Local and Multinational Comparative Advantage in the Global Mining Industry[*]

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March 19, 2025

Abstract

Empirical evidence and economic theory suggest multinational firms are more productive than their local counterparts. What explains the persistence of local firms and the recent surge in local content policies? Using a global database of corporate ownership changes for 35,567 commercial mines between 2000-2022, we test whether local firms have a comparative advantage in dealing with weak institutions, corruption, and conflict, which could attenuate or reverse the multinational advantage. We confirm that, on average, output declines by 8% after mines are taken over by local firms. Localized assets also exhibit higher air pollution, indicating lower operational quality. However, in states with weak governance, localization *increases* mine output by 8%. Local firms also generate more economic activity, urbanization, and non-agricultural employment around mines, indicating stronger local linkages. While multinational mining firms exhibit increasing returns to scale, local firms exhibit decreasing returns, suggesting they may grow based on their ability to navigate institutional weaknesses rather than their productivity. Results highlight the role of institutions in determining relative advantages of multinational versus local firms.

[*]Acknowledgments: This manuscript has benefited from discussions with seminar participants at the PoNACEE Workshop, the Swiss Joint PhD Seminar in Agricultural Economics, and the University of Geneva-IEE. We are grateful to Esha Zaveri and The World Bank for sharing data from the Demographic and Health Surveys, and to Diego Martin for excellent research assistance. We acknowledge generous financial support from the Structural Transformation and Economic Growth Initiative (Small Research Grant 1569). The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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1 Introduction

There is long-standing debate among economists and policymakers regarding the optimal balance of foreign and local capital in emerging economies (Hirschman, 1969). Multinational firms are typically more productive than local firms (Arnold and Javorcik, 2009; Melitz, 2003) and generate positive spillovers through innovation (Guadalupe et al., 2012), knowledge transfer (Javorcik, 2004), and job creation (Toews and Vézina, 2022). Despite these advantages, multinationals may struggle to operate in contexts characterized by corruption or conflict, potentially explaining the persistence of low-productivity local firms (Burger et al., 2016; Alfaro et al., 2008). In weak governance contexts, local firms may possess the information, political connections, or legal flexibility to protect assets and navigate politics, giving them a comparative *local advantage* (Rexer, 2024).

As global flows of goods and capital stall, giving rise to fears of "geo-economic fragmentation" (Aiyar et al., 2023), localization has become a resurgent policy tool, bringing debates over the relative advantages of local and multinational ownership to the fore. Despite this, there is a paucity of empirical evidence on the subject. Local ownership and local content policies are particularly prominent in extractive industries, where countries seek to onshore critical mineral supply chains and harness resource extraction to promote job creation and development (Fleck et al., 2024; Korineck and de Sa, 2024; Ramdoo, 2015).[1] The World Bank's Extractives-Led Local Economic Diversification Program identified 16 countries implementing localization policies for mining sectors as of 2023 (ELLED, 2023).

In this paper, we evaluate the relative performance of local and multinational firms in the global mining industry using a comprehensive database of corporate ownership changes for 35,567 commercial mines between 2000 and 2022. We estimate whether mining assets taken over by local firms become more or less productive on average, and whether there are particular contexts (i.e., weak governance settings) where local firms outperform multinationals. Furthermore, we intersect mine locations with high-resolution geospatial data on economic activity derived from night-time light intensity, population, violent conflict, air pollution, land use, and labor market outcomes to evaluate the broader impacts of local versus multinational

[1] Localization policies are also on the rise in other sectors, for instance, the 2022 Inflation Reduction Act in the United States – which provided substantial tax credits for steel, iron, and manufactured products produced domestically – and China's "Made in China 2025" policy – which focuses on internalizing production capacity in key technology sectors (RSM, 2023; Branstetter and Li, 2022).

mine ownership on socioeconomic and environmental outcomes around mining sites.

The global mining industry presents an ideal setting in which to identify the trade-offs of local versus multinational ownership. Sizable fixed capital and technology requirements generate plausible multinational comparative advantage in the production process. At the same time, exposure to complex governance challenges in host countries (Blair et al., 2022) generates conditions in which the local advantage may outweigh the technical efficiency of multinationals. For example, Rexer (2024) shows how local oil companies in Nigeria are more effective than multinationals at leveraging connections with military elites and striking deals with local militia groups to reduce violence and increase oil production, despite having access to worse technology. The Economist (2025) describes how multinational mining companies operating in Africa's Sahel region are disproportionately targeted by asset seizures, unpredictable tax increases, arrests targeting executives and employees, and lack of protection by state security forces. In contrast, local mining companies, especially those owned or aligned with political elites, face fewer expropriation risks.

Our main empirical approach uses high-dimensional fixed effects specifications to estimate the effect of local ownership on mine output and local socioeconomic outcomes around mining sites. The richness of our mine-level panel data allow us to control for mine fixed effects as well as numerous sources of time-varying unobserved heterogeneity at country-year, commodity-year, and more spatially granular levels. We complement this approach with estimation of event studies around multinational asset divestment to local firms, enabling evaluation of pre-trends. For both of these approaches, we estimate average effects across our global sample, and then interact local ownership with measures of host-country governance quality based on the World Governance Indicators database (World Bank, 2024) to measure the heterogeneous effects of local ownership in strong versus weak governance contexts.

Our analysis relies on the identifying assumption that while the assets owned by local firms may be non-randomly selected, the timing of divestment is idiosyncratic conditional on our rich set of commodity and country-specific unrestricted time trends. Our event-studies reveal no differential pre-trends in mine output, socioeconomic, or environmental outcomes prior to divestment. Furthermore, we find no evidence of selection in the timing of multinational divestment to local firms relative to the life cycle of the asset, strengthening our argument of idiosyncratic timing.

Our results reveal several novel empirical facts about local and multinational comparative advantage in the global mining sector. We begin with simple estimates of output by ownership type. Consistent with the literature in international economics – reviewed in detail below – we find that local firms produce less from the same assets than do multinationals. In our preferred specification, moving from fully multinational to fully local ownership reduces mine output by 8.3% on average annually, an economically meaningful contraction. This effect rises to 13.8% when we account for "effective" local ownership (i.e., accounting for local companies' multinational parents). Furthermore, not all firms are created equal: mine output *decreases* in firm size for local firms and *increases* in firm size for multinationals, suggesting large multinationals are positively selected and enjoy economies of scale while large local firms are negatively selected and may grow for reasons besides efficiency. Our results are robust to the inclusion of additional interacted fixed effects, time-varying fixed effects for more granular spatial administrative units, stacked difference-in-differences models, coarsened exact matching on baseline mine characteristics prior to event studies, binary treatment definitions using minimal and dominant share thresholds of local ownership, and varying output measurement assumptions.

Next, we investigate the socioeconomic and environmental consequences of mine localization using geospatial data. Despite producing less on average, local firms are more prolific polluters. Moving from full multinational to full local ownership increases fine particulate matter (PM2.5) around mines by 1.2%. This increase could be driven by local firms' evasion of environmental regulations or adoption of lower quality technology. Increased pollution is also consistent with local firms' larger economic impacts. Localization is associated with a 1% increase in local GDP – a small but meaningful increase in living standards.[2] These economic effects are accompanied by changing land use patterns: local ownership is associated with a by 1.2% decline in crop cover and a 12.7% increase in urban land cover. This suggests more dynamic economic activity concentrated in denser urban areas around mines, signaling a shift out of agriculture in response to localization.

[2]Estimates at different geographic radii around the mine do not reveal obvious spatial patterns that allow us to differentiate between PM2.5 effects at the mine or in nearby urban settlements. We validate night lights-derived GDP results by showing significant and intuitively signed correlations between night light intensity around mines and socioeconomic development indicators (household wealth, literacy, child mortality, and improved sanitation) from Demographic and Health Surveys after controlling for country-year fixed effects. We also find a significant positive effect of local mine ownership on household wealth indices, which is robust to inclusion of country-year and commodity-year fixed effects.

Our central hypothesis is that while multinational firms may outproduce local firms when performance depends only on technical efficiency, the institutional constraints of weak states impose a second-best equilibrium that generates a local advantage. We test this hypothesis by interacting our localization variable with a baseline measure of host country institutions. In the most rigorous specification, results reveal that for the most poorly-governed countries in the world – at the level of DRC, Iraq, and Myanmar – local firms produce 8% *more* than multinationals on average annually. Split sample event studies reveal that, in poorly governed countries, mine output 20 years after divestment to local firms is 27% higher than in non-divested assets. Simply put, local firms do significantly better than multinationals when operating in the weakest states. We also show that this heterogeneity by governance is dynamic: the multinational advantage in mine output disappears in countries that see governance conditions worsen significantly between the 2000s and 2010s, while the local advantage disappears in countries that see governance improve significantly over this period.

Furthermore, we posit that multinationals from poorly governed countries may also have a comparative advantage at operating under weak institutions. We show that multinational output performance is positively correlated with home-country institutional quality in well-governed host-countries, and negatively correlated in poorly-governed hosts. This suggests that multinationals from weak states are better-adapted to operating in weak governance environments, performing more like local firms.

We then test for heterogeneity in socioeconomic and environmental effects of localization by governance quality. We find that effects of mine localization on GDP, pollution, and urban land use are larger in poorly governed countries. These results are consistent with local firms exerting greater linkages to local markets – particularly in weak states where multinationals may rely on foreign equipment and workers with little connection to the local economy.

Finally, we test for a labor market linkage mechanism underlying increased economic activity and urbanization after mine localization, along the lines of Allcott and Keniston (2018). Using survey data on occupational composition near mining sites, we find that local ownership is associated with an 8.5% reduction in agricultural employment and a concomitant 5.4% increase in non-agricultural wage employment. This suggests that local firms exert stronger backward and forward linkages to local labor markets – potentially because they deploy more labor-intensive technology – and thus contribute to structural transformation.

2 Related Literature and Contributions

This paper contributes to four strands of literature: (i) the relative advantages of multinational versus local firms; (ii) operation of firms in settings characterized by corruption and weak governance; (iii) local mining impacts and mechanisms underlying the resource curse; and (iv) current policy debates regarding local content in extractive industries.

Multinational firms are positively selected and tend to be more productive than local firms (Arnold and Javorcik, 2009; Melitz, 2003). Those that opt to enter high-cost-of-entry markets are further positively selected on productivity (Chen and Moore, 2010). Multinationals benefit from economies of scale and scope, access to technology and capital, and superior management practices (Bloom and Van Reenen, 2010). Furthermore, the headquarters location of multinationals can shape their business practices and behavior in foreign markets (Bloom et al., 2012). For instance, Christensen et al. (2023) show that US anti-corruption regulations improved local environmental and economic outcomes around foreign mines operated by US firms. While the multinational productivity advantage may prevail in well-functioning markets, weak governance settings present challenges that could shift the advantage to local firms – which benefit from knowledge of local conditions, connections with local elites, and legal flexibility to bend the rules or exploit institutional voids (Rexer, 2024; Palepu and Khanna, 1998). Multinationals may adapt to weak institutional settings by forming joint ventures with local firms to combine multinational and local advantages (Javorcik and Wei, 2009). We contribute to this literature by quantifying relative multinational and local production advantages across heterogeneous institutional contexts for the mining sector – a major global industry with particular relevance for resource-dependent economies.

An extensive literature explores the corrosive effects of corruption and weak governance on economic activity (Colonnelli and Prem, 2021; Kaufmann et al., 1999; Shleifer and Vishny, 1993). In weak institutional settings, corruption may arise as a second-best equilibrium, "greasing the wheels" and allowing firms able to work the system to get things done (Méon and Weill, 2010). We contribute to this literature by providing empirical evidence that local firms outproduce multinationals in places where corruption may be needed to overcome contracting and operational frictions. Likewise, we show that multinationals based in weak governance countries also perform better in weak governance settings, suggesting they too have a comparative advantage in corruption. Our estimation of positive returns to scale for multinationals and negative returns to scale for locals suggests that the local advantage – a product of institutional weaknesses – may be a local optimum but likely implies welfare losses relative to a strong institutions equilibrium.

We contribute to literature on the subnational impacts of natural resource extraction (Ladewig et al., 2024; Berman et al., 2017; Jacobsen and Parker, 2016; Cust and Poelhekke, 2015; Aragón and Rud, 2013) and the institutional foundations of the resource curse (Armand et al., 2020; Robinson et al., 2006) by showing how weak governance selects for firms specialized in navigating institutional voids. While these firms may produce more in weak governance settings – representing a second best optimum – their prevalence could reinforce corruption and deter multinational investments. Furthermore, we show that local firms pollute more, suggesting any local advantage in production may come at an environmental cost.

Finally, we contribute to current policy debates over the costs and benefits of local content policies. Yan Ing and Grossman (2024) review these policies in several countries and conclude that they often result in aggregate welfare losses. Hansen and Therkildsen (2016) argue that localization policies shelter inefficient firms from competition and potentially enable rent-seeking. Rexer (2024) shows that a localization policy targeting Nigeria's oil industry increased production and reduced oil thefts – in line with the local advantage – but also increased oil spills and gas flaring because local firms use lower quality technology and production methods. Despite this mixed evidence, local content policies are booming in popularity – part of a broader resurgence of industrial policies across low, middle, and high-income countries alike (Cherif and Hasanov, 2019).[3] We contribute empirical evidence that local firms produce more and generate more economic spillovers in weak governance settings, justifying some defenses of local content policies. On the other hand, we document that multinationals produce significantly more on average, suggesting that local content requirements may have efficiency costs in all but the weakest institutional settings. Still, local job creation remains an overriding concern for policymakers. We present novel empirical evidence that localization can trigger economic growth and structural change.

[3] OECD countries implemented 145 new local content requirements between 2008 and 2015 (Stone et al., 2015). The share of Sub-Saharan African countries imposing local processing requirements on mining products rose from 26% in 2009 to 42% in 2020 (Cust and Zeufack, 2023).

3 Data and Descriptives

In this section, we describe our data sources and present descriptive evidence on local and multinational asset ownership in the global mining industry.

3.1 Mining Data

Our primary data source is the S&P Global Mining and Metals Database (2023), which reports annual data on 35,567 commercial assets (i.e., mines) spanning 162 countries between 2000 and 2022, including the location, primary commodities produced, development stage, activity status, and output by volume for each mine in each year.[4] The database encompasses mines in exploration, development, production, and post-production phases; data on output are reported for 6,170 mines covering 122 countries over 46,252 mine-years. Most of the mines for which production data are not available are inactive or in non-production stages.

We link this mine-year panel with data on mining firms based on time-varying corporate ownership stakes for each mine. Comprehensive corporate ownership data are available for 96.5% of mines in the S&P database. Firm-level data include firms' percentage participation share in each mine and country and city headquarters location for 16,805 unique mining firms.[5] For wholly or partially owned subsidiary firms, we identify parent firms and parents' characteristics and headquarters locations.[6] Based on these data, we calculate the time-varying *local share* of each mine's ownership as the sum of ownership stakes held by companies headquartered in the country where the mine is located. We also calculate second-level local shares based on the headquarters location of operating firms' parent companies and the share a parent owns of its first-level subsidiary. We proxy firms' size using the total number of mines in which they hold stakes around the world.

[4]This dataset offers the most comprehensive coverage of formally-registered commercial mines available, but misses informal mines. The prevalence of informality in mining varies across commodities and locations. High-income countries typically exhibit high levels of formalization, resulting in few mines being excluded from the S&P database. Low-income countries have higher rates of informal mining, leading to a larger share of total mines missing from the database for these countries. Informality is especially high (up to 70-80%) in the artisanal and small-scale mining (ASM) sector (IGF, 2022). ASM accounts for approximately 15-35% of cobalt production in the Democratic Republic of the Congo, 26% of global tantalum production, and 20% of global gold production (UN Environment, 2024; IGF, 2022). Despite these limitations, the S&P Global database captures the vast majority of global mineral and metal production, as commercial mines are much larger and more productive than ASM.

[5]We manually identified headquarters locations for 6.6% of firms where this information was not reported in the S&P database, using Google searches.

[6]We are able to obtain comprehensive parent information for 13,378 of the firms identified as first-level owners.

We define three sample restrictions and use each in the subsequent analyses where appropriate. Most broadly, we define an "in-S&P" sample that retains all mine-year observations for which data is reported on the mine in the S&P registry. We use this sample definition to study impacts from mining that could occur even without production (e.g., economic activity – which could occur during exploration and development phases). A slightly narrower sample is the "ever-produced" sample, encapsulating all mines that are ever recorded as producing during the 2000-2022 period. The narrowest sample, the "output" sample, is restricted to the unbalanced panel of mine-years where production is reported. We use this sample to evaluate the effects of local ownership on outcomes directly linked to production, such as mine output and air pollution.

3.2 Geospatial Outcomes

We intersect mine locations with several additional high-resolution geospatial gridded satellite datasets measuring annual socioeconomic and environmental outcomes at a global scale. We use annual 1x1km gridded GDP levels derived from satellite imagery of night-time light intensity from Chen et al. (2022), which are available yearly for 2000-2019. We compute aggregate levels of economic activity within 1, 5, 10, 15, 20, and 25km of mining sites each year. To validate the relationship between night-time light measures and on-the-ground socioeconomic development, we intersect mine locations with the universe of Demographic and Health Surveys (DHS) collected between 2000-2022 within 20km of those locations (DHS, 2024).[7] We also use DHS data to measure changes in household wealth and agricultural and non-agricultural employment around mines.

To measure population, we use Version 4 of NASA's Gridded Population of the World database (NASA, 2023), which provides 1x1km population estimates for 2000, 2005, 2010, 2015, and 2020. Geo-coded data on the universe of violent conflict events between 1975-2023 are drawn from the Uppsala Conflict Data Program (2023). Conflict events report parties involved and the number of combatant and civilian deaths. We aggregate these data to the

[7] In Appendix Figure A1, we plot correlations between residuals of local night lights-based economic activity around mines and survey-based indicators of socioeconomic development from those areas (household wealth index, literacy rate, child mortality, and access to improved sanitation) after controlling for country-year fixed effects. Correlations are significantly positive at the 1% level for household wealth, literacy, and improved sanitation, and significantly negative at the 1% level for child mortality, confirming that night lights-based economic activity is a meaningful proxy for broader measures of socioeconomic development.

total number of violent events and conflict-related deaths within 1, 5, 10, 15, 20, and 25km of each mine in each year.

To evaluate environmental outcomes around mines, we use data on land use changes from the Copernicus Land Monitoring Service (2024), which reports annual gridded land cover categories at 300x300m resolution between 1992-2023. We aggregate 23 detailed land-use classes into aggregate classifications: the share of area within 5km of a mine under forest cover, agriculture, urban use, or other land use. Concentrations of fine particulate matter air pollution (PM2.5) at a 1x1km spatial resolution between 1998-2022 are from Shen et al. (2024).

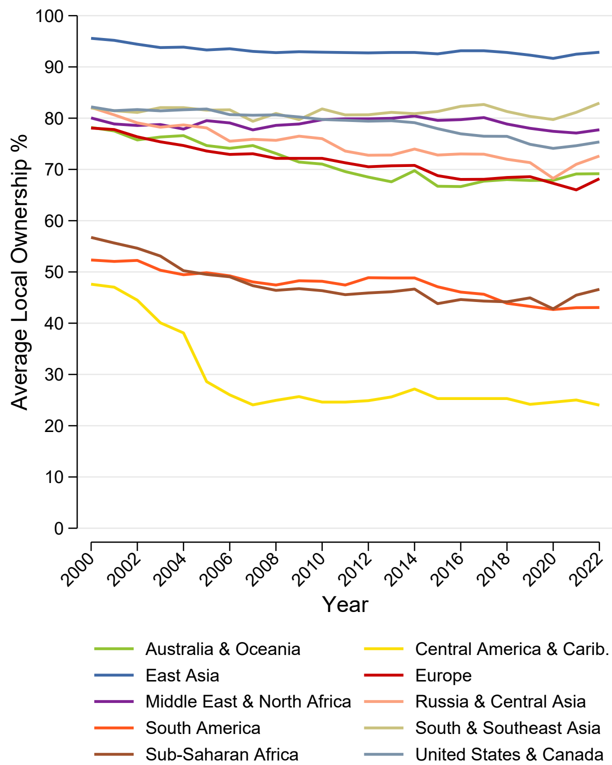
3.3 Institutional quality

Finally, we measure country-level governance quality using the Worldwide Governance Indicators (World Bank, 2024), which draws data from over thirty sources to construct annual measures of governance along the dimensions of voice and accountability, regulatory quality, political stability, rule of law, government effectiveness, and control of corruption. In our preferred specifications, we compute the country-level average of these measures at baseline (the year 2000) to create an aggregate governance index. In robustness checks, we use alternative measures of governance, including data on annual subnational (ADM1-level, i.e., state or province) corruption from the Subnational Corruption Index (Crombach and Smits, 2024), which is available for 1,473 regions in 178 countries between 1995-2022 (approximately half of all ADM1 regions in the world). We also aggregate conflict data from UCDP to ADM1 and country-levels to explore heterogeneity in local ownership impacts along the dimension of conflict prevalence.

3.4 Descriptive Evidence

There is substantial variation in mine ownership around the world. Figure 1 reports the average local ownership share of mines between 2000 and 2022, by region. Across all regions, local ownership of mines has declined in recent decades, indicating a progressive globalization of the mining industry. Globally, the average local ownership share of mines declined from 72% in 2000 to 57% in 2022. There are also large and stable differences in local ownership rates between regions. In Central America and the Caribbean, around 25% of mine ownership stakes are held by companies based in the same country as the mine, while this rate is above 90% in East Asia. South America and Sub-Saharan Africa also exhibit low (below 50%) local ownership of mines, while local ownership is relatively high (around 80%) in South and Southeast Asia, the Middle East and North Africa, and the United States and Canada. Average local ownership was around 70% for mines in Russia and Central Asia, Australia and Oceania, and Europe in 2022. The recent trend towards deglobalization is perhaps only visible in a slight uptick in local ownership in some regions beginning in 2020.

Figure 1: Local ownership over time by region, balanced panel sample

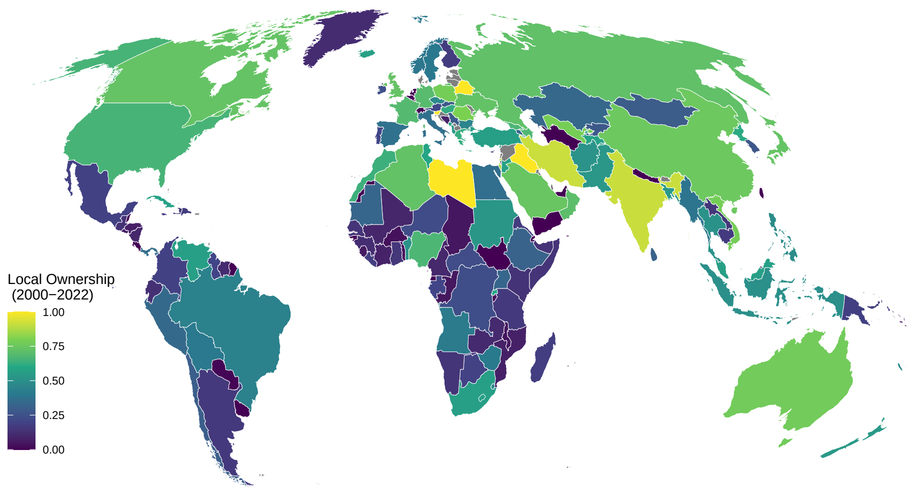


Note: Authors' calculations based on the S&P Global Mining and Metals Database (2023). Local ownership share is defined as the share of corporate ownership stakes held by companies headquartered in the same country where the mine is located. Sample is restricted to mines reporting data in 10 or more years between 2000-2022.

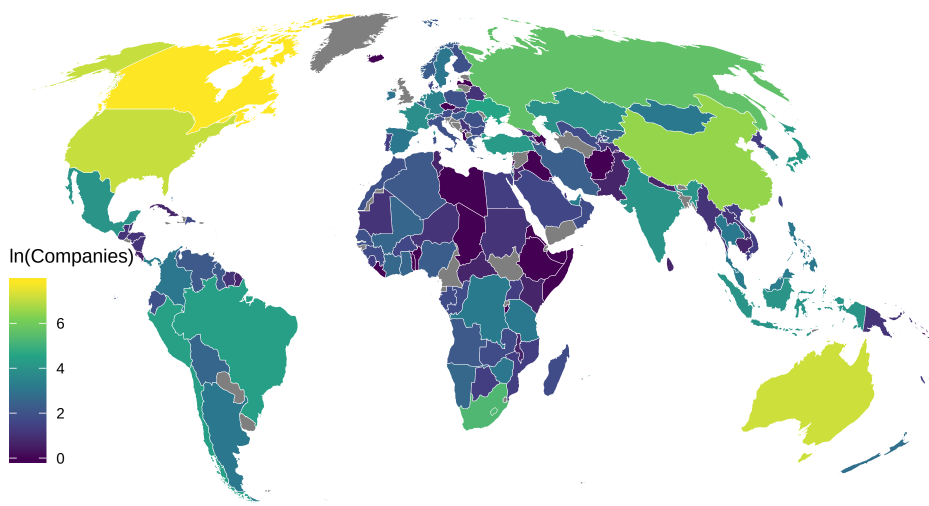
Figure 2 maps (a) the average country-level local ownership share of mines over the 2000-2022 period, and (b) the number of multinational mining companies headquartered in each country between 2000-2022. Local ownership is notably low in Central and South America and Sub-Saharan Africa. There are 39 countries where local ownership of mines is below 10%.

Local ownership rates are highest in India and Iran (both 91% local), and Aruba, Belarus, Iraq, Libya, and Slovenia (100% local). Countries with the highest rates of local ownership are typically characterized by dominant state-owned mining companies. Multinational mining firms are concentrated in Canada (2,436 multinationals), Australia (1,311 multinationals) the United States (1,195 multinationals), and China (668 multinationals).

Figure 2: Global Characteristics of the Mining Industry



(a) Average Local Ownership Share of Mines (2000-2022)

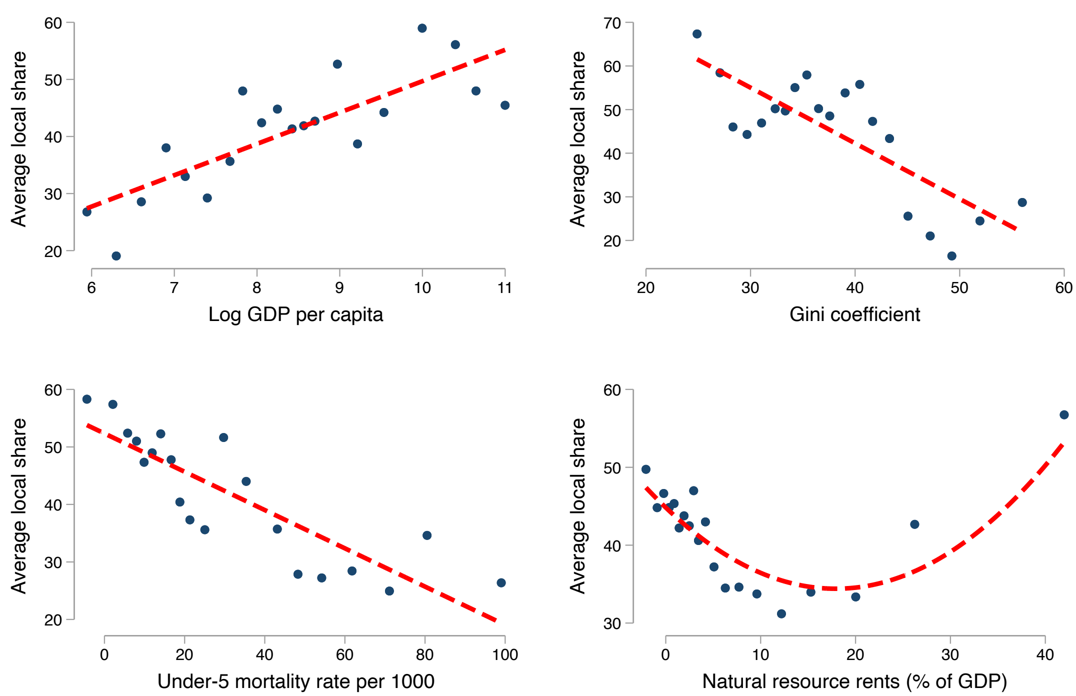


(b) Number of Multinational Mining Companies Based in Country between 2000-2022

Note: Authors' calculations based on the S&P Global Mining and Metals Database (2023). Local ownership percentage is computed as the average ownership share held by companies headquartered in the same country as the mine. Sub-figure (b) reports the logged number of companies headquartered in each country between 2000-2022 that held an ownership stake in at least one mine in another country. Countries colored in gray have no multinational mining firms.

In Figure 3, we plot binned scatter plots of average mine local ownership shares at the country-level against country characteristics, conditional on year fixed effects. Local ownership is positively correlated with a country's GDP per capita and negatively correlated with income inequality (measured by the Gini coefficient) and under-5 mortality rates. These correlations indicate that higher-income, healthier, and less-unequal countries have more local mine ownership. Low-income countries may lack the local technical expertise and capacity to extract resources, leading to dominance by multinational mining firms. There is a U-shaped relationship between natural resource rents as a percentage of GDP and local mine ownership. For most countries, greater dependence on resource rents is associated with lower local ownership of mines. However, for the upper tail of resource-dependent economies, local ownership levels are higher, likely reflecting the presence of state-owned mining companies.

Figure 3: Correlates of local ownership



Note: Figure shows binned scatter plots of the average local ownership share across mines within a country-year against country characteristics, conditional on year fixed effects. Sample is 156 countries with mining and economic data from 2000-2021. Independent variables are binned at 20 quantiles of their respective distributions.

4 Empirical Strategy

4.1 Fixed Effects Approach

The core empirical exercise of this paper is to estimate the impact of local ownership on asset-level mining outcomes, including mine output, local economic activity, violent conflict, and environmental outcomes around mines. However, raw comparisons between local and multinational assets are likely to be confounded by omitted variables at the time, asset, and country level. To control for these omitted variables, we estimate high-dimensional fixed-effects regression models that account for several different sources of unobserved heterogeneity. First, we include asset fixed effects to control for time-invariant asset characteristics that might drive selection into local ownership. Second, we use country-by-year effects, which flexibly control for country-specific, time-varying shocks that could be correlated with localization, such as policy changes. Finally, we control for commodity-by-year fixed effects, accounting for time-varying commodity cycles that might affect both the level of local ownership and the outcomes of interest. In robustness tests, we include additional interactions of these effects, as well as more granular spatial fixed effects at lower level administrative units. By including unit and time fixed effects, the model is equivalent to a difference in differences approach with continuous treatment (Callaway et al., 2024). For mine i at time t producing mineral m in country c, we estimate the following fixed effects regression:

$$y_{itmc} = \alpha + \beta locshare_{it} + \zeta_{tc} + \delta_{tm} + \gamma_i + \varepsilon_{itmc} \tag{1}$$

Where y_{itmc} measures the outcome variable of interest and $locshare_{it}$ captures the share of first-level equity ownership in the mine controlled by local firms. The estimate β captures the change in the outcome associated with moving from no local ownership to full (100%) first-level local ownership. The intercept terms ζ_{tc}, δ_{tm}, and γ_i are year-by-country, year-by-commodity, and mine fixed effects, respectively. Since ownership – our primary treatment of interest – varies at the mine-year level, standard errors are clustered at the mine level.

For y_{itmc}, we consider the following outcome variables: the log of annual mine output in tonnes, annual PM2.5 air pollution within 25km of the mine, the log of night lights-predicted GDP within 25km of the mine, and the share of the area immediately surrounding the mine covered by urban, forested, agriculture, and other vegetation land uses. Land cover outcomes are defined at a 5km radius distance from the mine, while pollution and local GDP are defined at that of a 25km radius. This is because air pollution travels (Wang, 2017) and GDP effects would be generated at nearby population centers, cities, and in the surrounding rural hinterlands (Aragón and Rud, 2013). In contrast, land cover changes are likely to materialize in the area directly around the mine.

Our primary specifications impose sample restrictions that depend on the outcome of interest. For mine output and PM2.5 air pollution, we use the output sample – the sample of mine-years for which output is not missing. This is by definition for output, and because PM2.5 emissions are directly linked to production (Graff Zivin and Neidell, 2012). For land cover outcomes, we use the sample of ever-producing mines on the assumption that while a mine may not necessarily need to be currently producing to generate a durable shift in land use, it is unlikely to generate such shifts without ever producing at all. For GDP, we use the full sample of mine-years for which ownership is available, since the local economic effects of mining may well materialize even in the exploration and discovery phases of the asset lifecycle (Cust and Mihalyi, 2017).

4.2 Heterogeneous Effects by Governance

We hypothesize that multinational-owned mines might have an advantage in well-governed countries with low levels of corruption and strong rule of law, where highly productive firms can flourish. However, in contexts where corruption is rife, local firms may have political advantages that offset lower technical efficiency. We therefore interact our local ownership variable with measures of national institutional quality from the World Bank's Worldwide Governance Indicators (WGI). To test this hypothesis, we estimate the following interaction regression:

$$y_{itmc} = \alpha + \beta_1 locshare_{it} + \beta_2 locshare_{it} \times gov_{c0} + \zeta_{tc} + \delta_{tm} + \gamma_i + \varepsilon_{itmc} \quad (2)$$

Where gov_{c0} is the quality of governance in the host country where mine i is located. Since the WGI variables are standardized around 0, β_1 gives the impact of localization for a country at the average level of governance, while β_2 can be interpreted as the change in the impact of localization for a one-unit (one SD) increase in governance quality. The level of gov_{c0} is subsumed by the country-year fixed effect. To fully saturate the specification, all models include interactions between gov_{c0} and the fixed effects ζ_{tc} and δ_{tm}. We measure institutional quality using the World Bank WGI, taking the simple country-level average of six sub-components of this index (voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption). Since governance is time-varying and may evolve in response to localization and mining output, we hold these variables fixed at their values in the initial year of the data (2000). For robustness, we also show interaction model results with individual sub-components of the index.

4.3 Event-study

Finally, in an alternative but complementary identification strategy, we look at the evolution of outcomes around discrete divestment events in an event-study framework. This allows us to estimate the dynamic effects of local ownership, as well as pre-trends, testing whether the outcomes of assets divested from multinational to local firms are likely to have evolved similarly in the absence of divestment.

However, traditional event-study methods present complications in our context, since assets may experience several changes in ownership during the sample period, and in multiple directions (i.e., either from MNC to local, local to MNC, MNC to MNC, or local to local). To simplify, we define the event year as the first year in our sample in which a mine has any equity participation by a local firm. Using this definition, we estimate a full-saturated event-study regression of the form:

$$y_{itmc} = \alpha + \sum_{\tau=-7}^{20} \beta_\tau local_{i\tau} + \zeta_{tc} + \delta_{tm} + \gamma_i + \varepsilon_{itmc} \tag{3}$$

Where β_τ are the coefficients for leads and lags of the first year in which a local firm takes ownership of the asset i, represented in event time τ. For heterogeneity analysis, we estimate this model separately for countries with high and low governance (above and below $gov_{c0} = 0$).

While this strategy allows us to estimate pre-trends and dynamic effects of asset divestment to local firms, it has several shortcomings. First, it does not allow for estimating the effects of transitions that take place after the first localization in our sample, which may or may represent the average treatment effect. Second, dynamic estimates for a large τ may be unreliable as the treatment status can change later in the panel – although dropping these switchers would affect the composition of the sample – introducing additional issues. Finally, the model is estimated with a two-way fixed effects structure, and so is vulnerable to the "negative weight" challenges that arise in these models (Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021). To solve this, as a robustness test we also estimate stacked models that allow for more direct control over the composition of the comparison group. Still, the event studies are useful for a graphical illustration of the effects of divestment. In general, we find that the event-study results are consistent with the regression-based fixed effects estimates from equations (1) and (2).

4.4 Identification and Measurement Challenges

We test for the robustness of the main results to several potential identification and measurement challenges, including *i*) different combinations of fixed effects and time-varying trends at smaller geographic units, *ii*) using actual vs. predicted output data, *iii*) using more detailed information on higher-level ownership structure to construct the treatment variable, and *iv*) using a binary variable for any local participation instead of the local share, *v*) using different distance rings spanning from 5km to up to 25km to define spatial outcomes, *vi*) using a stacked model, *vii*) using sub-indices of governance for heterogeneity, *viii*) using dominant shareholdings to define localization. We discuss these robustness tests in more detail in Section 8.

The core identification challenge inherent in our approach is that the timing of a divestment may be endogenous. In particular, it is plausible that multinationals divest assets to local firms as the assets trend downward in productivity. For example, firms may follow a cutoff strategy and divest when the net present value of the asset's stream of future profits falls below a given threshold. Furthermore, if local firms do have an underlying cost advantage in institutionally weak markets, this, in fact, *heightens* the identification challenge, because the most positively selected local firms should be willing to buy exactly these downward trending assets in politically difficult markets, given their comparative advantage. As such, this form of bias could generate spurious findings of not just average multinational advantage, but also differential local advantage in weak governance environments.

The event-study regressions estimated in equation (3) can help allay some of these concerns by showing that the pre-trends in output are reasonably parallel, leading up to a divestment. However, event studies still cannot fully rule out this form of bias, since some dimensions of profitability will be unobserved.[8] As such, we argue that the timing of the divestment is quasi-random. The divestments in our sample are subject to a wide array of idiosyncratic, country-specific processes, rules, and regulations, and while multinationals may select the assets they target for divestment, they are unlikely to be able to manipulate the timing to correspond precisely with changes in profitability.

To bolster this claim, we analyze the point at which assets are divested relative to their lifecycle. If mines are sold to local firms as profitability falls, they should consistently be divested at older ages, where reserves are closer to exhaustion and the net present value of the mine is lower. We test whether this is the case in Appendix Figure A4, which plots the distribution of mine ages at divestment for divested mines, overlaid with the ages of all mines (both local and multinational) in the sample. The plot shows first that local and multinational mines have almost identical age distributions. As for asset sales, mines tend to be divested at slightly higher ages than average (9.2 vs. 8.8), although the difference is not quantitatively meaningful (4.5%), and the distributions appear quite similar. Overall, this suggests that multinational firms do not systematically divest assets at older ages.

5 Main Results

5.1 Localization and Mine Output

We begin by estimating the relationship between local ownership and mine output. Table 1 shows regression results for variants of equation (1) with increasingly stringent fixed effects specifications. We build up to the full specification in column (7), beginning with no fixed effects at all in column (1). In this bivariate unconditional model, there is actually a *positive* correlation between local ownership and asset production. This likely reflects selection into larger assets by local firms. Locals are likely to obtain the largest, most important national assets, either through explicit preferences in contracting procedures, super political connec-

[8]This is a particular challenge given we do not observe costs in our data.

tions, or state-owned firms. This positive association persists in (2) when only year fixed effects, though the magnitude reduces slightly.

Table 1: Localization and mine output

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local share	0.557***	0.427***	-0.111***	-0.091**	-0.076**	-0.108***	-0.083**
	[0.07]	[0.08]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Observations	51297	51297	51297	51297	51297	51297	51297
Mine FE	N	N	Y	Y	Y	Y	Y
Year FE	N	Y	N	Y	N	N	N
Country-Year FE	N	N	N	N	Y	N	Y
Commodity-Year FE	N	N	N	N	N	Y	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

However, the positive relationship flips completely in column (3) and becomes negative and significant when we add the mine fixed effects. In all specifications with mine fixed effects (3)-(7), the relationship remains negative and significant. This implies that mine-level time-invariant heterogeneity is important, likely reflecting local firms' selection into larger asset sizes. Columns (3)-(7) imply that switching from fully multinational to fully local ownership reduces output by approximately 7.6-11.1%, an economically meaningful magnitude. This estimate is significant at the 1, 5, or 10% level in every specification, and the results are remarkably robust to the inclusion of various different combinations of fixed effects: mine FE only in (3), two-way FEs in (4), country-year FE in (5), commodity-year FE in (6), and both country and commodity-year in (7), our most exacting specification. Column (7), our preferred specification, yields an estimate of 8.3%, near the midpoint of the range of estimates.

One issue with estimates in Table 1 is that local ownership is measured using first-level owners of a given asset. However, firms registered as local in a given jurisdiction may actually be subsidiaries for multinationals. These assets, therefore, may be less local than they appear. In the extreme case of a wholly-owned subsidiary, the local firm is effectively a multinational with a local address. We view this as a uni-directional form of measurement error – some assets are wrongly measured as having a higher local share than they actually do. If multinational firms truly have an average output advantage, then re-classifying these firms should increase the effect size by raising the signal of the independent variable.

Using data on second-level ownership from S&P, we estimate the 'effective' share of local ownership at the mine level by accounting for subsidiary relationships and then use this as the main independent variable. We construct this parent local share by multiplying the share of the mine owned by a given local firm by the share of the firm not owned by a multinational, summing across owners in a mine.[9]

Table 2: Local ownership and output by ownership structure

Outcome	Log mine output							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent Local Share	-0.191***	-0.179***	-0.136***	-0.138***	-0.217***	-0.223***	-0.157***	-0.152***
	[0.04]	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]
Local Share					0.033	0.058	0.028	0.019
					[0.05]	[0.05]	[0.05]	[0.05]
Observations	50742	50742	50126	50025	50742	50742	50126	50025
Year FE	N	Y	N	N	N	Y	N	N
Mine FE	Y	Y	Y	Y	Y	Y	Y	Y
Country-Year FE	N	N	Y	Y	N	N	Y	Y
Commodity-Year FE	N	N	N	Y	N	N	N	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Parent local share is measured as the share of the mine owned by local firms, adjusted for the share of equity in local firms held by multinational parents. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 2 shows the results. Columns (1)-(4) include the various combinations of fixed effects, all conditional on mine-level heterogeneity. The quantitative magnitudes of the multinational output advantage rise substantially, now between 13.6-19.1%, all significant at 1%. In the preferred specification in (4), the effect is 13.8%, 66% larger than column (7) of Table 1. Solving the measurement error problem by using second-level ownership measures leads to strong estimates of the multinational advantage, lending more credence to the estimates. Finally, columns (5)-(8) include *both* local share measures simultaneously, and show that the most meaningful variation is from the measurement of local participation that accounts for multinational subsidiaries. This strengthens the identification argument, since a refinement of the criteria used to measure the treatment now produces even stronger results.

Not all firms are created equal, and patterns of selection on firm size may differ for lo-

[9] For a numerical example, say mine i is split between local firm j, which owns 50%, and multinational k, which owns 50%. However, another multinational, firm l, has an interest of 30% in firm j. According to the first-level definition, this asset is 50% local. Under the second-level definition, the asset is only $(1 - 0.3) \times 0.5 = 0.35$, or 35% local.

cal and multinational firms. Multinationals may be large because they are more productive, heightening the multinational advantage relative to similarly sized local firms. Instead, local firms may be large because of political connections and/or preferential access to state subsidies, credit, or monopoly rents. Table 3, we test whether the multinational advantage differs by firm size and whether the output-firm size gradient varies by local ownership.

We measure firm size as the number of mining properties owned by a given firm across the world in a given year, and collapse this variable to the mine level by taking the maximum firm size among all first-level owners.[10] We then interact this variable with local share in our primary fixed effects specification. Table 3 shows the results for four different combinations of fixed effects. The estimates reveal that size matters for the multinational advantage. Across all specifications, the local disadvantage (or multinational advantage) is significantly increasing in firm size – larger multinationals have a greater output advantage. More interestingly, however, the relationship between firm size and output in the strictly multinational sample (when $locsh = 0$) is positive and significant, as seen from the coefficient on firm size, which ranges from 0.016-0.022 (Row (2)). Instead, the effects are zero or negative for fully locally-owned assets, given by the sum of coefficients on $firmsize + firmsize \times localshare$. This suggests that, as hypothesized, there is an asymmetric relationship between size and asset productivity for locals and multinationals: large multinationals are positively selected, while large local firms are negatively selected.

5.2 Localization and Other Outcomes

Localization policies are not justified only, or even primarily – on the basis of increased output. Typically, policymakers care about other outcomes, including the environmental, economic, and social spillovers from mining production, and may be willing to trade off losses in production against these other benefits. We estimate the impact of local ownership on local environmental and economic outcomes in Table A18 using the specification with mine and commodity-year fixed effects. As explained in Section 4, each model uses a different subsample of the data, depending on its relevance to the outcome: either the full sample of mines for which we have ownership information, or the sample of currently producing mines, or the mines that have ever-produced in our sample period. The table contains the mean of

[10]That is, we measure the firm size of the largest firm among the mine owners.

Table 3: Localization and mine output by firm size

Outcome	Log mine output			
	(1)	(2)	(3)	(4)
Local share	-0.037	-0.020	-0.034	-0.037
	[0.04]	[0.04]	[0.04]	[0.04]
Firm size	0.022***	0.016***	0.016***	0.016***
	[0.01]	[0.01]	[0.01]	[0.01]
Local share × Firm size	-0.032***	-0.036***	-0.016*	-0.018**
	[0.01]	[0.01]	[0.01]	[0.01]
Observations	49184	49184	48568	48467
Year FE	N	Y	N	N
Mine FE	Y	Y	Y	Y
Country-Year FE	N	N	Y	Y
Commodity-Year FE	N	N	N	Y

Notes: Standard errors in brackets clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Firm size is measured as the number of properties owned by the largest firm among the first-level mine owners. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

the dependent variable in the fully multinational sample for reference.

Table 4: Local ownership and economic and environmental outcomes

Outcome	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.009***	0.202**	0.094	-0.284***	-0.159*	0.199***
	[0.002]	[0.103]	[0.104]	[0.090]	[0.088]	[0.075]
Mine FE	Y	Y	Y	Y	Y	Y
Commodity-Year FE	Y	Y	Y	Y	Y	Y
Mean Dep Var	6.15	16.20	47.75	24.35	40.47	1.57
Observations	306376	51098	95366	85710	112718	116202

Notes: Standard errors in brackets are clustered at the mine level. Samples used for each outcome are: for log GDP (1), the full sample, for PM2.5 (2) the sample of producing mines, and for land cover outcomes (3)-(6), the sample of mines that ever produced. Samples in (3)-(5) are subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Column (1) estimates the impact of localization on local economic activity, measured as GDP predicted from satellite images of nighttime luminosity (night lights). Moving from fully multinational to fully local ownership increases local GDP by roughly 1% on average annually, significant at 1%. While this effect size is not particularly large in magnitude[11], it is nonetheless notable given that the local firms produce less output, and output should determine the extent of local resource booms[12]. This suggests that local firms employ different modes of production – perhaps through greater employment of local labor, use of local suppliers, and other backward linkages. Using Demographic and Health Survey (DHS) data on non-agricultural employment around mines, we provide evidence in support of this channel in Section 7. Since there may be doubts regarding the reliability of night lights-based measures of economic activity, we further validate our findings by regressing average DHS household wealth indices within 20km of mines on local ownership, controlling for commodity-year and country-year fixed effects. Results reported in Appendix Table A14 confirm that local ownership is significantly postively associated with household wealth.[13]

Column (2) estimates the relationship between local ownership and the environmental externalities of mining. We proxy these externalities with local air pollution, measured with fine particulate matter (PM2.5) emissions, which generally increases in mining activity. Localization increases PM2.5 concentration by 0.2 $\mu g/m^3$ in the sample of producing mines. This is a small but non-negligible effect, amounting to a roughly 1.3% increase in concentration on the control group mean. Again, the result is notable given the decline in output and the positive correlation between mining output and air pollution, as shown in Aragón and Rud (2015) and in Figure A7, in the right panel. There are two potential explanations for the increase in the level of PM2.5, and both are likely contributors. First, it could be driven by the rising GDP, as well as accompanying positive effects on urbanization in column (6). Second, local firms may employ dirtier technology, invest less in pollution abatement, and potentially be more able to evade regulation (Duflo et al., 2013; Rexer, 2024). It seems more likely to be the second, because the PM2.5 increase is only observed in the output sample, but falls to zero in the full

[11] Though dynamic estimates in Figure 6 show that it rises to 5% after 20 in years in weak states.

[12] see, for e.g., Aragón and Rud (2013), and evidence in the left panel of Appendix Figure A7, which shows a strong correlation between mine output and local GDP in our sample, conditional upon mine and commodity-by-year fixed effects.

[13] Demographic and Household Survey data are only available for a subset of developing countries. Furthermore, there are only a limited number of survey results that intersect with 20km radii around mines, resulting in an average of 1.6 DHS observations per mine. Due to these limitations, we cannot include mine fixed effects in regressions using DHS outcomes. These results should thus be interpreted as supporting evidence due to their cross-sectional nature.

sample and the ever-produced sample (see Appendix Tables A8 and A9). This suggests air pollution effects are specifically tied to production technology.

Columns (3)-(6) estimate changes in land use around localized mines. We observe no change in the forest cover (3). However, the area devoted to crop cover (4) falls by 0.3 percentage points, or 1.2% of the control group mean. Similarly, the area under other types of vegetation cover falls by 0.4%. This land area is reallocated to urban land cover, which rises by 0.2 percentage points, or 12.7% of the control group mean. Localization produces a substitution away from farming and other vegetation – but not forested area – and towards urbanization. These results are certainly consistent with the increase in GDP and PM2.5 in (1) and (2). Taken together, the set of results suggest a rise in local economic activity and a shift away from agriculture, even despite the lower production of local firms.

6 Heterogeneity: The Role of Governance

Local firms produce roughly 9% less after the takeover of multinational assets. However, we hypothesize that local firms may have distinct advantages in markets with weak institutions. In these contexts, local firms can better exploit institutional weakness to strike a bargain with corrupt political elites. These bargains may allow for a preferential access to inputs, evasion of burdensome regulations, and protection from resource-related violence (Rexer, 2024). This corruption advantage may be driven by better political networks, lower reputational or legal costs of engaging in corruption, or other mechanisms.

We present the results of estimating equation (2) in Table 5. As in the case before, we build the specification from the unconditional form in Column (1) to the most exacting form with mine, commodity-year, and country-year fixed effects in Column (7). All specifications include interactions between the fixed effects and the host country governance index. Across all specifications, the multinational output advantage rises as governance quality improves: A 1 SD increase in the host-country governance quality increases multinational advantage by 4.3-17.2%, depending on the specification, with 5 out of 7 estimates being significant at the 5% level. Quantitatively, the regression results reveal two things. First, in Column (7) for a country with a governance score of zero (that is, at the average level of governance), there is no statistically significant multinational advantage. For countries at a governance level 1.5

Table 5: Localization and mine output: heterogeneity by governance

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local share	0.593***	0.455***	-0.089**	-0.050	-0.036	-0.066	-0.043
	[0.08]	[0.08]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Local share × Governance index (2000)	-0.172**	-0.098	-0.043	-0.083**	-0.074**	-0.083**	-0.082**
	[0.08]	[0.08]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Observations	51261	51261	51261	51261	51261	51261	51261
Mine FE	N	N	Y	Y	Y	Y	Y
Year FE	N	Y	N	Y	N	N	N
Country-Year FE	N	N	N	N	Y	N	Y
Commodity-Year FE	N	N	N	N	N	Y	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

SD below the average[14], there is a roughly 8% local advantage, though it is not statistically significant[15]. Table A12 estimates the interaction effects with sub-indices of the Worldwide Governance Indicators, showing similar effects on each individual indicator.

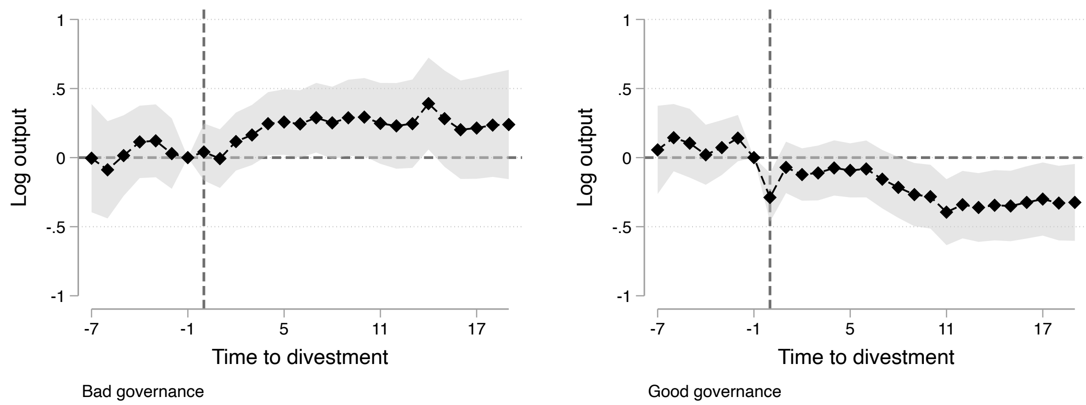
Figure 4 estimates the event-study equation separately for poorly (left) and well (right) governed countries, defined as those with governance scores below and above zero. Consistent with the regression results, the event-study estimates reveal a clear drop in output following the first local takeover of an asset in better-governed countries. In contrast, there is a clear and gradual *increase* in output following local takeover in poorly governed states. Both event studies exhibit parallel pre-trends, suggesting that divestments do not simply follow trends in output, conditional on the fixed effects. Furthermore, in both cases the effect is remarkably sustained, with output remaining elevated or depressed for up to 20 years following divestment.

Quantitatively, output is up to 35% lower 20 years after a divestment in a well-governed country. In contrast, it remains elevated by nearly 27% 20 years after a divestment in a poorly governed country. These strikingly divergent dynamics reveal fundamental differences in how local and multinational firms compete in different governance environments. The dy-

[14] In our sample, this includes some of the most poorly governed countries in the world: the Democratic Republic of Congo, Afghanistan, Iraq, and Myanmar.

[15] Another implication of our hypothesis is that joint ventures should perform particularly well, since they combine the technology and productivity advantages of multinationals with the political advantages of locals. We find evidence for this proposition in Appendix Table A11.

Figure 4: Event-study: output

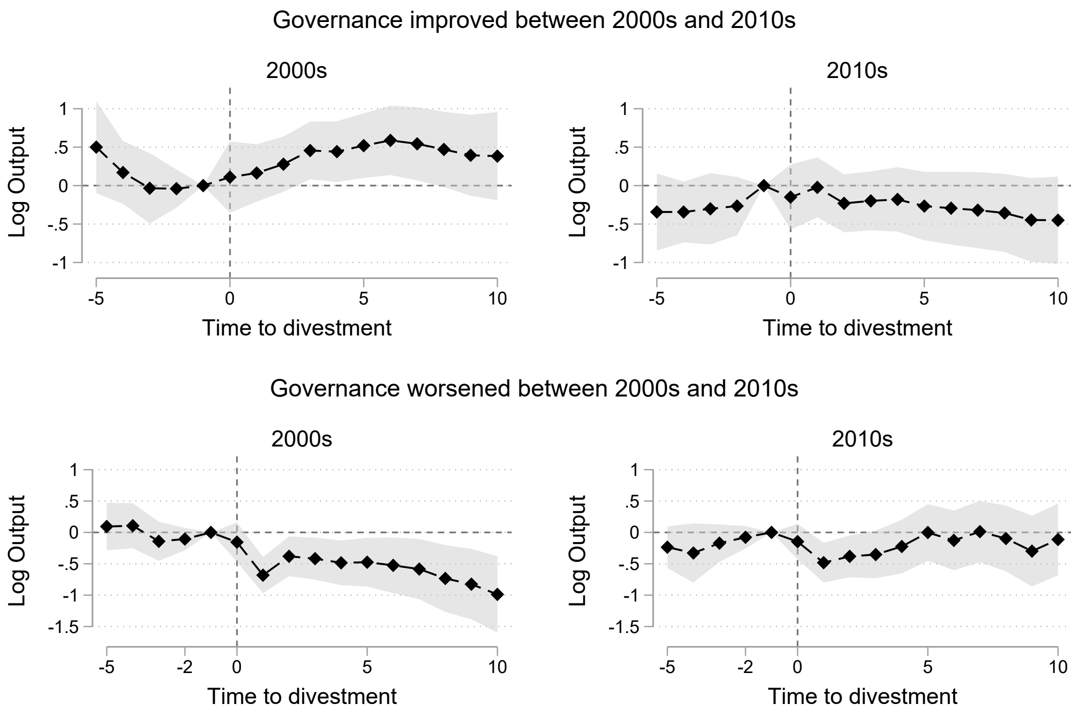


Note: Figure shows coefficients from event-study regressions of log mine output on leads and lags of divestment as well as property and year-by-commodity fixed effects. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

namics of the event-studies are a helpful complement to the regressions, which give only the time-averaged effects. As we can see, this time averaging effectively underestimates the cumulative dynamic effect of divestment in both directions.

Are these relative output advantages in good and bad governance settings dynamic? If good governance conveys a multinational advantage and weak governance conveys a local advantage, then improvement in governance over time should shift the advantage toward multinationals, and worsening governance should shift the advantage toward locals. To explore these dynamics, we calculate the change in each country's WGI governance index between the 2000s and 2010s and identify countries in the top quartile (e.g., Rwanda) and bottom quartile (e.g., Syria) of governance change over this period. We then estimate decade-specific output event studies for each subsample of countries. Results, reported in Figure 5, reveal dynamic changes in local versus multinational output advantage over time. In countries where governance conditions were poor in the 2000s, there is a clear local advantage (i.e., mine output increased following localization). After governance conditions improved substantially, this local advantage disappears in the 2010s and a weak multinational advantage emerges. In contrast, in countries where governance conditions were moderate or good in the 2000s, there is a clear multinational advantage (i.e., mine output decreased significantly following localization). After governance conditions worsened, this multinational advantage attenuates substantially.

Figure 5: Event-study: dynamic multinational/local advantage



Note: Figure shows coefficients from event-study regressions of log mine output on leads and lags of divestment as well as property and year-by-commodity fixed effects. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. The top two sub-figures show results from event studies estimated on the subsample of countries where change in the WGI governance index between the 2000s and 2010s was in the top quartile globally. Effects of mine localization are estimated separately for localizations that occurred in the 2000s (left) and 2010s (right). The bottom two sub-figures show analogous event studies for the subsample of countries where change in the WGI governance index between the 2000s and 2010s was in the bottom quartile globally.

Our theory of comparative advantage with respect to corrupt activity does not only apply to the distinction between locals and multinationals. Even within the set of multinationals, there may be some that are better suited to thrive amidst poor governance. We argue that multinational firms originating in poor governance environments are likely to be able to mimic the local advantage and behave "like locals" when operating in weak institutional environments. They are more likely to face weaker anti-corruption regulations in their home countries, face less reputational damage for bad behavior, and retain tacit knowledge of how to optimize for corruption, providing them a comparative advantage in corruption vis a vis their multinational competitors from better-governed home-countries. Therefore, within MNCs, we should see a performance gradient depending on the interaction between home and host-country institutional strength.

We test this proposition in Table 6, which interacts the home and host-country governance indices, measured in the year 2000, for the sample of multinationally-owned assets. The home country governance index is measured for the largest shareholder of the mine. The host-governance term is collinear in all models with mine fixed effects, while the home governance term – and its interactions with host governance – varies with changes in ownership. The interaction term is positive and significant in all specifications, implying that firms from better-governed countries do better in better-governed markets. However, the flip-side of this positive selection, of course, is that that in poorly-governed countries, multinationals from poorly-governed places hold an advantage. For example, in the preferred specification of Column (6), the estimates imply that in a host country 1 SD below the mean in governance, a 1 SD improvement in home-governance leads to an 11.8% output disadvantage. This relationship is made clearer in Appendix Figure A16, which plots the predicted effect of home-country governance by levels of host-country governance, for both a linear specification (left) and a nonlinear kernel regression (right), conditional on mine and year fixed effects. The results make it clear that the advantage of being from a "good" country is concentrated only in other good countries, and evaporates entirely – rather even reverses – in bad countries.

We test whether local firms affect socioeconomic and environmental outcomes differentially in poorly governed countries. The results in Table 7 estimate the interaction models of equation 2 with the various different spatial outcomes of Table A18. Each model includes mine and commodity-year fixed effects, the latter of which is interacted with the country-level governance index measured in the year 2000.

Column (1) contains the results for local GDP. For the average country, GDP rises by 0.7%, and this effect size falls by roughly 71% for each SD increase in governance quality. For countries that are 1.5 SD below, the effect is 1.45% on average annually – significant at 5%, while for those that are 1.5 SD above average, it is effectively zero. This contrast is borne out clearly

Table 6: Mine output and governance interactions for multinational firms

Outcome	Log mine output					
	(1)	(2)	(3)	(4)	(5)	(6)
Home governance index	0.166**	0.176**	0.055	0.061	0.003	0.012
	[0.08]	[0.08]	[0.07]	[0.07]	[0.06]	[0.07]
Host governance index × Home governance index	0.171**	0.161**	0.100*	0.113**	0.113**	0.129**
	[0.08]	[0.08]	[0.06]	[0.06]	[0.06]	[0.06]
Observations	11223	11223	11016	11016	10580	10468
Year FE	N	Y	N	Y	N	N
Mine FE	N	N	Y	Y	Y	Y
Country-Year FE	N	N	N	N	Y	Y
Commodity-Year FE	N	N	N	N	N	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all solely multinational mine-years producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Governance index is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

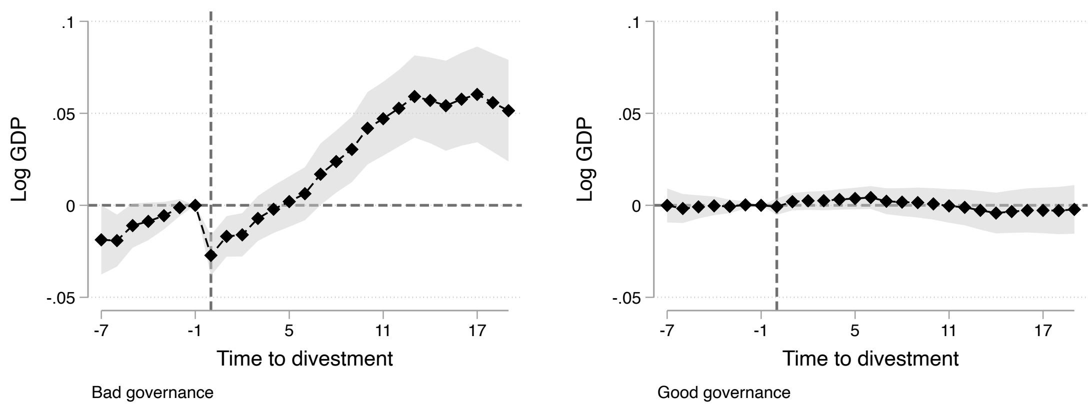
Table 7: Local ownership and economic and environmental outcomes: heterogeneity by governance

Outcome	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.007**	0.210	0.155	-0.279***	-0.235**	0.198**
	(0.004)	(0.145)	(0.137)	(0.104)	(0.114)	(0.101)
Local share × Governance index (2000)	-0.005**	-0.155	-0.107	0.156*	0.159*	-0.141**
	(0.002)	(0.108)	(0.109)	(0.084)	(0.086)	(0.068)
Observations	306376	51098	95366	85710	112718	116202
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets are clustered at the mine level. Samples used for each outcome are: for log GDP (1), the full sample, for PM2.5 (2) the sample of producing mines, and for land cover outcomes (3)-(6), the sample of mines that ever produced. Samples in (3)-(5) are subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

in the event-study plot in Figure 6. The plot shows a small initial dip in GDP in poorly governed countries following a divestment to local firms, likely reflecting a pause or disruption in mining activity during the ownership transition. However, this is followed by a steady increase in the local economic activity, ultimately resulting in a 5% economic gain 15-20 years following divestment, a quantitatively meaningful change. In contrast, we observe no change in the local GDP following localization in well-governed markets. Both series exhibit reasonably parallel pre-trends. We validate these night lights-based GDP effects by regressing average DHS household wealth indices on local ownership and the local-governance interaction. Results reported in Appendix Table A15 show a stable negative effect of the interaction between local ownership and governance, confirming that household wealth is relatively higher around locally-owned mines in weak governance areas.

Figure 6: Event-study: local economic activity

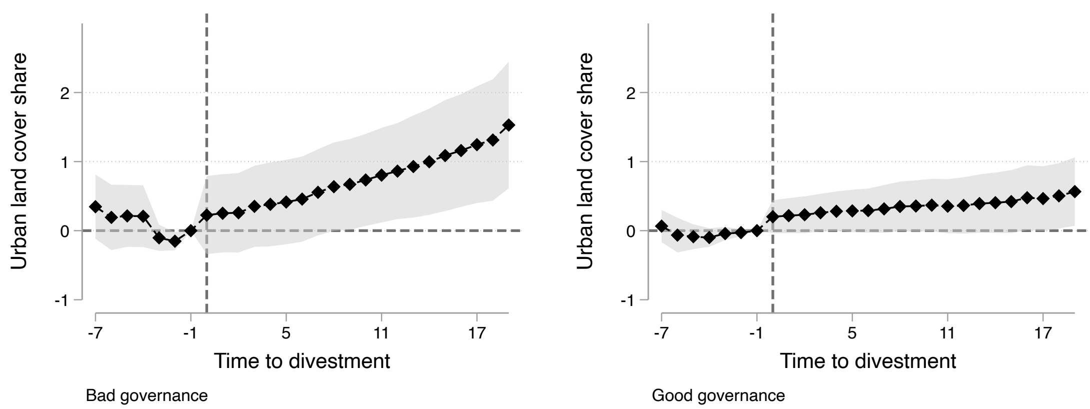


Note: Figure shows coefficients from event-study regressions of log local GDP on leads and lags of divestment as well as property and year-by-commodity fixed effects. GDP is predicted by night lights luminosity and measured within 25 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Column (2) estimates the differential impacts on air pollution. Though the estimates are not significant, they do move in the same direction as the GDP estimates: localization increases air pollution in more corrupt countries but not in better-governed ones. However, the evidence from the event-study plots in Appendix Figure A8 is somewhat inconclusive. Column (3) is similarly insignificant, consistent with no clear impact of divestment on deforestation. Similarly, in Appendix Figure A9, forest cover is flat before and after divestment.

However, land cover shares devoted to crops (Column (4)) and urban built area (Column (6)) change substantially in response to localization, and these changes are differential with respect to host-country governance. In the worst-governed countries – 1.5 SD below the mean, crop cover loss rises to 0.5 p.p. under full local ownership, or 2.1% of the control group mean, significant at the 5% level. In contrast, there is no effect of localization on crop cover in countries 1.5 SD above the mean in governance quality. The pattern reverses for urbanization: for countries that are 1.5 SD below the mean governance level, shifting to local ownership induces a 0.41 p.p. increase in urbanization, equivalent to a sizable 26.1% increase on the control group mean. In contrast, the effect for well-governed countries at 1.5 SD above zero is nil. This reallocation of land from cropping to urban uses induced by localization – suggestive of a structural change – is concentrated primarily in the weakest states. These results are confirmed in the event-study plots of Figures 7 and 8, which show urban and cropped land area cover, respectively. The plots are almost perfect inverses between the two covered areas, suggesting a nearly one-to-one substitution between cropped and urban areas. Both plots demonstrate parallel pre-trends, followed by an approximately linear growth (or decline) in land cover following divestment in poorly governed countries. In better-governed countries, in contrast, there is only a small and insignificant change in land cover.

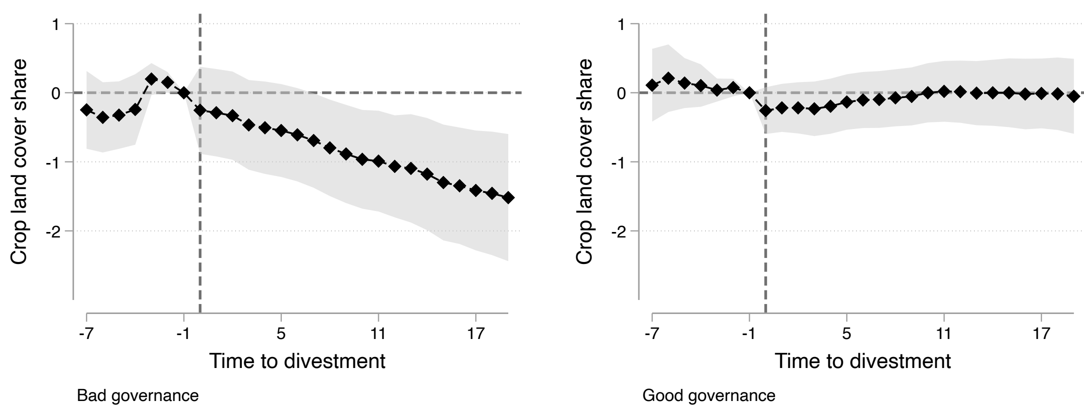
Figure 7: Event-study: Urbanization



Note: Figure shows coefficients from event-study regressions of urban land cover share on leads and lags of divestment as well as property and year-by-commodity fixed effects. Urban land cover share is predicted by satellite images and measured within 5 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Finally, we assess whether the local advantage in poor governance settings comes from local firms' advantage in overcoming governance challenges *per se* (i.e., dealing with corrupt officials or institutional voids) versus overcoming security risks from conflict. To do so, we re-estimate the production event study along the dimension of high/low country-level conflict, defined by falling above or below the 75th percentile of violent conflict deaths per capita between 1989-2022. Event study results, reported in Appendix Figure A10, show a clear multinational production advantage in low conflict settings, and no effects of localization on production in high-conflict settings. This suggests that the presence of violent conflict erases multinationals' technological and scale advantages relative to locals, but does not convey a measurable local advantage, as poor local governance conditions do. We conclude from this that local institutional weaknesses and corruption present greater obstacles for multinationals than do security challenges. This could be because poor governance requires tacit local knowledge and connections, while security challenges may be addressed through less nuanced means.

Figure 8: Event-study: Crop cover



Note: Figure shows coefficients from event-study regressions of urban land cover share on leads and lags of divestment as well as property and year-by-commodity fixed effects. Urban land cover share is predicted by satellite images and measured within 5 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

7 Labor Market Effects: Structural Transformation

The results in Table A18 imply a shift in land use from agriculture to urbanization in response to a divestment; this pattern is particularly pronounced in poor and weak states (Figures 7 and 8). One potential mechanism driving this shift is a structural transformation in the labor market. Local firms may employ different production processes than multinationals, generating more linkages to local labor markets. In particular, local firms may directly employ more local labor, rather than importing human capital from abroad. They may also utilize more labor intensive production technologies, employing more manpower for any given composition of foreign and local labor. Or, they may source more local inputs, generating more backward linkages to local labor markets. Any of these technological and supply chain differences might trigger structural transformation. At the same time, it is also possible that the local output advantage in weak states, along with the concomitantly larger local resource booms that it generates (Figure 6), leads to a rising demand for local services, triggering structural transformation.

In either case, we hypothesize that the observed land use reallocation is driven by a structural transformation in the labor market, rather than simply by the physical footprint of mining activities. We test this hypothesis using the DHS data on sectoral employment rates. In particular, for mine i at time t producing mineral m in country c, we estimate the following fixed effects regression:

$$s_{itmc} = \alpha + \beta local_{it} + \zeta_{tc} + \delta_{tm} + \varepsilon_{itmc} \quad (4)$$

Standard errors are clustered at the mine level. We define two outcome variables – s_{itmc}: the share of the DHS sample respondents within 20 kilometers of the mine in a given year (DHS round) t working on i) agricultural or home-based work, or ii) non-agricultural work outside home.[16] All shares s are adjusted using the DHS sample weights. Our sample is 2,889 unique mines and 4,677 mine-years for which we are able to intersect the DHS clusters with employment data. Note that our regression specification differs in two important ways from our previous equations. First, we remove the mine fixed effects γ_i. We do this by necessity,

[16] By construction, the unemployment rate, the non-agricultural employment rate, and the agricultural employment rate sum to 1.

since our restricted sample contains only 1.6 panel observations per unique mine, such that the unit fixed effects will absorb nearly all meaningful variations in the outcome. Therefore, this analysis should be considered more speculative and correlational than our main analysis, as it exploits cross-sectional variation. Second, we use the indicator variable *local* to measure the localization treatment, instead of the continuous variable *locshare*. This is because *locshare* does not add significant information in this subsample – only 10% of the data contains local shares interior to 0 and 1.[17]

Table 8: Localization and employment outcomes

Outcome	Employment rate				
	(1)	(2)	(3)	(4)	(5)
Panel A: Agricultural employment					
Local	-0.137***	-0.114***	-0.085***	-0.038***	-0.030***
	(0.011)	(0.011)	(0.011)	(0.009)	(0.009)
Mean Dep Var	0.35	0.35	0.35	0.35	0.35
Observations	4677	4677	4677	4677	4677
R^2	0.06	0.15	0.29	0.51	0.57
Panel B: Non-agricultural employment					
Local	0.036***	0.047***	0.042***	0.025***	0.022***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Mean Dep Var	0.41	0.41	0.41	0.41	0.41
Observations	4677	4677	4677	4677	4677
R^2	0.01	0.07	0.22	0.32	0.42
Year FE	No	Yes	No	No	No
Commodity-Year FE	No	No	Yes	No	Yes
Country-Year FE	No	No	No	Yes	Yes

Notes: Standard errors in brackets clustered at the mine level. Employment rate in agriculture / non-agriculture is measured as the share of working-age DHS respondents employed in each sector. Local is measured as an indicator variable equaling one if the mine has any first-level equity participation by firms headquartered in the producing country. Sample is all mine-years for which DHS employment data is available within 20 kilometers of the mine location. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

The results of this estimation are presented in Table 8. Columns (1)-(5) build up the specification, from the unconditional bivariate model up to the model that includes both the commodity-year and country-year fixed effects. Panel A shows results for the agricultural

[17] However, for completeness, we include results for the local share variable in Appendix Table **??**.

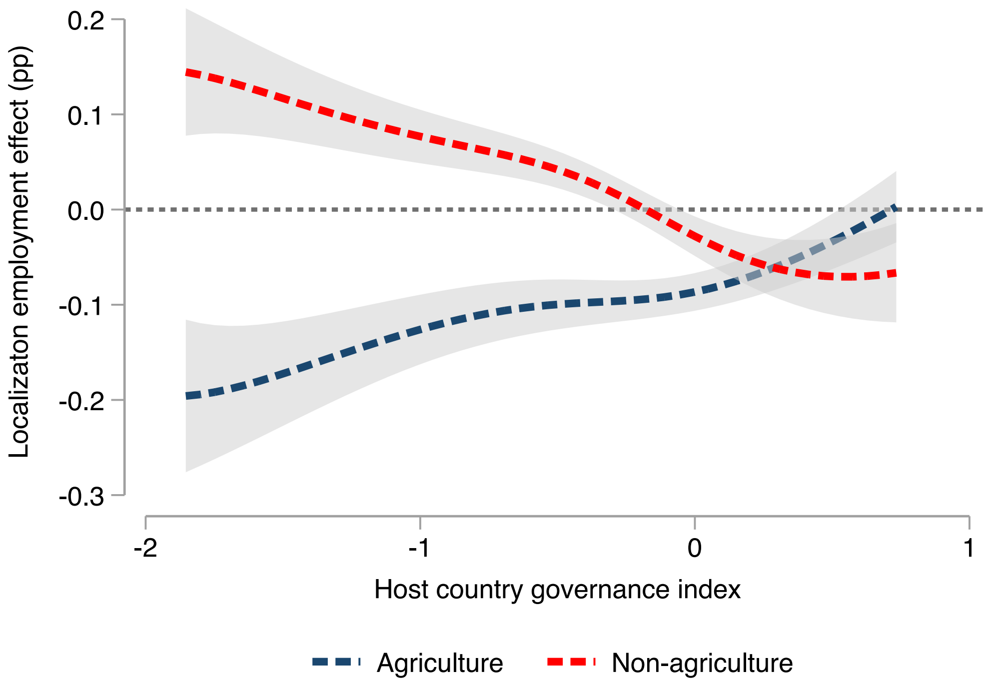
employment rate outcome. Across all models, agricultural employment is strongly and significantly negatively correlated with local ownership at the mine-level. Quantitatively, any local participation in a mine is associated with a 3-13.7 p.p. reduction in the agricultural employment rate. In our preferred, most rigorous specification (column 5), we observe a 3 p.p. reduction, equivalent to an 8.5% reduction on the control mean, significant at 1%.

Panel B, instead, estimates the relationship with non-agricultural employment. Here, the impact flips. Localization of mining activity is associated with a robust positive increase in non-agricultural employment of 2.2-4.7 p.p., with all estimates significant at 1%. In the most rigorous specification of Columnn (5), the 2.2 p.p. increase in non-agricultural employment is equivalent to the 5.4% increase on the control group mean. Overall, as predicted by the structural transformation hypothesis, we observe that a divestment to local firms triggers a clear shift out of agricultural and household-based work, and into off-farm employment activity. This suggests that local firms' production processes exhibit stronger linkages to local labor markets, and that these labor market dynamics underlie the land use changes observed in Sections 5 and 6.

Lastly, as throughout this paper, we test for governance heterogeneity in these employment effects. We are unable to replicate the split sample event-study approach given limited within-mine panel observations in the DHS sample. Instead, we test both linear and non-linear interaction models using cross-sectional variation. Figure 9 plots the predicted relationship between local ownership and labor market outcomes at each point along the distribution of host-country governance – where the predicted effects are estimated using an interacted kernel regression. For simplicity, no controls or fixed effects are included in this nonparametric specification, however, the linear interaction model with the full suite of interacted fixed effects is considered in Appendix Table A16.

Generally, the results from Figure 9 and Appendix Table 9 tell a consistent story: the effect of localization on the structural change in the labor markets is much more pronounced in poorly governed states. Quantitative estimates from the kernel regression predict that for countries with a governance index of -1 – just above the 10th percentile, equivalent to the institutional quality found in Azerbaijan, Nigeria, and Cameroon – the switch from multinational to local ownership of mining assets is associated with a nearly 12.7 p.p. reduction in the rate of agricultural employment. Conversely, the switch to local ownership in countries at

Figure 9: Local ownership and local employment by governance: kernel regression



Note: Figure shows predicted values of the unconditional relationship between localization and sector-specific employment rates by host-country governance levels, estimated using an interacted nonparametric kernel regression with a bandwidth of 0.5. No other controls or fixed effects are included in the model. Employment rates are calculated as the share of the working age DHS respondents within 20km of the mine employed in each sector. Sample is all mine-years for which DHS employment data is available within 20km of the mine location, with all employment statistics adjusted using survey weights. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000.

this level of governance is associated with an 7.7 p.p. increase in the share of the population employed in non-agricultural wage jobs.

At the top end of the governance index – at the level of Botswana, South Africa, and Thailand – there is essentially no significant change in either forms of employment share in response to localization.[18] Appendix Figure A18 instead bins host-country governance by quartiles and estimates the employment-localization regressions within each bin, allowing for commodity-year fixed effects – so that the specification is slightly more rigorous than the

[18]Note that given the DHS sample restriction, the sample contains only low and middle income countries, and so the distribution of governance in this analysis is truncated on the right-hand side.

kernel regression. Here, the effect sizes become slightly smaller, but the patterns of heterogeneity are broadly similar: large structural transformation effects in response to localization are concentrated exclusively in weak governance environments. This pattern is consistent with the land use effects in the event -study analyses, again suggesting these are driven by sectoral labor market reallocation.

8 Robustness

Our main analysis makes several assumptions concerning specification choice, outcome measurement, and sample selection. Here, we test robustness to each of these choices.

Specification Choice: We consider several different specification choices. Appendix Table A1 estimates the main fixed effects model with various combinations of two and three-way interactions between year, commodity, country, and owner-country fixed effects. The results are remarkably consistent, showing a multinational production advantage of 6.5-19.3% across specifications, significant in 5 out of 7 models. Appendix Table A2 allows for more granular location-specific and flexible time trends at the ADM1 or ADM2 levels, in combination with other fixed effects. The multinational production advantage remains robustly significant in all models and ranges from 9.2-11.3%. Appendix Table A3 uses the "stacked" differences-in-differences estimator (Dube et al., 2023; Rexer, 2024) instead of the fixed effects estimator, which allows for a more precise control over the composition of the comparison group and removes already-treated units as controls. Once we make these adjustments, the results are similar, although not identical, to the main results. The output effect – although of a strikingly similar magnitude – is no longer statistically significant. The localization impact on local GDP is similar in both magnitude and significance, while the PM2.5 effect increases somewhat in magnitude only. The urbanization effect is similar in magnitude and significance, while the crop cover effect now falls to zero. Instead, the effect on forest cover becomes negative and significant. Overall, the stacked model supports the conclusion of a sizable multinational advantage, as well as a local economic expansion and land use transition accompanying divestment to local firms. Alternatively, we use the Callaway and Sant'Anna (2021) estimator to avoid bias from staggered treatment timing and heterogeneous treatment effects (Goodman-Bacon, 2021). This is not our preferred estimator because it does not allow for inclusion of interacted, multi-level fixed effects. Event study results, presented in Appendix Figure A11, are qualitatively similar to our main findings, confirming that localization leads to decreased output in good governance settings and increased output in bad governance settings

Finally, we address concerns that mines treated by localization may differ systematically from mines that are not localized. While Appendix Figure A4 confirms that divestments do not exhibit any particular relationship with mine age, they could potentially be associated with other mine characteristics. Using coarsened exact matching (Iacus et al., 2012), we exactly match treated mines (i.e., those that are localized between 2000-2022) with never-localized mines on their ADM-1 region, commodity, and deciles of baseline (2000) forest cover, urban land share, population, GDP, and air pollution within 20km. We then re-estimate key specifications on the matched sub-sample, including matching weights. Results are reported in Appendix Tables A17-A19 and Figure A19. For the subsample of mines that were highly comparable on observables at baseline, local share is significantly negatively associated with output, with the estimated effect increasing from -8% in the full sample to -10% in the matched sample. Effects of local share on socioeconomic and environmental outcomes are also very similar. The local share interaction with host governance is significant, negative, and of similar magnitude in both full and matched samples. Finally, event studies for the matched sample show – as in our main specification – that output falls significantly after localization in good governance settings and rises (though not significantly) in bad governance settings.

Measurement Choices: We also consider the robustness of the results to various measurement choices on both the dependent and independent variables. Appendix Tables A4 and A5 test for the robustness of the main results on output to different definitions of localization. In particular, Table A4 defines local as an indicator variable for any local participation, while Table A5 defines the treatment as an indicator for whether the largest shareholder in the mine (the dominant firm) is local. The results are similar here, although slightly smaller in magnitude than that of Table 1. Table A6 estimates impacts on the log of *actual* output only, rather than using modeled output where available to fill in missing values. Similar results are observed. Finally, Table A7 tests for the robustness of the local GDP (Panel A) and air pollution (Panel B) results to different radii around the mine, in intervals of 5km from 5 to 25km. The results do not appear sensitive to the arbitrary distance used to define the radius of the outcome variable.

Sample Selection: The effects on output, can of course only be estimated for the sample of mine-years with reported production levels. But the estimates for other outcomes in Table A18 may be reported for a variety of different sub-samples. While we argue that the sample selection logic should indeed be outcome specific, Appendix Tables A8, A9, A10 report results for the full sample, the sample of mines that have ever produced output, and the sample of actively producing mines, respectively. The local GDP results (Column (1)) are similar in all samples, though not statistically significant in the output sample, perhaps due to the smaller sample size. The impact on PM2.5 (Column (2)) is only positive and significant in the output sample. Instead, the crop cover loss (Column (4)) is robust in all samples, as is the urban land cover increase (Column (6)). Changes in forest and other types of vegetation cover are less consistent across the samples. Overall, the choice of sample ultimately does not appear to affect the main message: divestment to local firms produces local economic gains and results in a land substitution from agricultural to urban uses.

9 Conclusion

The growing retrenchment in global trade and investment flows has spurred new interest in localization as a key element of industrial policy strategies. In the global metals and mining industry, localization has long been considered as means to maximize the domestic benefits and labor market linkages of resource extraction, even at the cost of foregoing the superior technology, productivity, and environmental footprint of multinational firms.

We bring new evidence to bear on this debate using comprehensive data on the ownership structure of commercial mines across the world over the past two decades. Consistent with the champions of continued globalization, we show that local ownership is indeed associated with significantly lower mine output, and greater local air pollution, suggesting local firms use lower quality technology. However, in line with the skeptics, local firms produce meaningfully larger domestic economic benefits, increasing local GDP and triggering structural transformation out of agriculture and into off-farm wage employment in the labor market.

These tradeoffs also depend critically on domestic governance conditions – a point not previously emphasized in this debate. Where corruption is rampant and the rule of law is weak, local firms have an advantage and outproduce their better-resourced multinational competitors. Importantly, this is also exactly where the local economic benefits of divestment are greatest. In these environments, the only tradeoff involved in localization appears to be environmental. That being said, local ownership in corrupt countries still represents a second-best equilibrium – greater output, and therefore government revenues, could be attained from reforming institutions and then contracting efficient multinational firms. Still, taking institutional constraints as given, the rationale for foreign investment in these environments becomes less compelling.

Critically, our global data do not allow us to distinguish the underlying mechanism driving the structural transformation in response to localization – whether in terms of direct employment effects, labor intensity of production, input supply chains, human capital spillovers, local content regulations – nor why these effects would be more pronounced in weak states. However, the results suggest that local mining firms interact with local labor markets in a fundamentally different manner than multinationals, with important implications for a structural change and economic development. Careful country-specific studies with more granular firm-level and labor force survey data would be better suited to study these mechanisms. We view this as a fruitful avenue for future research.

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ONLINE APPENDIX

Appendix tables

Table A1: Localization and output: robustness to fixed effects

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local share	-0.108***	-0.083**	-0.095**	-0.065	-0.104*	-0.193**	-0.101
	(0.038)	(0.039)	(0.042)	(0.052)	(0.058)	(0.091)	(0.097)
Observations	50643	50025	47838	49951	47973	50445	47111
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	No	Yes	No	Yes	Yes
Year-Country FE	No	Yes	No	No	No	No	No
Year-Owner country FE	No	No	No	Yes	No	No	No
Commodity-Country-Year FE	No	No	Yes	No	No	No	No
Commodity-Owner country-Year FE	No	No	No	No	Yes	No	No
Country-Owner country FE	No	No	No	No	No	Yes	No
Country-Owner country-Year FE	No	No	No	No	No	No	Yes

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A2: Localization and output: robustness to ADM fixed effects

Outcome	Log mine output							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Local share	-0.103***	-0.098**	-0.095**	-0.092**	-0.112**	-0.102**	-0.097*	-0.093*
	(0.039)	(0.039)	(0.040)	(0.040)	(0.050)	(0.051)	(0.050)	(0.051)
Observations	46996	46924	46894	46822	36110	36037	35990	35917
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ADM1-Year FE	Yes	Yes	Yes	Yes	No	No	No	No
Country-Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Commodity-Year FE	No	No	Yes	Yes	No	No	Yes	Yes
ADM2-Year FE	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A3: Localization and outcomes: stacked model

Outcome	Output	GDP	PM 2.5	Urban	Crop	Tree
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All controls						
Divested	-0.111	0.011**	0.477***	0.226**	0.126	-0.340*
	(0.097)	(0.005)	(0.077)	(0.111)	(0.130)	(0.179)
Observations	199861	1948514	2580745	2594760	1549400	2057379
R^2	0.922	0.999	0.959	0.987	0.998	0.998
Panel B: Never treated						
Divested	-0.115	0.010*	0.524***	0.241**	0.083	-0.403**
	(0.102)	(0.005)	(0.080)	(0.111)	(0.128)	(0.180)
Observations	120687	1683156	2244866	2257500	2250353	2254388
R^2	0.917	0.999	0.957	0.988	0.999	0.999
Panel C: Not yet treated						
Divested	-0.145	0.017***	0.208***	0.130	0.079	-0.225
	(0.104)	(0.006)	(0.079)	(0.115)	(0.132)	(0.180)
Observations	80228	275678	350479	351933	346157	349304
R^2	0.932	0.998	0.971	0.982	0.999	0.999
Mine-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets are clustered at the mine level. Cohorts are defined as event-years in which mine ownership switches from multinational to local. Never treated sample includes as controls in each cohort only those multinational mines that are never localized. Them not-yet-treated sample includes as controls in each cohort only those multinational mines that eventually become locally owned, up until the date at which they become localized. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A4: Localization and output: robustness to local definition

Outcome	Log mine output					
	(1)	(2)	(3)	(4)	(5)	(6)
Local	-0.087**	-0.071**	-0.051	-0.087**	-0.059	-0.078**
	(0.034)	(0.034)	(0.035)	(0.035)	(0.036)	(0.039)
Observations	50742	50742	50126	50643	50025	47838
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	No	No
Country-Year FE	No	No	Yes	No	Yes	No
Commodity-Year FE	No	No	No	Yes	Yes	No
Commodity-Country-Year FE	No	No	No	No	No	Yes

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Local is measured as an indicator if the mine has any equity stake by a firm headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A5: Localization and mine output: dominant share treatment

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dominant local owner	0.539***	0.417***	-0.077**	-0.060*	-0.054	-0.077**	-0.060*
	[0.07]	[0.07]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Mine FE	N	N	Y	Y	Y	Y	Y
Year FE	N	Y	N	Y	N	N	N
Country-Year FE	N	N	N	N	Y	N	Y
Commodity-Year FE	N	N	N	N	N	Y	Y
Observations	51297	51261	51297	51297	51297	51297	51297

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Dominant local owner is measured as an indicator if the mine has a dominant (plurality) equity stake by a firm headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A6: Localization and output: actual output

Outcome	Log actual mine output					
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	-0.104***	-0.086**	-0.067*	-0.103***	-0.076*	-0.083*
	(0.039)	(0.039)	(0.040)	(0.039)	(0.040)	(0.043)
Observations	49426	49426	48822	49323	48725	46600
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	No	No
Country-Year FE	No	No	Yes	No	Yes	No
Commodity-Year FE	No	No	No	Yes	Yes	No
Commodity-Country-Year FE	No	No	No	No	No	Yes

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Actual mine output does not substitute missing production values with S&P modeled mine output. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A7: Localization, economic activity, and air pollution: distance radii

Distance (km)	5	10	15	20	25
	(1)	(2)	(3)	(4)	(5)
Panel A: Local GDP					
Local share	0.007**	0.006**	0.007***	0.008***	0.009***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Observations	305967	306151	306271	306348	306383
Panel B: Air pollution					
Local share	0.202*	0.210**	0.208**	0.205**	0.202**
	(0.105)	(0.104)	(0.104)	(0.103)	(0.103)
Observations	51097	51102	51102	51134	51134
Mine FE	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets are clustered at the mine level. Samples used for each outcome are: for log GDP (Panel A), the full sample, for PM2.5 (2) the sample of producing mines. Distance radii for outcome measurement are indicated in table header. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A8: Local ownership and economic and environmental outcomes: full sample

	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.009***	-0.047	0.146**	-0.239***	-0.090**	0.104***
	[0.002]	[0.037]	[0.059]	[0.056]	[0.045]	[0.034]
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep Var	6.15	15.38	47.66	24.33	40.53	1.57
Observations	306383	386509	316004	222534	365970	388486

Notes: Standard errors in brackets are clustered at the mine level. Samples used for all outcomes is the full sample of mine-years for which S&P ownership data is available. Samples in (3)-(5) are still subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A9: Local ownership and economic and environmental outcomes: ever-produced sample

	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.013***	0.018	0.095	-0.284***	-0.158*	0.199***
	[0.004]	[0.079]	[0.104]	[0.090]	[0.088]	[0.075]
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep Var	6.71	16.49	39.61	27.13	38.11	3.48
Observations	99492	115934	95452	85773	112804	116288

Notes: Standard errors in brackets are clustered at the mine level. Samples used for all outcomes is the full sample of mine-years for which S&P ownership data is available for mines that have ever produced positive output. Samples in (3)-(5) are still subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A10: Local ownership and economic and environmental outcomes: output sample

	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.008	0.202**	-0.072	-0.207*	-0.055	0.171*
	[0.005]	[0.103]	[0.126]	[0.117]	[0.113]	[0.098]
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep Var	6.80	16.18	38.71	24.93	39.83	3.09
Observations	46488	51134	42026	37856	49899	51297

Notes: Standard errors in brackets are clustered at the mine level. Samples used for all outcomes is the sample of mine-years for which output data is available (the output sample). Samples in (3)-(5) are still subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A11: Localization and output by joint venture ownership structure

Outcome	Log mine output			
	(1)	(2)	(3)	(4)
Local Share	-0.149***	-0.132***	-0.101**	-0.106***
	[0.04]	[0.04]	[0.04]	[0.04]
Parent Owned JV	0.133***	0.144***	0.088*	0.082*
	[0.05]	[0.05]	[0.05]	[0.05]
Observations	50742	50742	50126	50025
Year FE	N	Y	N	N
Property ID FE	Y	Y	Y	Y
Country-Year FE	N	N	Y	Y
Commodity-Year FE	N	N	N	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022 for which fixed effects are defined. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Parent owned JV is defined as an indicator for vertical joint ventures in which the first-level operator of a mine is local but the parent company is a multinational. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A12: Localization and mine output: heterogeneity by WGI sub-indices

Outcome	Log mine output					
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	-0.062	-0.096**	-0.058	-0.046	-0.079*	-0.070
	(0.044)	(0.039)	(0.047)	(0.048)	(0.041)	(0.044)
Local share × VAE	-0.091**					
	(0.040)					
Local share × PVE		-0.083**				
		(0.036)				
Local share × GEE			-0.076**			
			(0.037)			
Local share × RQE				-0.091**		
				(0.042)		
Local share × RLE					-0.069**	
					(0.032)	
Local share × CCE						-0.066**
						(0.032)
Observations	51261	51256	51250	51250	51261	51261
Mine FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquarted in the producing country. World Bank WGI sub-indices are defined as follows: VAE - voice and accountability, PVE - political violence, GEE - government effectiveness, RQE - regulatory quality, RLE - rule of law, CCE - control of corruption. All are measured in 2000. All models include interactions between governance measures and commodity-year fixed effects. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table A13: Localization and mine output: heterogeneity by governance, dominant share

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dominant local owner	0.585***	0.458***	-0.053	-0.022	-0.014	-0.039	-0.020
	[0.07]	[0.07]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Dominant local owner × Governance index (2000)	-0.212***	-0.144*	-0.047	-0.079**	-0.071**	-0.079**	-0.080**
	[0.07]	[0.08]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Mine FE	N	N	Y	Y	Y	Y	Y
Year FE	N	Y	N	Y	N	N	N
Country-Year FE	N	N	N	N	Y	N	Y
Commodity-Year FE	N	N	N	N	N	Y	Y
Observations	51261	51261	51261	51261	51261	51261	51261

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Dominant local owner is measured as an indicator equaling one if the mine's largest owner is a firm headquartered in the producing country. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table A14: Localization and DHS wealth index

Outcome	Household wealth index				
	(1)	(2)	(3)	(4)	(5)
Local	-0.063*	0.058*	0.098***	0.059*	0.065*
	(0.034)	(0.034)	(0.035)	(0.035)	(0.035)
Mean Dep Var	2.74	2.74	2.74	2.74	2.74
Observations	5855	5855	5855	5855	5855
R^2	0.00	0.12	0.26	0.30	0.39
Year FE	No	Yes	No	No	No
Commodity-Year FE	No	No	Yes	No	Yes
Country-Year FE	No	No	No	Yes	Yes

Notes: Standard errors in brackets clustered at the mine level. Household wealth is measured as a standardized asset index. Local is measured as an indicator variable equaling one if the mine has any first-level equity participation by firms headquartered in the producing country. Sample is all mine-years for which DHS employment data is available within 20 kilometers of the mine location. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table A15: Localization and DHS wealth index

Outcome	Household wealth index				
	(1)	(2)	(3)	(4)	(5)
Local	-0.199***	-0.101**	-0.001	0.003	0.015
	(0.044)	(0.044)	(0.047)	(0.046)	(0.047)
Local × Governance index (2000)	-0.356***	-0.285***	-0.151**	-0.120*	-0.119
	(0.073)	(0.069)	(0.070)	(0.072)	(0.075)
Observations	5855	5855	5855	5855	5855
R^2	0.012	0.141	0.332	0.296	0.436
Year FE	No	Yes	No	No	No
Commodity-Year FE	No	No	Yes	No	Yes
Country-Year FE	No	No	No	Yes	Yes

Notes: Standard errors in brackets clustered at the mine level. Household wealth is measured as a standardized asset index. Local is measured as an indicator variable equaling one if the mine has any first-level equity participation by firms headquartered in the producing country. Sample is all mine-years for which DHS employment data is available within 20 kilometers of the mine location. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table A16: Localization and employment outcomes: heterogeneity by governance

Outcome	Employment rate				
	(1)	(2)	(3)	(4)	(5)
Panel A: Agricultural employment					
Local	-0.098***	-0.071***	-0.035***	-0.028***	-0.015
	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)
Local × Governance index (2000)	0.025	0.050***	0.058***	0.021	0.032*
	(0.019)	(0.019)	(0.018)	(0.016)	(0.017)
Observations	4677	4677	4677	4677	4677
R^2	0.120	0.232	0.423	0.512	0.597
Panel B: Non-agricultural employment					
Local	-0.004	0.029***	0.017	0.023**	0.015
	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)
Local × Governance index (2000)	-0.087***	-0.048***	-0.041**	-0.004	-0.015
	(0.016)	(0.017)	(0.017)	(0.016)	(0.016)
Observations	4677	4677	4677	4677	4677
R^2	0.016	0.092	0.319	0.316	0.456
Year FE	No	Yes	No	No	No
Commodity-Year FE	No	No	Yes	No	Yes
Country-Year FE	No	No	No	Yes	Yes

Notes: Standard errors in brackets clustered at the mine level. Employment rate in agriculture / non-agriculture is measured as the share of working-age DHS respondents employed in each sector. Local is measured as an indicator variable equaling one if the mine has any first-level equity participation by firms headquartered in the producing country. Sample is all mine-years for which DHS employment data is available within 20 kilometers of the mine location. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table A17: Local ownership and mine output (matching robustness)

Outcome	Log mine output					
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.183*	0.103	-0.125***	-0.110***	-0.096**	-0.101**
	[0.10]	[0.10]	[0.04]	[0.04]	[0.04]	[0.04]
Observations	42934	42934	42465	42465	41985	41903
Year FE	N	Y	N	Y	N	N
Mine FE	N	N	Y	Y	Y	Y
Country-Year FE	N	N	N	N	Y	Y
Commodity-Year FE	N	N	N	N	N	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table A18: Local ownership and economic and environmental outcomes

Outcome	Log GDP	PM2.5	Forest	Crop	Other Veg	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
Local share	0.006***	0.121	0.081	-0.296***	-0.134	0.203***
	[0.00]	[0.11]	[0.11]	[0.10]	[0.09]	[0.07]
Mine FE	Y	Y	Y	Y	Y	Y
Commodity-Year FE	Y	Y	Y	Y	Y	Y
Observations	251818	42805	78085	68618	93815	96736

Notes: Standard errors in brackets are clustered at the mine level. Samples used for each outcome are: for log GDP (1), the full sample, for PM2.5 (2) the sample of producing mines, and for land cover outcomes (3)-(6), the sample of mines that ever produced. Samples in (3)-(5) are subject to the restriction that the baseline value of land cover is greater than zero. Local share is measured as the share of the mine owned by firms headquartered in the producing country. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

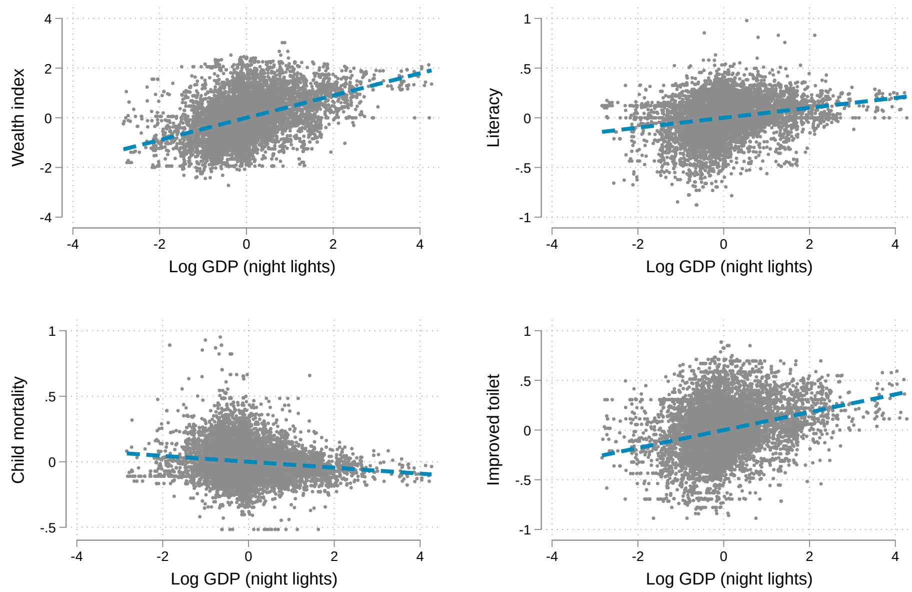
Table A19: Localization and mine output: heterogeneity by governance (matching robustness)

Outcome	Log mine output						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local share	0.291***	0.238**	-0.099**	-0.064	-0.051	-0.082	-0.055
	[0.10]	[0.10]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Local share × Governance index (2000)	-0.211**	-0.183*	-0.043	-0.078*	-0.070*	-0.078*	-0.080*
	[0.10]	[0.09]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Observations	39919	39919	39919	39919	39919	39919	39919
Mine FE	N	N	Y	Y	Y	Y	Y
Year FE	N	Y	N	Y	N	N	N
Country-Year FE	N	N	N	N	Y	N	Y
Commodity-Year FE	N	N	N	N	N	Y	Y

Notes: Standard errors in brackets are clustered at the mine level. Sample is all mine-years from 6170 unique mines producing positive output from 2000-2022. Local share is measured as the share of the mine owned by firms headquartered in the producing country. Governance score is defined as the average of the country-level sub-indices of the World Bank WGI in 2000. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

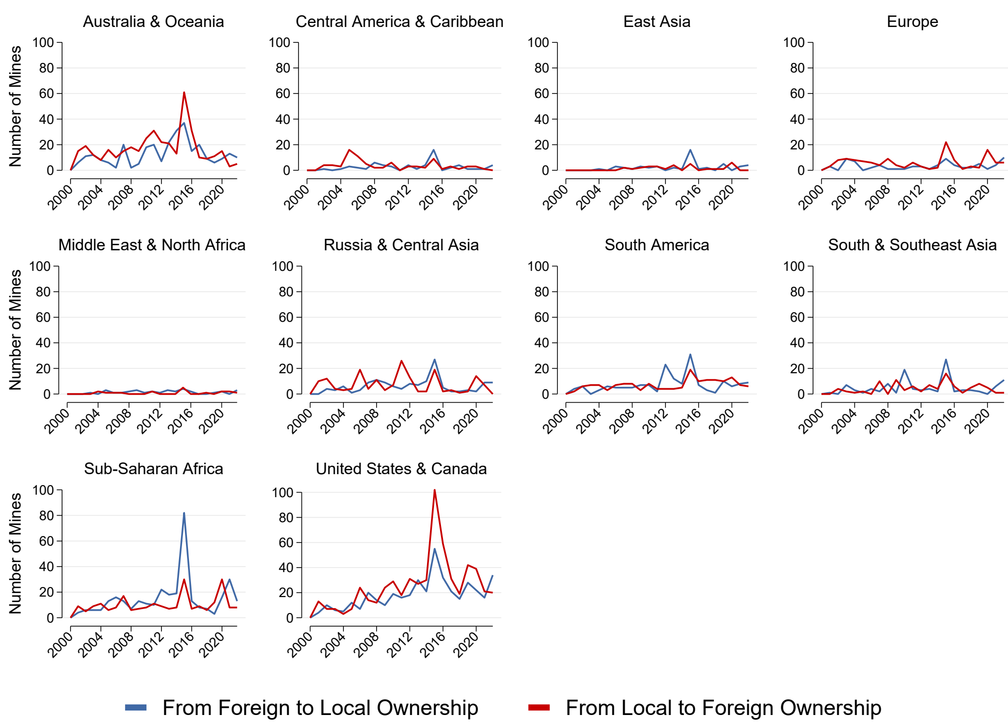
Appendix figures

Figure A1: Measurement validation of satellite night lights-predicted GDP



Note: Plots present partial correlations between local GDP and DHS outcomes at the mine level, controlling for country-by-year effects. Local GDP is measured as the log of total night lights-predicted GDP, in USD, within 25 kilometers of the mine. Wealth index is measured as the standardized DHS asset index. Literacy is the share of the adult population that is literate. Child mortality is the share of births in which the child died before their 5th birthday. Improved sanitation measures the share of households in the DHS sample with. All mine-level DHS estimates use survey weights and are defined within 20 kilometers of the mine. Sample is all active mine-years from 2000-2019 for which DHS data is available.

Figure A2: Ownership change events

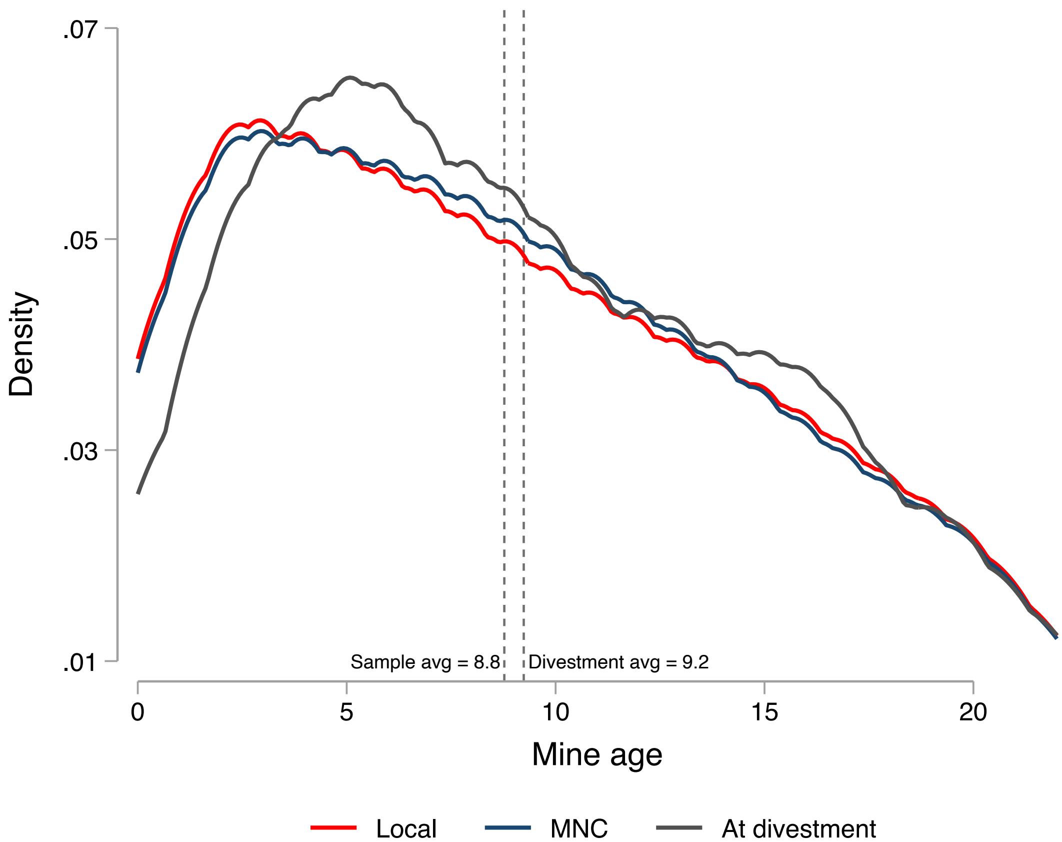


Note: Figure shows ownership change events, as indicated in the legend, by world region over time.

Figure A3: Net localization by region

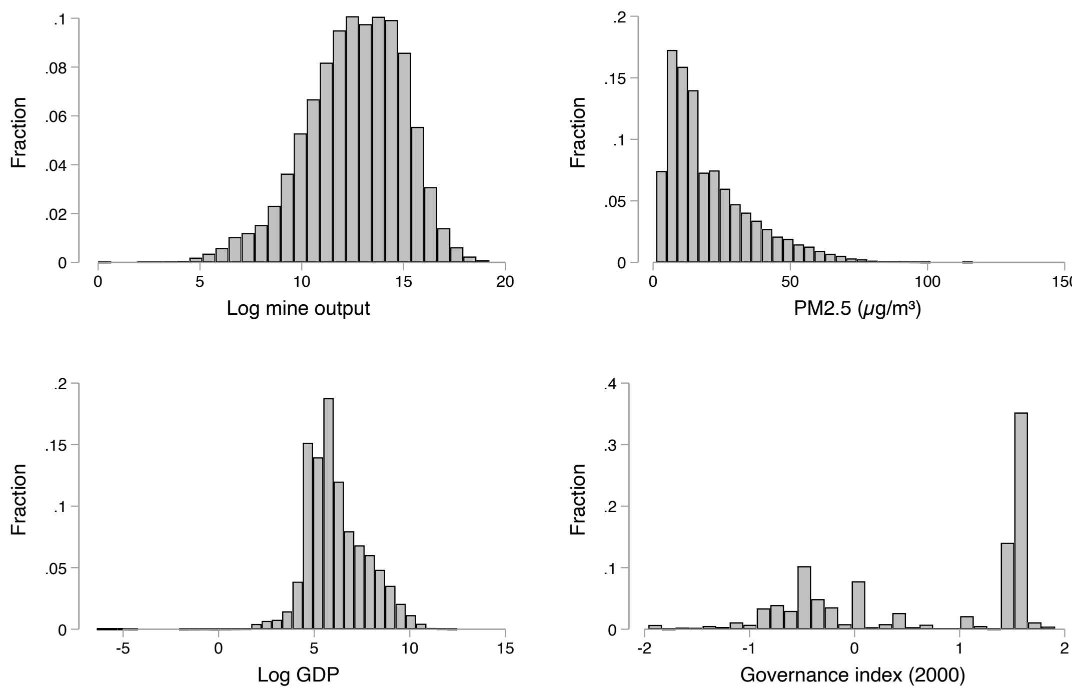
Note: Figure shows net localization events – the total number of multinational-to-local divestments minus the total number of local-to-multinational transactions – by world region over time.

Figure A4: Divestment timing



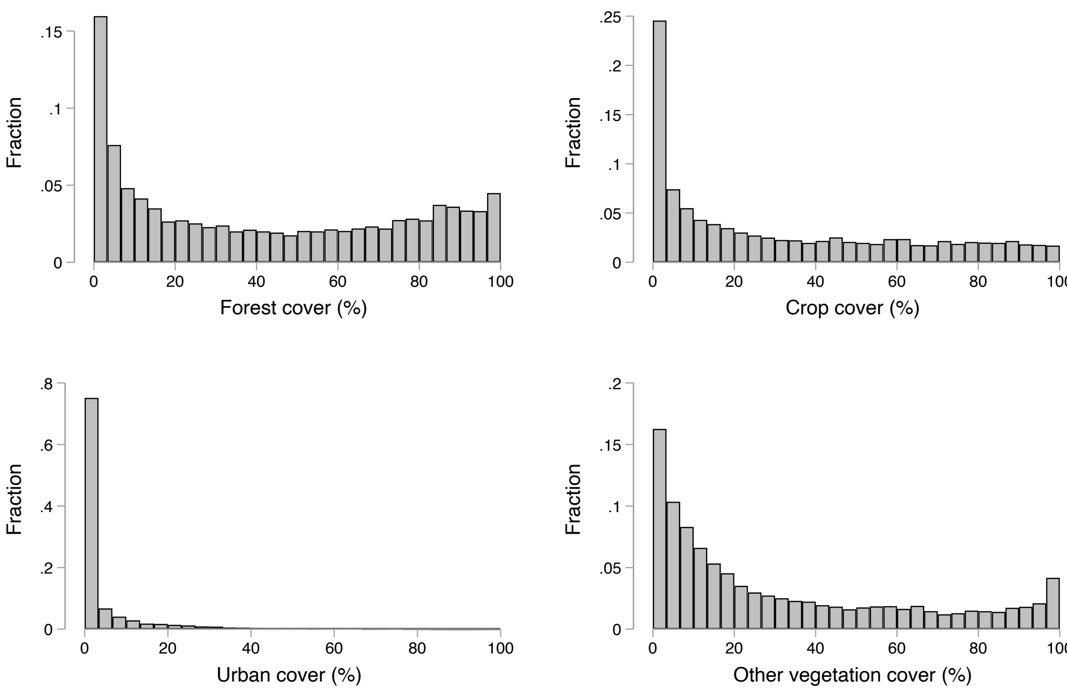
Note: Figure shows the average age of mining assets in the S&P data. Asset age defined as the difference between the current year and the first year in which production is observed, and therefore is only defined for mines the ever-produced sample. Local assets are those with any local participation, while multinational assets are those with full multinational ownership. At divestment indicates the distribution of ages across assets in the year in which their ownership status switched from multinational to local.

Figure A5: Histograms of key variables



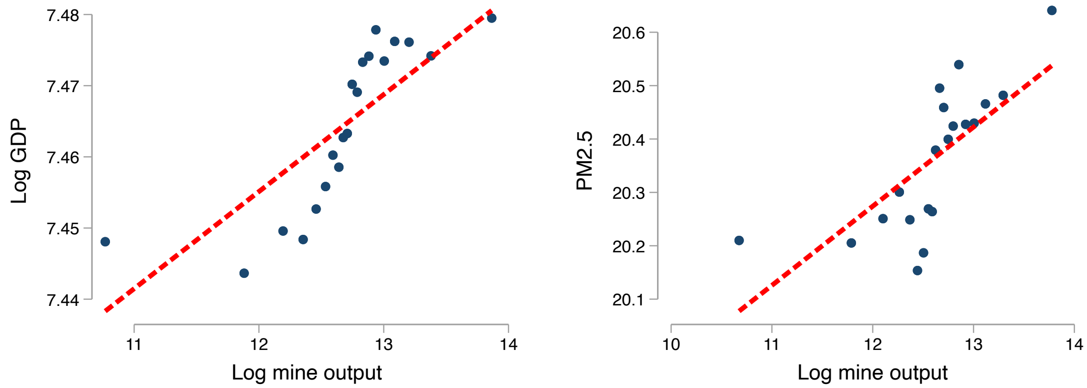
Note: Figure shows histograms of key mine characteristics. PM2.5 and GDP are measured as averages within 25 km of the mine. Governance index is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000 and its distribution show at the the mine-level.

Figure A6: Histograms of land use variables



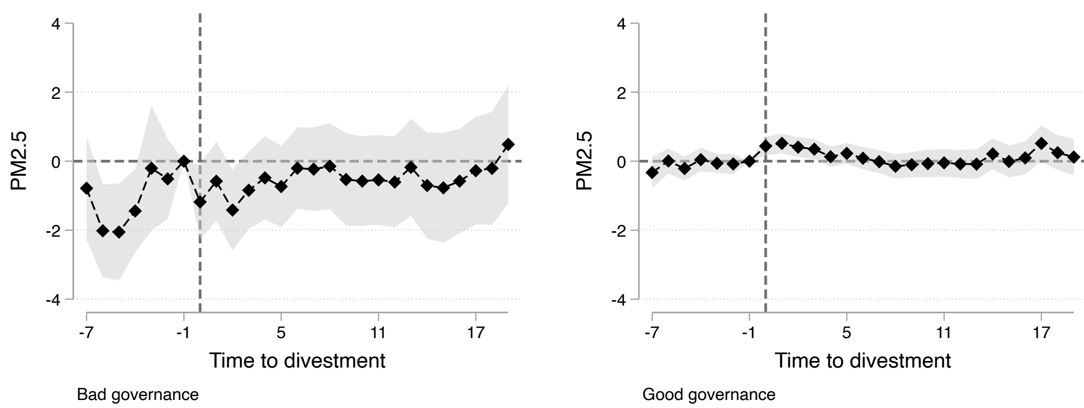
Note: Figure shows histograms of key land cover variables. All samples are restricted to mines for which the baseline (year 2000) land cover share for that category is greater than zero. All land cover variables are defined as the share of the land area within 5 km of the mine covered by a particular land use category.

Figure A7: Correlations between mine output, local GDP, and PM2.5



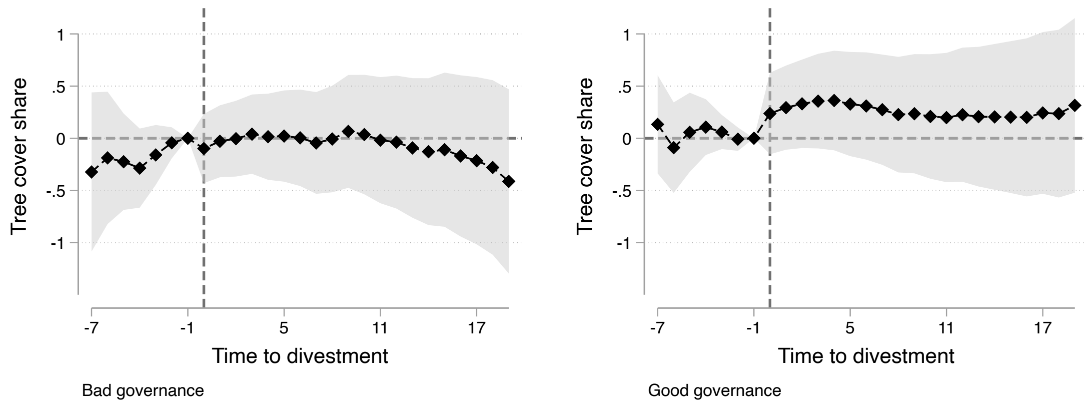
Note: Figure shows binned scatterplot of correlations between mine output and GDP (left) and mine output and PM2.5 (right). Sample is all mine-years with positive output.

Figure A8: Event-study: Air pollution



Note: Figure shows coefficients from event-study regressions of air pollution on leads and lags of divestment as well as property and year-by-commodity fixed effects. Air pollution is measured in $\mu g/m^3$ within 25 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A9: Event-study: Forest cover



Note: Figure shows coefficients from event-study regressions of forest land cover share on leads and lags of divestment as well as property and year-by-commodity fixed effects. Forest land cover share is predicted by satellite images and measured within 5 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A10: Event-study: Localization and output by armed conflict

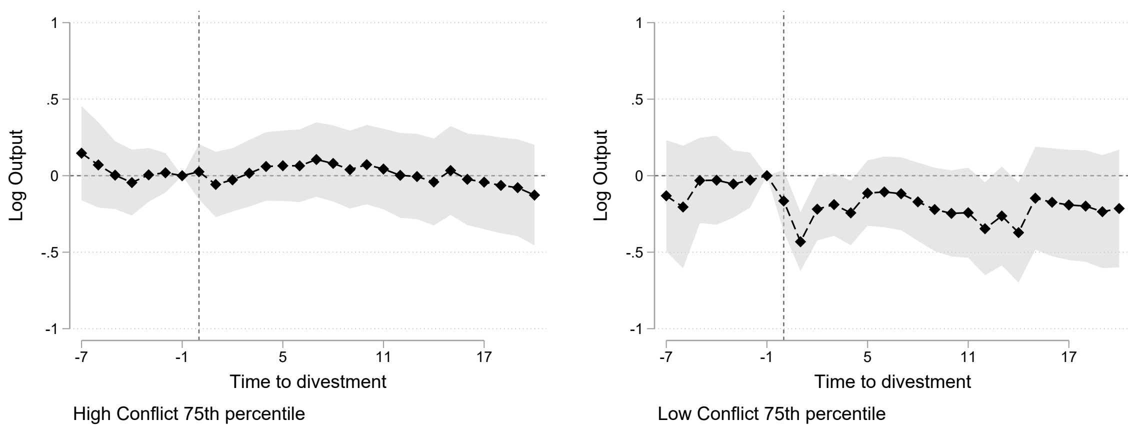


Figure A11: Event-study: Callaway and Sant'Anna (2021) Estimator

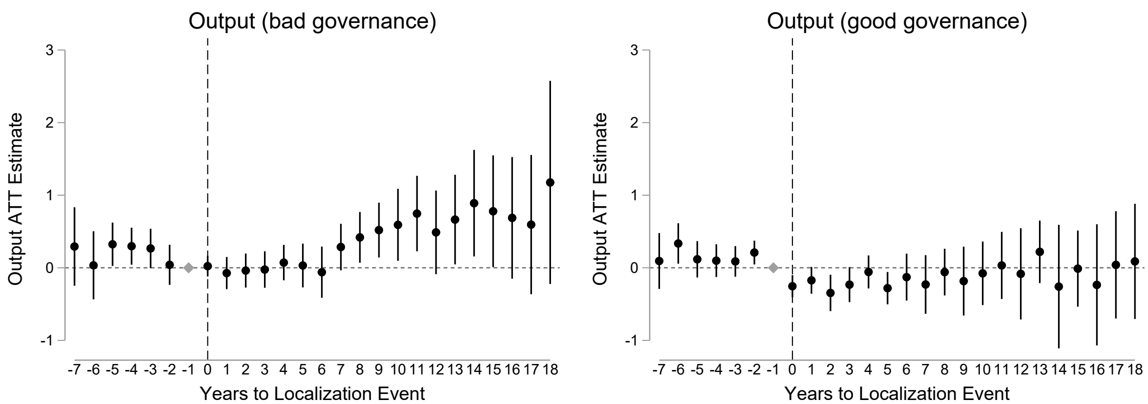
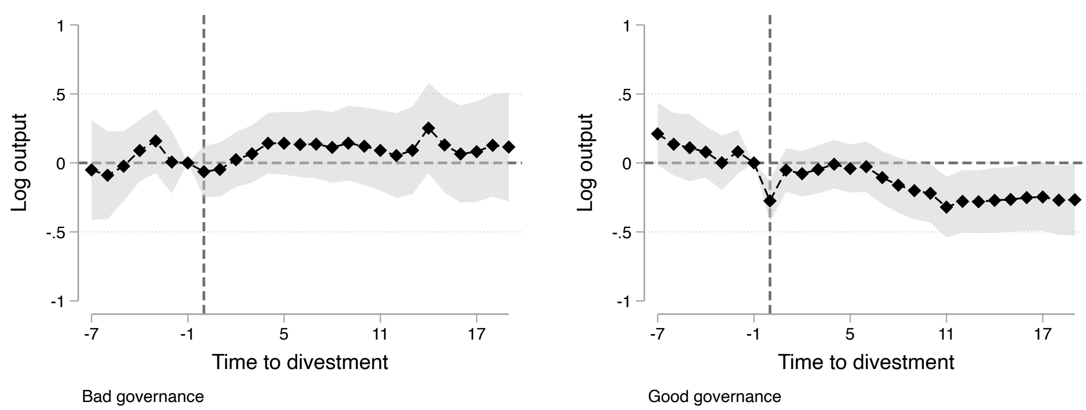
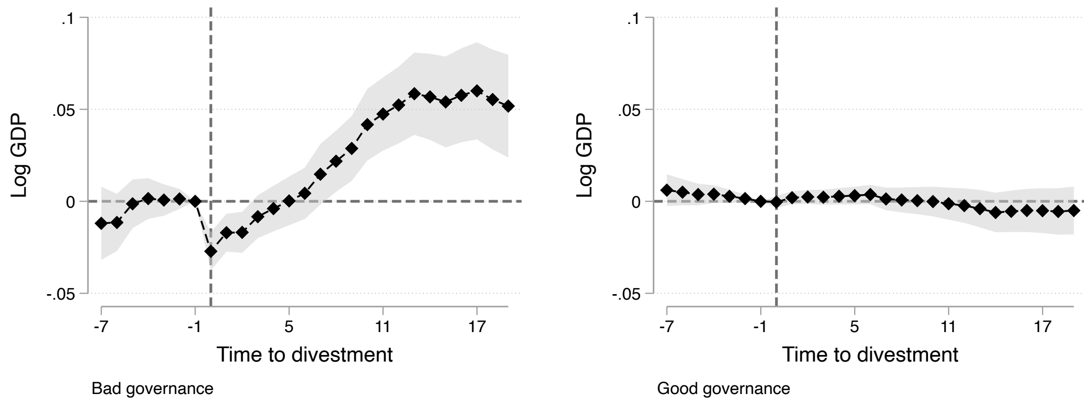


Figure A12: Event-study: output, dominant transitions



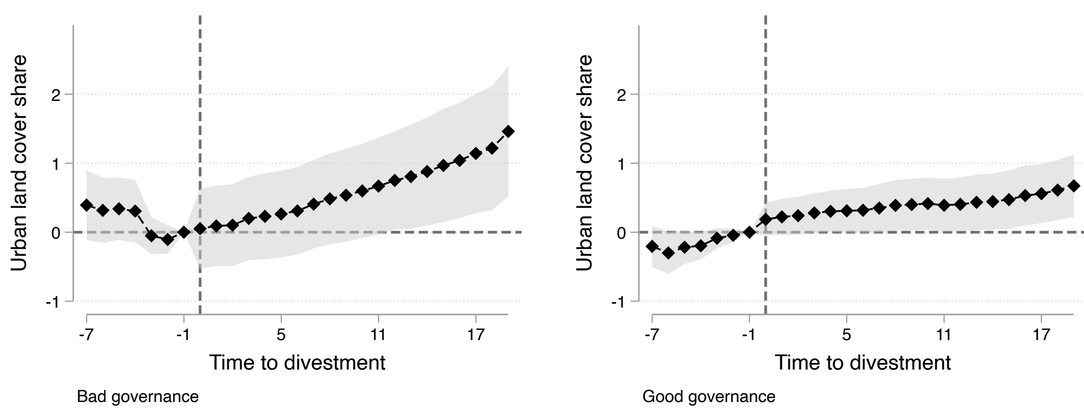
Note: Figure shows coefficients from event-study regressions of log mine output on leads and lags of divestment as well as property and year-by-commodity fixed effects. Divestment timing is determined by the first year in which a mine's status switches from multinational to dominant local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A13: Event-study: local economic activity, dominant transitions



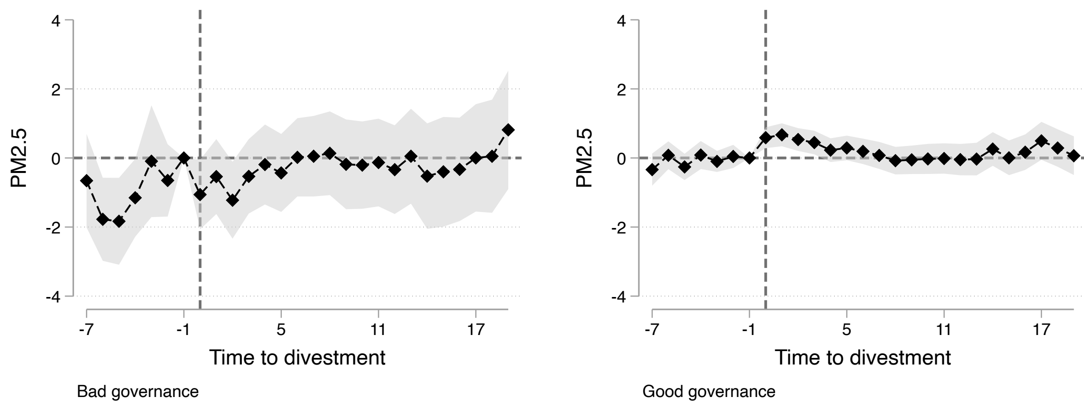
Note: Figure shows coefficients from event-study regressions of log local GDP on leads and lags of divestment as well as property and year-by-commodity fixed effects. GDP is predicted by night lights luminosity and measured within 25 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to dominant local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A14: Event-study: Urbanization, dominant transitions



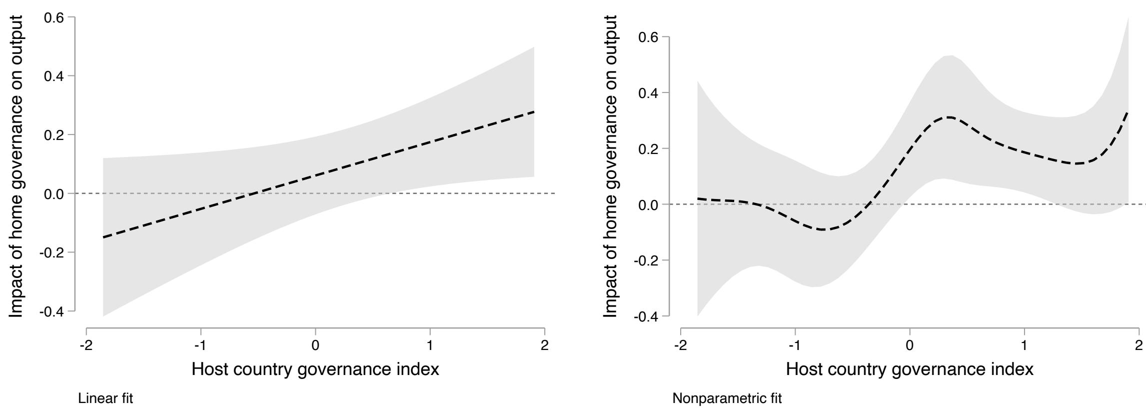
Note: Figure shows coefficients from event-study regressions of urban land cover share on leads and lags of divestment as well as property and year-by-commodity fixed effects. Urban land cover share is predicted by satellite images and measured within 5 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to dominant local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A15: Event-study: Air pollution, dominant transitions



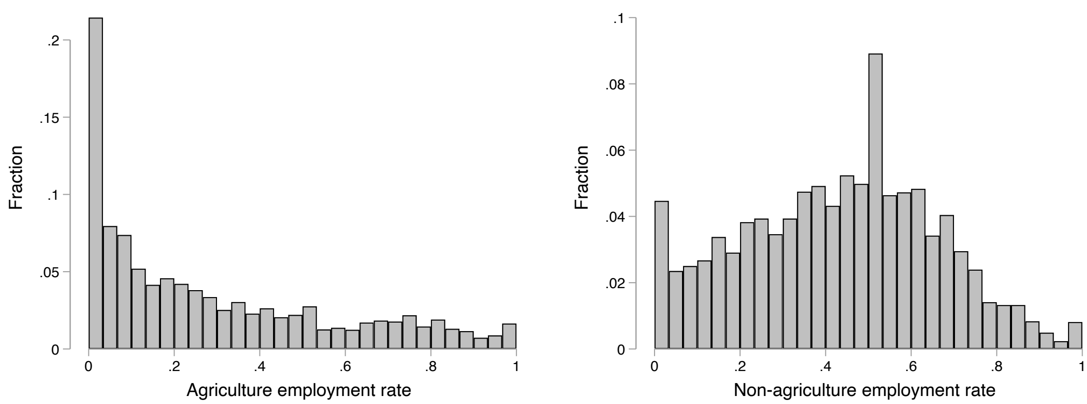
Note: Figure shows coefficients from event-study regressions of air pollution on leads and lags of divestment as well as property and year-by-commodity fixed effects. Air pollution is measured in μg/m^3 within 25 kilometers of the mine location. Divestment timing is determined by the first year in which a mine's status switches from multinational to dominant local ownership. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Host countries with a governance score above zero are classified as good governance while those below zero are bad governance.

Figure A16: Home and host governance



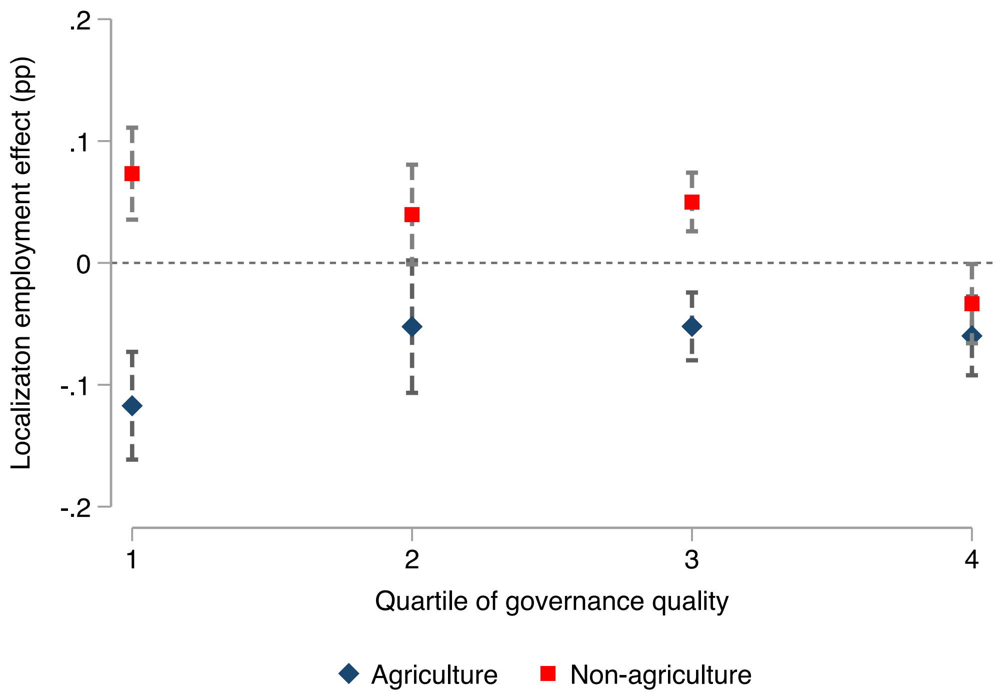
Note: Figure shows predicted margins of the relationship between mine output and home-country governance quality along the distribution of host-country governance conditional on mine and year fixed effects, for linear (left) and kernel (right) interacted regression models. Sample is all fully multinationally-owned assets producing positive output. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000.

Figure A17: Employment histogram



Note: Histogram of agricultural and non-agricultural employment rates at the mine-year level. Employment rates are defined as the share of working age DHS respondents engaged in *i*) agricultural or domestic work, or *ii*) non-agricultural non-household work. Sample is all mine-years for which DHS employment data is available. Employment rates are averaged within 20 km of the mine location, re-weighted by survey sampling weights.

Figure A18: Local ownership and local employment composition by governance: binned quantile estimation



Note: Figure shows estimates of the impact of localization from equation (4) for agricultural and non-agricultural employment. Regressions are estimated in 4 subsamples of the data for each quartile of host-country governance quality. Governance score is defined as the average of the country-level World Bank Worldwide Governance Indicators across sub-indices in 2000. Bars show 95% confidence intervals. Sample is all mine-years for which DHS employment data is available. Employment rates are averaged within 20 km of the mine location, re-weighted by survey sampling weights.

Figure A19: Switch to Local and Output: Event Study (matched sample)