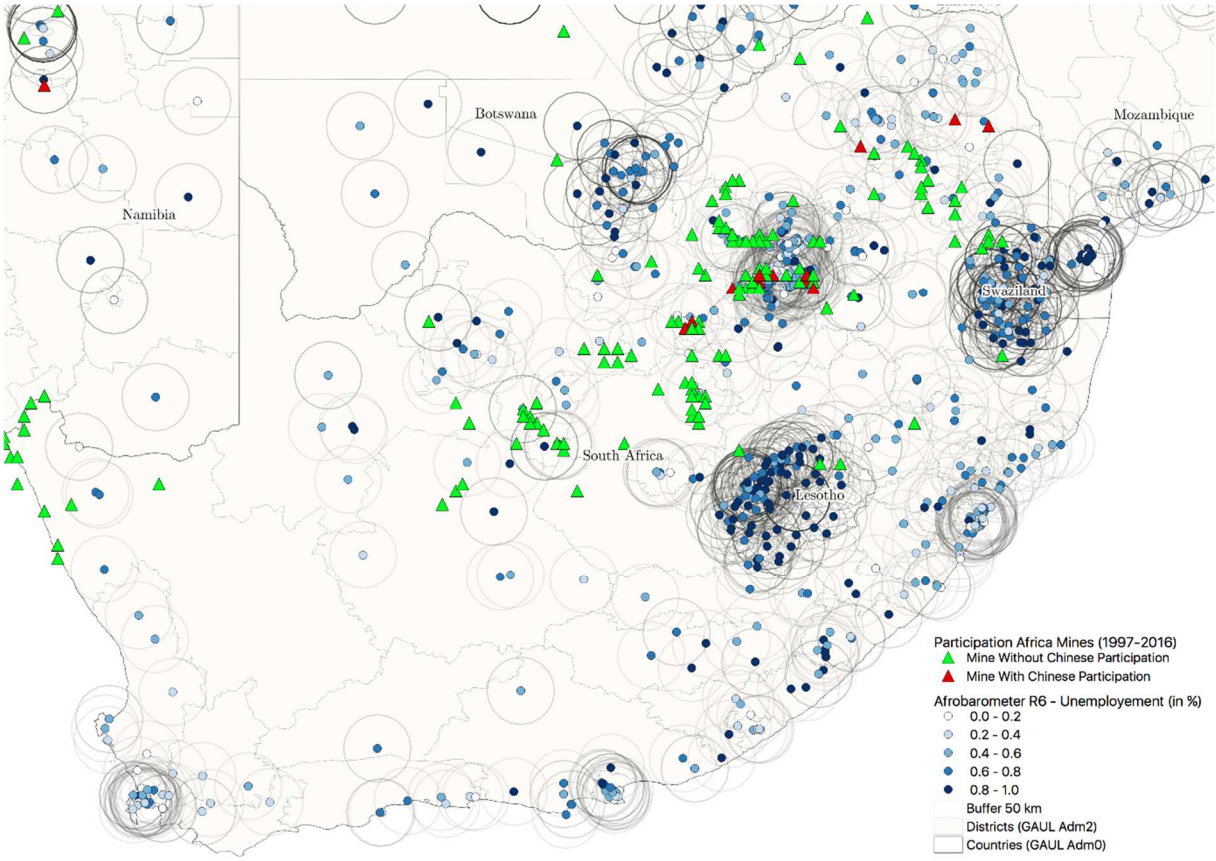


FIGURE 2. Location of Chinese- and non-Chinese controlled mines and mean unemployment of respondents living within 50 km buffer zones



Tables

TABLE 1. Effect of Chinese versus non-Chinese mines on respondents' employment status using Afrobarometer data and different buffer sizes

VARIABLES	Unemployment in Afrobarometer round 5 (2011–2013)			Unemployment in Afrobarometer round 6 (2014–2015)		
	(1)	(2)	(3)	(4)	(5)	(6)
	(25 km buffers)	(40 km buffers)	(50 km buffers)	(25 km buffers)	(40 km buffers)	(50 km buffers)
Chinese mines	0.0771***	0.0517***	0.0573***	0.177***	0.0779***	0.0762***
	(0.0211)	(0.0134)	(0.0145)	(0.0135)	(0.0139)	(0.0160)
Domestic mines	-0.106	-0.129*	-0.0908	0.0183	0.0135	0.0370
	(0.0789)	(0.0661)	(0.0562)	(0.0923)	(0.0894)	(0.102)
International mines	0.0140	0.00939	-0.0124	-0.0192	-0.0186	-0.0213
	(0.0219)	(0.0160)	(0.0143)	(0.0491)	(0.0368)	(0.0292)
Living conditions	-0.189***	-0.189***	-0.188***	-0.234***	-0.234***	-0.234***
	(0.0675)	(0.0673)	(0.0672)	(0.0524)	(0.0526)	(0.0525)
Education	-0.824***	-0.824***	-0.824***	-0.580***	-0.579***	-0.578***
	(0.0856)	(0.0856)	(0.0856)	(0.116)	(0.116)	(0.115)
Urban	-0.285***	-0.286***	-0.286***	-0.258***	-0.258***	-0.259***
	(0.0487)	(0.0487)	(0.0485)	(0.0825)	(0.0826)	(0.0827)
Crime	0.0552*	0.0554*	0.0560*	-0.0739	-0.0735	-0.0727
	(0.0320)	(0.0320)	(0.0321)	(0.0531)	(0.0531)	(0.0531)
Democracy	-0.00316	-0.00301	-0.00291	0.0290	0.0295	0.0294
	(0.00897)	(0.00896)	(0.00900)	(0.0535)	(0.0535)	(0.0536)
Discrimination	0.00733	0.00822	0.00884	0.106*	0.106*	0.106*
	(0.0908)	(0.0909)	(0.0910)	(0.0636)	(0.0633)	(0.0632)
State capacity	-0.111**	-0.110**	-0.111**	-0.0106	-0.0107	-0.0107
	(0.0442)	(0.0442)	(0.0441)	(0.0561)	(0.0560)	(0.0560)
Local corruption	-0.0905**	-0.0912**	-0.0905**	-0.00597	-0.00593	-0.00530
	(0.0386)	(0.0386)	(0.0386)	(0.0385)	(0.0386)	(0.0386)
Constant	1.920***	1.919***	1.918***	0.887***	0.887***	0.887***
	(0.0842)	(0.0840)	(0.0838)	(0.104)	(0.103)	(0.103)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,194	37,194	37,194	32,913	32,913	32,913

Note: Logistic regressions with unemployment as dependent variable and mean number of active mines during the last five years with igneous or hydrothermal deposits as independent variable. Standard errors clustered around countries in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

TABLE 2. Effect of majority-controlled Chinese versus non-Chinese mines within district on unemployment (DHS Data)

VARIABLES	Majority ownership 66%		Majority ownership 51%	
	(1) Unemployment	(2) Unemployment	(3) Unemployment	(4) Unemployment
Chinese mines	0.0312***	0.0208**	0.0312***	0.0208**
	(0.00762)	(0.00975)	(0.00762)	(0.00976)
Domestic mines	-0.0166	-0.0178	-0.0167	-0.0178
	(0.0146)	(0.0134)	(0.0146)	(0.0134)
International mines	-0.0110*	-0.0118**	-0.0109*	-0.0116**
	(0.00567)	(0.00545)	(0.00563)	(0.00542)
Regional gross product		-0.0350***		-0.0350***
		(0.0119)		(0.0119)
No education		0.118**		0.118**
		(0.0468)		(0.0468)
State capacity electricity		0.103**		0.103**
		(0.0462)		(0.0462)
One-sided violence		0.00410		0.00410
		(0.0139)		(0.0139)
Population density		2.95e-05		2.95e-05
		(2.59e-05)		(2.59e-05)
Constant	0.220***	0.129***	0.220***	0.129***
	(0.0186)	(0.0368)	(0.0186)	(0.0367)
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Observations	26,155	26,137	26,155	26,137
R-squared	0.419	0.441	0.419	0.441

Note: Two-way fixed-effects models with mean levels of unemployment within districts as dependent variable and number of active mines with igneous or hydrothermal deposits as independent variable.
Standard errors clustered around countries in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

TABLE 3. Effect of Chinese versus non-Chinese mines on respondents' perception of China taking jobs and resources using Afrobarometer 6 data and different buffer sizes

VARIABLES	China is taking jobs			China is taking resources		
	(1)	(2)	(3)	(4)	(5)	(6)
	(25 km buffers)	(40 km buffers)	(50 km buffers)	(25 km buffers)	(40 km buffers)	(50 km buffers)
Chinese mines	0.325***	0.179***	0.174***	0.0549***	0.0304***	0.0160**
	(0.0128)	(0.00818)	(0.0126)	(0.00773)	(0.00837)	(0.00726)
Domestic mines	0.148*	0.153*	0.125	0.0857	-0.00505	-0.00453
	(0.0838)	(0.0796)	(0.0852)	(0.105)	(0.0972)	(0.0731)
International mines	-0.0999**	-0.0778***	-0.0660**	-0.0276	-0.00968	0.0145
	(0.0480)	(0.0256)	(0.0309)	(0.0231)	(0.0205)	(0.0155)
Unemployed	0.00669	0.00652	0.00590	-0.00799	-0.00787	-0.00684
	(0.0440)	(0.0440)	(0.0442)	(0.0814)	(0.0815)	(0.0815)
Education	0.0810	0.0835	0.0848*	0.106	0.106	0.105
	(0.0517)	(0.0515)	(0.0509)	(0.0720)	(0.0721)	(0.0715)
Urban	0.214***	0.213***	0.213***	-0.0898	-0.0906	-0.0897
	(0.0652)	(0.0652)	(0.0653)	(0.122)	(0.122)	(0.123)
Protectionism	0.141**	0.139**	0.138**	-0.0403	-0.0408	-0.0400
	(0.0637)	(0.0641)	(0.0640)	(0.0572)	(0.0570)	(0.0568)
News consumption	0.156**	0.156**	0.157**	0.113	0.112	0.111
	(0.0661)	(0.0664)	(0.0664)	(0.0846)	(0.0848)	(0.0840)
Xenophobia	0.0677	0.0683	0.0690	0.113	0.112	0.111
	(0.0550)	(0.0550)	(0.0548)	(0.0902)	(0.0904)	(0.0907)
Constant	-1.706***	-1.706***	-1.706***	-1.645***	-1.644***	-1.644***
	(0.0687)	(0.0689)	(0.0686)	(0.117)	(0.117)	(0.116)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	38,035	38,035	38,035	38,035	38,035	38,035

Note: Logistic regressions with China taking jobs and resources contributing to a negative image of China as dependent variables. The mean number of active mines during the last five years with igneous or hydrothermal deposits is the independent variable.
Standard errors clustered around countries in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

TABLE 4. Effect of Chinese versus non-Chinese mines of respondents' perception of China taking land and Chinese behavior using Afrobarometer 6 data and different buffer sizes

VARIABLES	China is taking land		
	(1) (25 km buffers)	(2) (40 km buffers)	(3) (50 km buffers)
Chinese mines	0.229***	0.122***	0.126***
	(0.00825)	(0.00786)	(0.00604)
Domestic mines	0.00625	0.0106	0.0156
	(0.112)	(0.121)	(0.0921)
International mines	0.102***	0.0660***	0.0538***
	(0.0252)	(0.0217)	(0.0142)
Unemployed	-0.00659	-0.00596	-0.00529
	(0.0639)	(0.0640)	(0.0639)
Education	0.0154	0.0121	0.0118
	(0.0651)	(0.0651)	(0.0655)
Urban	-0.221*	-0.219*	-0.218*
	(0.117)	(0.117)	(0.117)
Protectionism	0.0151	0.0164	0.0167
	(0.0756)	(0.0751)	(0.0750)
News consumption	-0.132*	-0.134*	-0.134*
	(0.0797)	(0.0798)	(0.0799)
Xenophobia	0.0406	0.0427	0.0419
	(0.0688)	(0.0690)	(0.0687)
Constant	-2.183***	-2.182***	-2.184***
	(0.107)	(0.107)	(0.108)
Country dummies	Yes	Yes	Yes
Observations	38,035	38,035	38,035

Note: Logistic regressions with China's land-grabbing contributing to a negative image of China as dependent variable. The mean number of active mines during the last five years with igneous or hydrothermal deposits is the independent variable.
Standard errors clustered around countries in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Endnotes

[i] DHS data is provided by ICF (1996–2014) and can be retrieved from: https://dhsprogram.com/data/available-datasets.cfm (accessed June 30, 2016).
[ii] Particularly for poorer and low-skilled rural households, studies find that artisanal mining provides a more accessible alternative livelihood activity (Hilson, Amankwah & Ofori-Sarpong, 2013; Spiegel, 2012b). Large-scale industrial mining, in contrast, often has a smaller employment effect due to the lack of relevant skills among the local population. Nevertheless, a general effect is also evident in the latter case (Gamu, Le Billon & Spiegel, 2015, p. 168).
[iii] According to Chen et al. (2009, p. 83), approximately 50% of the labor forces of the surveyed construction firms in Africa are Chinese. At the managerial level, the share rises to approximately 90%. In Sino-Angolan enterprises the percent share of local employment ranges between approximately 38% in the telecommunication sector, 60% in the construction sector, and 81% in agriculture. In the DRC, where labor costs are lower, the ratio is on average much higher than in Angola, with an average of 76% local workers in Sino-Congolese enterprises (Tang, 2010, pp. 354, 361).
[iv] Afrobarometer data can be retrieved from: http://www. afrobarometer.org (accessed March 22, 2017).
[v] Round 5 of the Afrobarometer consists of 34 national surveys conducted between 2011 and 2013 and round 6 covers 36 countries during the years 2014–2015. A list of countries covered by each round is provided in Table A1 in the Online Appendix. As can be noted, South Africa (a country hosting many Chinese mining investments) is excluded from our time-series, cross-sectional regressions as it does not have sufficient georeferenced DHS survey rounds over our period of analysis. The DRC, a country also hosting considerable Chinese mining investments, is not covered by Afrobarometer round 5 and therefore cannot be included in some of our models. Note, however, that this country is included in the estimations that are based on round 6 of Afrobarometer. Except for these two cases, all countries hosting major Chinese copper, diamond, and gold operations are included in our estimations. We do not expect that the partial exclusion of these two countries from some of our models biases our results.
[vi] Round 5 covers 50,405 individuals and round 6 contains 53,935 respondents.
[vii] For a complete list of variable definition, coding rules, and data sources see Table A2 in the Online Appendix. For descriptive statistics of all variables, please refer to tables A3 and A4.
[viii] Items Q81B and Q81D, respectively.
[ix] Countries with three survey rounds include Burkina Faso, Ghana, Guinea, Kenya, Namibia, Nigeria, Rwanda, Senegal, Uganda, and Zimbabwe.
[x] The countries covered by the two survey rounds are: Benin, Cameroon, Democratic Republic of Congo, Ethiopia, Ivory Coast, Liberia, Madagascar, Sierra Leone, Tanzania, Togo, and Zambia.
[xi] GAUL features global geographic polygon layers with all districts in all countries of the world (EC-FAO Food Security Programme, 2008).
[xii] Note that mining locations overlap and therefore not all Chinese-controlled mines are visible.
[xiii] We also test the robustness of our results when employing average ownership shares of active mines using 4- and 6-year periods (instead of the reported 5-year periods), and obtain substantively unchanged results. The corresponding tables A6 and A7 are included in the Online Appendix.
[xiv] The data can be retrieved from: https://mrdata.usgs.gov/major-deposits/ (accessed September 2, 2018).
[xv] See Table A2 for more detailed coding information on all variables.
[xvi] See Table A2 for further details on all control variables.
[xvii] Most enumeration areas comprise approximately 9 respondents.
[xviii] Scholars such as Irwin and Gallagher (2013) or Tan-Mullins and Mohan (2013) show that the national and local socioeconomic impact of mining investments by Chinese or non-Chinese mining companies are largely driven by the host country's regulatory framework and implementation.
[xix] Legal inequality is proxied by the question of whether respondents think that people in their region are never treated equally under the law. Local governments' capacity to create jobs is proxied by the question of whether individuals believe that local governments' performance in generating jobs is either good or very good.
[xx] There are a total of 41 Chinese-controlled mine openings for the given period.