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Golden opportunities: Firm-level evidence on the economic impacts of mining operations

Bai Yu[*] Li Yanjun[†]

Abstract

This paper examines the economic effects of gold mining operations on local firm performance using a comprehensive firm-level panel dataset. Employing fixed-effects models that exploit temporal and spatial variation in mine openings and activity status, we find that firms within a 10–100 kilometer radius of active mining operations experience significant positive effects: annual sales increase, employment rates rise—with a notable shift toward male and full-time positions—and firms adopt more autonomous and resilient trade practices. Our analysis suggests that these improvements are facilitated by reductions in business constraints, particularly those related to power supply, transportation infrastructure, customs procedures, court efficiency, tax administration, and reliance on less-educated workers. While mining boosts firm performance overall, sales gains concentrate in less-corrupt countries, while employment effects dominate in more-corrupt ones.

JEL classification. O13, Q32, L25, J23

Keywords. natural resources, gold mining, firm performance, employment, international trade, business constraints

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1 Introduction

The relationship between natural resource extraction and economic development has been a subject of extensive debate among economists and policymakers. While the "resource curse" literature has traditionally focused on negative macroeconomic consequences of resource abundance (Venables, 2016), recent research has shifted toward examining local economic effects of extractive industries (Aragón and Rud, 2013; Loayza et al., 2013). Gold mining, as a significant extractive activity in many developing and emerging economies, provides an important context for understanding how natural resource operations affect surrounding communities and businesses (Bazillian et al., 2020; Sánchez and Polanco, 2018).

Despite growing interest in the local economic impacts of mining, much of the existing literature has focused either on household-level outcomes (Chuhay and Papyrakis, 2021; Benshaul-Tolonen, 2019a) or on aggregate regional effects (Cust and Poelhekke, 2015; Aragón and Rud, 2015). Less attention has been paid to how mining operations influence the performance of local firms—the economic engines that generate employment, drive innovation, and facilitate trade in local communities. Understanding these firm-level effects is crucial for developing a comprehensive picture of how natural resource extraction shapes local economic development beyond direct employment in the mining sector itself (Fafchamps et al., 2017).

This paper addresses this gap by examining how gold mining operations affect nearby firms across multiple dimensions of performance. Using a rich firm-level panel dataset, we analyze changes in sales growth, employment rates and composition, and international trade participation among firms located in proximity to gold mines. Our empirical strategy employs fixed-effects models that exploit not only temporal and spatial variation in gold mine openings but also leverage the presence of non-active mines as an additional control group. This allows us to compare firms near active mining operations to those near non-active mines at various distances (from 10 to 100 kilometers), before and after mine openings.

Our findings reveal significant positive effects of gold mining on local firm performance. First, firms near gold mines experience substantial increases in annual sales compared to their counterparts in non-mining areas. Second, these firms exhibit higher employment rates, with a notable shift toward male-dominated and full-time positions. Third, we observe that firms not only increased their export share but also reduced their reliance on imported inputs, suggesting a shift toward more autonomous and resilient forms of international trade participation. This transformation reflects both stronger integration into global markets and enhanced domestic capabilities to support outward-oriented growth.

We further explore heterogeneity in the effects of mining activity by institutional quality, distinguishing how firms respond across different governance contexts. To understand the mechanisms behind these effects, we examine changes in business constraints following mine openings. Our analysis suggests that improvements in firm performance are mediated by reductions in obstacles related to power supply, transportation infrastructure, customs procedures, court efficiency, tax administration, and reliance on less-educated workers. These findings indicate that mining operations can generate positive spillovers for local businesses by alleviating infrastructural bottlenecks that previously hindered firm growth and market access.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on natural resource extraction and local economic development. Section 3 describes our data sources and empirical strategy. Section 4 presents our main results on the effects of gold mining on firm performance, and explores the mechanisms behind these effects by examining changes in business constraints. Section 5 discusses the implications of our findings and concludes.

2 Literature Review

The economic impact of extractive industries, particularly gold mining, has been the subject of extensive scholarly inquiry. This literature review synthesizes key strands of research relevant to our study.

The relationship between natural resource extraction and economic development has traditionally been examined through the lens of the "resource curse" hypothesis (Van der Ploeg, 2011; Venables, 2016). While this literature initially focused on national-level outcomes, recent studies have shifted toward examining subnational and local economic effects (Aragón and Rud, 2013; Loayza et al., 2013; Bellemare et al., 2018). Several studies have documented positive economic spillovers from mining operations in developing countries, finding increased household income and improved welfare effects in areas surrounding mines, though with significant heterogeneity across regions (Bazillian et al., 2020; Hilson, 2016; Sánchez and Polanco, 2018).

On the other hand, mining operations also generate substantial externalities that affect other sectors of the economy and broader socioeconomic outcomes (Aragón and Rud, 2015; Parker and Vadheim, 2017). Research has identified negative impacts on agricultural productivity due to mining-related pollution, resource-related conflicts that hinder economic development, and unintended consequences of policies targeting conflict minerals (Berman et al., 2017; Chuhay and Papyrakis, 2021; Santos, 2018).

Despite these mixed findings at the macro and household levels, a growing body of research suggests that mining operations can positively affect local economies through their impact on firm performance and business development. Several mechanisms have been proposed through which mining activities may generate positive spillovers for local businesses.

First, the literature examining firm-level productivity impacts of mining operations remains relatively nascent and methodologically limited. Some studies have examined how natural resource extraction affects business constraints faced by firms and found that mining activities can create local boom-bust cycles that influence business operations, particularly through infrastructure bottlenecks and access to skilled labor (De Haas and Poelhekke, 2019; Cust and Poelhekke, 2015; Loayza and Rigolini, 2018). Other research has shown that mining operations can lead to structural transformation and increased enterprise productivity in surrounding areas, though many of these studies rely primarily on cross-sectional comparisons rather than longitudinal data (Benshaul-Tolonen, 2019b; Fafchamps et al., 2017; Mamo et al., 2019).

Second, research on employment effects of mining has produced mixed findings across different contexts (Wilson, 2012; Kotsadam and Tolonen, 2016). Studies have documented increased formal employment opportunities in mining regions but also revealed important heterogeneity in these effects, particularly along gender lines and depending on the type of mining operation (Chuhan-Pole et al., 2017; Zabsonré et al., 2018; Benshaul-Tolonen, 2019a). Most of these studies, however, rely on household survey data rather than firm-level employment records, limiting their ability to directly link mining activities to firm-level employment decisions and workforce composition changes.

Third, the relationship between mining activities and firms' international trade participation has received limited attention in the literature (Allcott and Keniston, 2018; Harding and Javorcik, 2011). Some research suggests that resource extraction can create opportunities for local firms to integrate into global value chains, though this often requires complementary investments in infrastructure and human capital. Resource heterogeneity can also lead to varying effects on trade patterns and economic structure across different contexts (Edwards, 2016; Stevens et al., 2015).

Our study addresses these gaps through four main contributions. First, we employ firm-level panel data that allows for robust causal identification through within-firm comparisons over time, addressing the limitations of cross-sectional or aggregated analyses prevalent in previous studies. Second, rather than focusing on isolated outcomes, we simultaneously examine multiple dimensions of firm performance, including sales per worker, to provide a more comprehensive picture of how mining activities reshape local economic landscapes. Third, compared to previous studies that rely on household or individual data to assess labor market effects, a key advantage of using firm-level data is the ability to jointly observe changes in both the level and composition of employment. For instance, while the absolute number of female employees increases near active mines, the female employment ratio declines—a nuanced pattern that would likely be obscured in household-level analyses. This allows us to uncover structural shifts in labor demand that accompany resource-driven firm expansion. Fourth, we extend this literature by explaining the main mechanisms—namely, the reduction in obstacles related to power supply, transportation, and customs procedures following the opening of gold mines. While these business constraints have been studied by De Haas and Poelhekke (2019), we take a step further by providing a more direct assessment of how the reduction of such constraints can translate into firm success and development.

3 Data and Methods

3.1 Data sources

Our analysis combines several datasets to examine the relationship between gold mining operations and firm performance. The primary data on firm characteristics and performance come from the World Bank Enterprise Surveys (WBES), which provide detailed firm-level information across multiple countries and time periods. These nationally representative surveys collect data on various aspects of the business environment and firm operations, including sales, employment composition, export activities, and perceived business constraints. We matched the WBES data with geospatial information obtained through a special request to the World Bank, ensuring that all included countries had been surveyed at least twice. This process allowed us to construct a firm-level panel dataset spanning the years 2003 to 2023 (with the exact survey years varying by country; see the official WBES website for details), covering nearly 20,000 firms across 26 countries.[*]

To identify the location of gold mines, we use the S&P Global Market Intelligence database (formerly SNL Metals & Mining), which provides comprehensive information on mining operations worldwide, including geographical coordinates, operational status, production volumes, and opening dates. This industry-standard database is widely regarded as the most comprehensive source of global mining data, covering approximately 36,000 mining properties across more than 180 countries. The S&P database allows us to select mines located near firms in selected regions and to distinguish between active and inactive mines, which is crucial for our identification strategy. We focus specifically on gold mining operations, identifying mines where gold is either the primary commodity or a significant by-product.

For geographical analysis, we employ Geographic Information System (GIS) tools to calculate the distance between each surveyed firm and the nearest gold mine. Using the

[*]These countries include Benin, Central African Republic, Cameroon, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, The Gambia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

geographical coordinates provided in both the WBES and S&P mining datasets, we determine whether firms are located within various distance bands (from 10 km to 100 km, in 10 km increments) of active and inactive gold mines. This spatial matching enables us to implement our estimation strategies.

As an illustrative example, Figure 1 demonstrates how we construct the spatial matching using a 100 km threshold. Specifically, we generate a buffer zone with a 100 km radius around each gold mine based on its geographical coordinates. We then examine whether each firm's location, as recorded in the WBES data, falls within any of these buffers. If a firm is located within the buffer zones of multiple mines, we record the corresponding mine codes and count the total number. This approach allows us to systematically capture the intensity of exposure to nearby mining activity.

The map also shows substantial variation in the concentration of firms around mining operations across different regions, which helps identify the local economic effects of gold mining activities.

3.2 Key variables

Our analysis examines the impact of gold mining operations on three primary dimensions of firm performance. First, we measure firm size and productivity through two key indicators: the logarithm of annual sales, which captures the firm's market reach and revenue generation capacity, and the logarithm of total employment, which reflects the firm's operational scale and labor utilization. Both logarithmic transformations allow us to analyze proportional changes while reducing the influence of outliers, which is particularly important given the heterogeneity in firm sizes across our sample.

Second, we analyze employment composition through two workforce metrics: the female employment ratio, which measures the proportion of female employees and provides insights into gender inclusivity in the labor market; and the temporary employment ratio, which captures the proportion of non-permanent workers and reflects employment stability. These composition measures help us understand not only quantitative changes in employment but

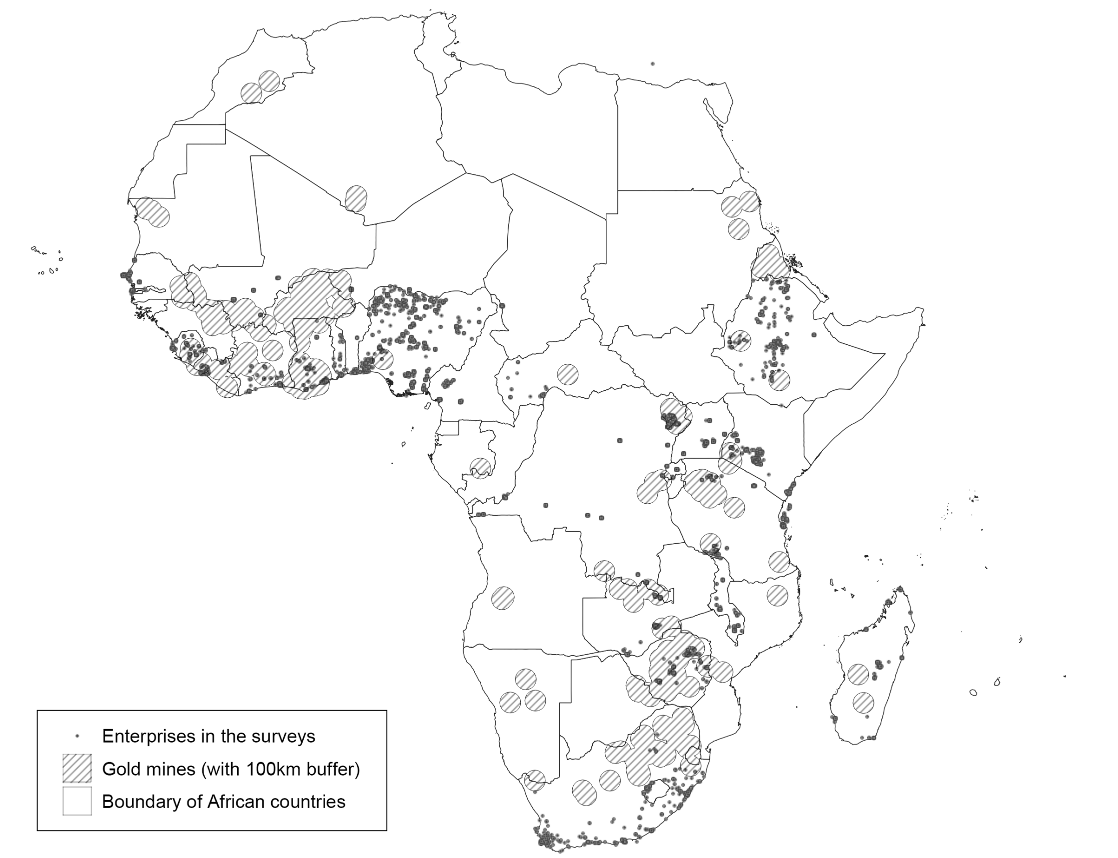

Figure 1: Spatial Distribution of Firms and Gold Mines in Africa

Notes: This figure illustrates the spatial matching approach used in our analysis. The shaded circular areas represent 100km buffer zones around gold mines. Small dots indicate the locations of firms from the World Bank Enterprise Surveys. The map demonstrates the variation in firm concentration relative to mining operations across different regions of Africa, which helps identify the local economic effects of gold mining activities. Data sources: WBES and S&P Global Market Intelligence database.

also qualitative shifts in workforce structure near mining operations.

Third, we examine international trade participation through two measures: direct export sales (measured as the share of exports in total sales) and the use of imported inputs (measured as the share of inputs sourced from foreign countries). These indicators reflect firms' integration into global value chains and their ability to access international markets. Trade-related outcomes are particularly important for understanding how proximity to mining operations may influence firms' competitiveness and market reach beyond local economies.

To account for firm heterogeneity, we include several firm-level controls that may affect performance outcomes. While not all characteristics can be incorporated, we focus on arguably exogenous ones, including firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise.

Table 1 presents summary statistics for our key variables, comparing firms located within and beyond 30km of active gold mines. From Panel A, firms located closer to mines report significantly higher average logged annual sales and employment levels, with differences of 2.35 and 0.29 log points, respectively. They also exhibit a higher share of foreign input use by 10.20 percentage points and a lower share of temporary workers by 4.86 percentage points, both statistically significant at the 1% level. In contrast, there are no statistically significant differences in the share of female workers or the share of direct export sales between the two groups. These patterns suggest notable baseline differences in firm size and input sourcing near mines. The underlying reason is that firms located beyond and within 30 km belong to different sectors and exhibit distinct patterns in ownership and firm type (see Panel B). For instance, firms with a foreign share of more than 10% are more likely to locate near mines. All these factors justify the use of panel datasets in the empirical analysis.

Table 1: Summary statistics and group differences

	(1) Beyond 30km (Control)	(2) Within 30km (Treat)	(3) Difference	(4) p-value	(5) No. of observations	(6)
					Control	Treat
Panel A: Outcome variables						
Annual sales (log)	16.528	18.882	-2.353	0.000	17,022	302
Employees (log)	2.954	3.242	-0.288	0.000	19,262	315
Female emp. (%)	28.422	28.800	-0.378	0.836	11,235	222
Temporary emp. (%)	15.350	10.495	4.855	0.003	16,961	285
Export sales (%)	4.702	5.239	-0.537	0.564	18,796	314
Imported inputs (%)	28.608	38.804	-10.197	0.000	12,139	276
Panel B: Firm-level features						
Service sector	0.371	0.380	-0.009	0.754	19,600	316
Firm's age	17.594	16.147	1.447	0.098	18914	314
Ownership						
% Owned by private	81.508	77.823	3.686	0.076	19,600	316
% Owned by foreign	10.024	20.566	-10.542	0.000	19,600	316
% Owned By government	0.599	0.547	0.051	0.888	19,600	316
Firm type						
Shareholding company	0.209	0.335	-0.126	0.000	19,600	316
Sole proprietorship	0.546	0.459	0.088	0.002	19,600	316
Partnership	0.244	0.206	0.038	0.114	19,600	316
Affiliated to a large firm	0.797	0.870	0.073	0.002	19,600	316

Notes: This table presents summary statistics for firms located beyond 30km (control group) and within 30km (treatment group) of active gold mines. Panel A reports outcome variables: log of annual sales, log of total employees, percentage of female employees, percentage of temporary employees, percentage of export sales, and percentage of imported inputs. Panel B presents firm characteristics including sector, age, ownership structure, and firm type. Columns (1) and (2) show means for control and treatment groups, respectively. Column (3) displays the difference between treatment and control means. Column (4) reports p-values from t-tests of equality of means. Columns (5) and (6) show the number of observations in each group. Service sector, shareholding company, sole proprietorship, partnership, and affiliation to a large firm are binary indicators. Ownership percentages represent the average share owned by each type of entity.

3.3 Empirical strategy

To identify the causal effects of gold mining activity on nearby firms, we develop a fixed-effects estimation strategy that leverages both spatial and temporal variation in mine operations. The baseline model estimates the relationship between firm outcomes and the number of active gold mines, using a panel fixed-effects framework that controls for firm-specific time-invariant characteristics and common shocks across years:

$$Y_{fit} = \alpha + \beta \cdot \text{ActiveMines}_{ft} + \mu_f + \lambda_{it} + \varepsilon_{fit} \tag{1}$$

where Y_{ft} denotes firm-level outcomes such as sales, employment, or trade metrics; ActiveMines_{ft} represents the number of active mines within a specified distance of firm f in year t—30 km in the baseline specification, and 10 km to 100 km (in 10 km increments) in robustness checks. This graduated approach captures the intensity of nearby mining activity and allows us to examine how the effects of mining operations attenuate with distance, thereby identifying the spatial extent of economic spillovers.

μ_f denotes firm fixed effects. Instead of including only year fixed effects, we incorporate sector-by-year fixed effects, where sector is measured at the 2-digit ISIC level, to account for industry-specific trends over time. Standard errors are clustered at the sector-year level to account for potential autocorrelation. This empirical approach provides a comprehensive framework for estimating the spatially varying impact of mining operations on firm dynamics.

For robustness, we also use binary indicators of exposure—whether a firm is located within each distance threshold of at least one active mine—regardless of the number of mines. This allows us to evaluate both the intensive and extensive margins of mining activity.

To strengthen causal identification, we extend this model by incorporating a second treatment variable that captures the number of *inactive* gold mines (defined as mines that were previously operational but have ceased production or are currently in care and maintenance status). This specification enables a more refined comparison between areas with actual mining activity and those with only mining potential:

$$Y_{fit} = \alpha + \beta_1 \cdot \text{ActiveMines}_{fit} + \beta_2 \cdot \text{InactiveMines}_{fit} + \mu_f + \lambda_{it} + \varepsilon_{ft} \tag{2}$$

This approach controls for unobservable location-specific characteristics that might be correlated with both firm performance and mining site selection (Kotsadam and Tolonen, 2016). The variable ActiveMines_{fit} measures the number of active gold mines within a specified distance from the firm, while $\text{InactiveMines}_{fit}$ measures the number of non-operational (inactive) mines. The net effect of exposure to active mining—beyond location-specific unobservable characteristics proxied by inactive mines—is given by $\beta_1 - \beta_2$. Standard errors are clustered at the sector-year level.

4 Empirical Results

4.1 Baseline results

Table 2 reports the estimated effects of the number of active gold mines within 30 kilometers on six key dimensions of firm performance. Column (1) shows that proximity to active mining operations is associated with significantly higher firm revenue: a one-unit increase in the number of active mines is associated with a 4.634 log-point increase in annual sales ($p<0.01$). Similarly, column (2) indicates a significant positive effect on employment size, with a 0.485 log-point increase in the number of employees ($p<0.01$). Using these two outcomes to calculate annual sales per employee, we find that this variable—used as a proxy for individual productivity—also increases (see column 1 of Appendix Table A.1).

In terms of workforce composition, the results in columns (3) and (4) indicate a shift in employment structure near active gold mines. In column (3), the female employment ratio decreases significantly by 7.886 percentage points, suggesting that mining activities disproportionately stimulate job creation in roles more commonly held by men, such as logistics, security, and equipment maintenance. Importantly, when combined with the results in columns (2) and (3) of Appendix Table A.1, we find that although the share of female workers declines, firm-level data indicate that the absolute number of female employees slightly increases—albeit insignificantly and at a slower rate than male employment. Therefore, our results are consistent with the existing literature but offer additional insights into changes in employment composition. Furthermore, the temporary employment ratio drops by 15.691 percentage points, and this decline is also observed in absolute terms, indicating a shift toward more stable employment (see columns 4 and 5 of Table A.1).

Turning to international trade participation, column (5) reveals that firms near active mines report significantly higher levels of direct export sales, with a 2.756-point increase in export revenue. These gains in revenue, employment, and export may reflect improved productivity and market access driven by proximity to mining activity. Gold mining operations often stimulate the development of local infrastructure—such as roads, electricity, and communication networks—that reduce trade costs and enhance logistics. Moreover, the formation of mining clusters may generate agglomeration economies, increasing firms' visibility, knowledge spillovers, and connections to international markets. Nearby firms may also benefit from heightened local demand for mining-related goods and services, creating scale economies that further support growth and expansion.

However, column (6) shows a negative but statistically insignificant relationship between mine proximity and foreign input use. Nevertheless, the presence of gold mining operations may stimulate the growth of supporting industries—such as logistics, machinery maintenance, fuel supply, and construction. These structural improvements could reduce reliance on foreign inputs by increasing the availability and diversity of domestically sourced inputs, thereby strengthening local supply chains.

In panel B, we find that the results remain robust after the inclusion of firm-level controls. These results highlight the multifaceted economic spillovers of gold mining operations, which appear to boost firm size and export activity while altering employment structure.

Different distances To test the robustness of our results, we explore alternative distance thresholds by replacing the 30-kilometer cutoff with both smaller and larger radii, ranging from 10 km to 100 km. The results are reported in Figure 2. When expanding the proximity range to 50 kilometers, we find that most of the estimated effects diminish and become

Table 2: Baseline results

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
ActiveMines (30km)	4.634***	0.485***	-7.886**	-15.691***	2.756**	-5.181
	(1.204)	(0.086)	(3.654)	(3.105)	(1.220)	(6.870)
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
R-squared	0.658	0.662	0.515	0.073	0.353	0.340
No. of observations	8,040	9,361	5,765	7,644	9,013	4,604
ActiveMines (30km)	4.537***	0.589***	-8.851**	-16.097***	1.723*	-5.898
	(1.464)	(0.090)	(3.861)	(3.936)	(0.945)	(6.932)
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
R-squared	0.666	0.685	0.519	0.073	0.359	0.344
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

statistically insignificant. This pattern suggests that the economic influence of gold mining is highly localized, with stronger spillover effects concentrated within close geographic proximity to the mines.

Furthermore, we include the number of active gold mines within three concentric distance bands—0–30 km, 30–100 km, and 100–150 km—as separate regressors in the same specification. The results in Appendix Table A.2 confirm that only mines within the 0–30 km range exert significant effects on firm outcomes, while those farther away do not appear to boost local economic activities.

Interestingly, we observe that the number of active gold mines located between 30–100 km and 100–150 km from a firm is sometimes associated with small but statistically significant negative coefficients, particularly for annual sales and imported inputs. One possible interpretation is that these distant mines may draw away resources or labor from the local economy, leading to a crowding-out effect. Another possibility is that the presence of mining activity in surrounding areas increases regional inequality or disrupts local supply chains, indirectly affecting firms that are not in the immediate vicinity of a mine.

Form of the treatment variable To ensure that our results are not driven by the functional form of the treatment variable, we replace the count of active mines within 30km with a simple dummy indicator for the presence of at least one active mine. As shown in Appendix Table A.3, the results remain qualitatively unchanged. Firms located near active mines continue to exhibit significantly higher annual sales and employment, but lower female and temporary employment ratios. The effects on export sales are also positive and statistically significant. While the coefficient on imported inputs remains statistically insignificant, its direction is consistent with previous specifications. These findings confirm that our main conclusions are robust to alternative definitions of mining exposure.

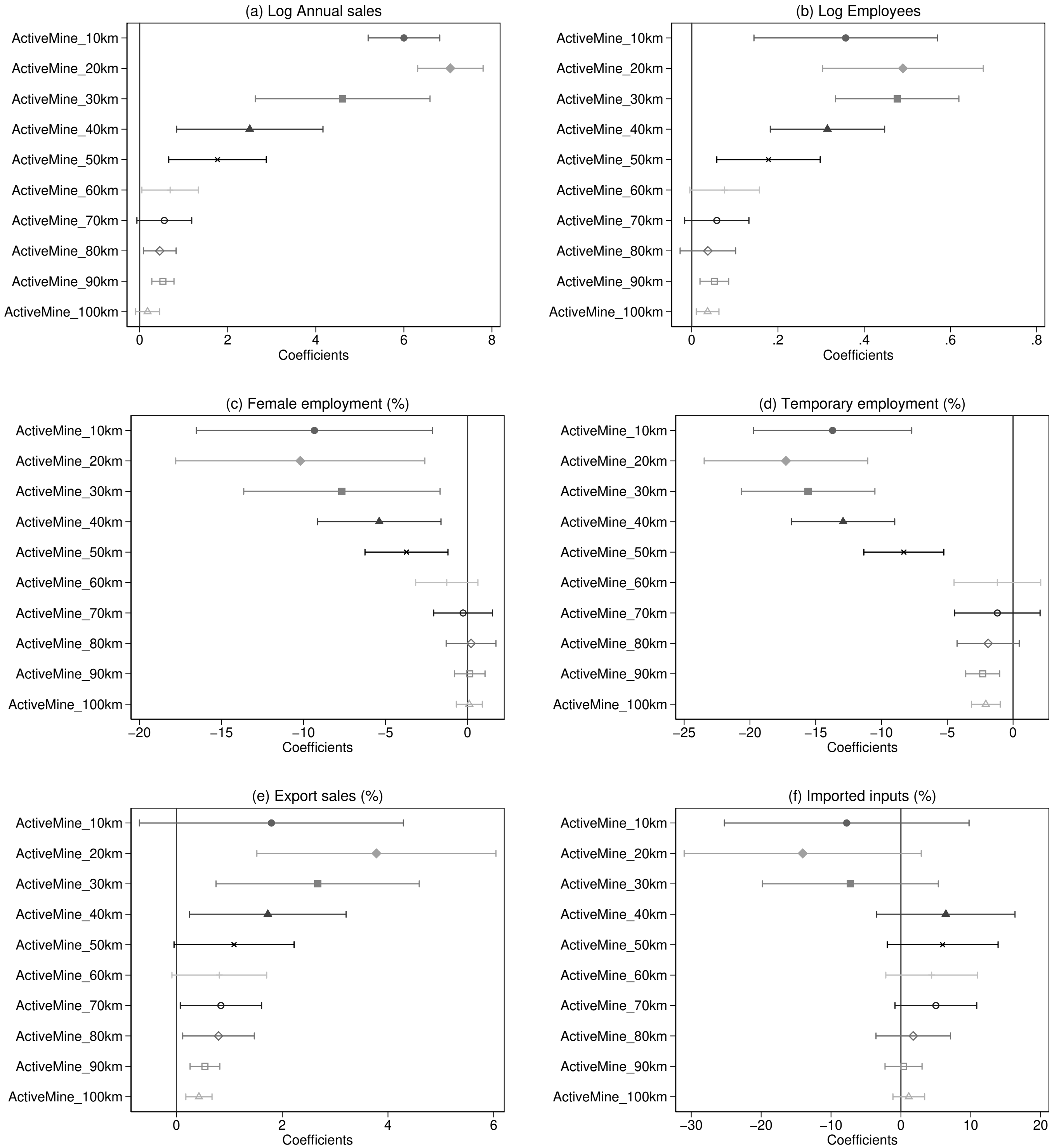

Figure 2: Different distance selection

Notes: The y-axis represents the treatment variable calculated using different distance thresholds, while the x-axis displays the corresponding coefficients for the outcome variables: (a) logged annual sales; (b) logged number of employees; (c) female employment ratio; (d) temporary employment ratio; (e) export sales ratio; and (f) imported inputs ratio.

4.2 Selection into treatment

We then estimate Equation (2), following the approach of Kotsadam and Tolonen (2016), to control for unobservable location-specific characteristics that may be correlated with both firm performance and the selection of mining sites. This is achieved by including proximity to inactive mines and comparing the differences in outcomes.

Table 3 presents results based on proximity to both active and inactive mines within a 30-kilometer radius. The findings indicate that proximity to inactive mines does not generate effects comparable to those observed near active mines. Firms near inactive mines exhibit either statistically insignificant coefficients (columns 2–5) or coefficients with the opposite sign (columns 1 and 6), suggesting that the baseline results are unlikely to be driven by pre-existing locational advantages or selection effects, but rather reflect the causal impact of mining activity.[†]

The differences shown in the middle panel represent the net effects of gold mining activity. F-tests reported in the table confirm that the differences between the effects of proximity to active versus inactive mines are statistically significant for most outcomes. The only exception is export sales, which becomes statistically insignificant once we account for selection effects. These results further strengthen the causal interpretation of our findings.

Importantly, the last column reveals a notable pattern. While proximity to active mines alone does not significantly affect the share of imported inputs (Column 6, Table 2), the inclusion of inactive mines as a comparison group alters the interpretation. Firms near inactive mines show a significantly positive association with imported input usage, suggesting that such areas may have been selected for reasons correlated with higher import reliance. Once this selection effect is accounted for, the net effect of mining becomes more pronounced and reaches marginal statistical significance ($p = 0.059$). This finding suggests that mining activity may, in fact, reduce firms' reliance on global input markets—an effect that would otherwise be masked by locational selection bias.

[†]The opposite-signed coefficients—indicating, for example, that mines tend to be located in areas where firms have lower sales and a stronger reliance on imported inputs—may even imply that our baseline estimates are conservative, potentially underestimating the true effects of mine activity.

Table 3: Selection in location

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
ActiveMine (30km)	4.464***	0.580***	-8.628**	-15.854***	1.760*	-5.584
	(1.454)	(0.089)	(3.858)	(3.968)	(0.948)	(6.872)
InactiveMine (30km)	-1.382***	-0.152	4.218*	4.727	0.671	8.647**
	(0.497)	(0.103)	(2.297)	(3.780)	(0.865)	(4.188)
Differences ($\beta_1 - \beta_2$)	5.846	0.732	-12.846	-20.580	1.089	-14.231
F-test: $\beta_1 - \beta_2 = 0$	17.830	29.862	10.548	20.661	0.728	3.589
p-value, F-test	0.000	0.000	0.001	0.000	0.394	0.059
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
R-squared	0.840	0.846	0.770	0.555	0.688	0.702
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. ActiveMine (30km) refers to firms located within a 30 km radius of an active mine, while InactiveMine (30km) refers to firms located within a 30 km radius of an inactive mine. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We find that employee productivity also increases significantly after accounting for locational selection bias, as reported in column (1) of Appendix Table A.4. Then we address potential confounding factors that could bias the observed effects of mining activity on firm performance. In column (2), we examine whether proximity to active mines is correlated with managerial quality by using the experience of the top manager as the outcome variable. In column (3), we use the gender of the top manager, which may capture broader management or ownership dynamics, particularly in settings with gender-based barriers to business. In both cases, the coefficients on active mines are small and statistically insignificant, suggesting that changes in firm performance are unlikely to be driven by variations in managerial characteristics. In column (4), we additionally include the log of annual sales from three years prior as a proxy for baseline firm performance, and examine whether new mines opened in the past three years affect the outcome. The joint F-test confirms statistically significant net effects of active mines.

4.3 Heterogeneity

To assess heterogeneity by local governance quality, we estimate a fully interacted model that distinguishes between firms located near active and inactive mines, and includes interactions with a binary indicator for country-level corruption control (coded as 0 for highly corrupt and 1 for relatively better-governed contexts, using corruption data from World Bank Governance Indicators). This specification allows us to examine how the impact of local firm activity varies across institutional environments.

The last rows of Table 4 report the difference in these corruption-specific effects ($\beta_3 - \beta_4$), capturing how the relative impact of proximity to active versus inactive firms varies with the quality of corruption control. The results indicate significant heterogeneity across several outcomes. For instance, firms in less corrupt areas experience a 14.463 log-point greater increase in annual sales when located near active mines compared to inactive ones (column 1), suggesting stronger market integration under better institutions. This occurs without a corresponding rise in employee numbers (column 2), indicating that productivity gains or

Table 4: Heterogeneous across institutional environments

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
ActiveMine	-1.443	0.441***	-0.035	-8.914***	-0.171	5.234
	(1.207)	(0.091)	(3.242)	(2.215)	(0.638)	(6.249)
InactiveMine	-0.611**	-0.201*	4.763**	2.679	0.533	6.410
	(0.269)	(0.111)	(2.183)	(3.974)	(0.931)	(4.412)
ActiveMine	9.364***	0.202	-14.327***	-10.577*	2.844*	-21.761**
*Less corruption	(1.289)	(0.143)	(5.476)	(5.501)	(1.469)	(10.468)
InactiveMine	-5.099***	0.430***	-11.430*	14.488	1.770	12.463*
*Less corruption	(0.513)	(0.121)	(6.675)	(11.720)	(2.149)	(7.354)
Differences ($\beta_3 - \beta_4$)	14.463	-0.229	-2.897	-25.065	1.074	-34.224
F-test: $\beta_3 - \beta_4 = 0$	112.334	1.412	0.114	3.425	0.147	6.818
p-value, F-test	0.000	0.236	0.736	0.065	0.701	0.010
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. ActiveMine (30km) refers to firms located within a 30 km radius of an active mine, while InactiveMine (30km) refers to firms located within a 30 km radius of an inactive mine. The corruption measure dummy interacts with the proximity to active and inactive mines, where the lower panel shows the difference in outcomes for firms located in regions with lower corruption (compared to those in regions with higher corruption). Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

higher capital intensity are more likely under better governance (as evidenced by a negative difference between β_1 and β_2 in more corrupt countries). This constitutes the most significant difference observed between the two governance contexts.

Moreover, firms in better-governed areas exhibit significantly reduced reliance on foreign inputs (column 6, p = 0.010), suggesting that stronger governance may facilitate greater localization or reshoring of production inputs. In contrast, while the effects on employment quantity and workforce composition are relatively muted, temporary employment shows a significant decrease (column 4, p = 0.065) for firms near active mines in better-governed areas compared to those in worse-governed areas, where firms show development primarily in terms of employment, mainly driven by temporary employment.

To assess heterogeneity in the impact of mining activity, we estimate fully interacted models distinguishing firms near active and inactive mines and examining how these effects vary by firm characteristics. First, to explore sectoral heterogeneity, we interact mining proximity with a service-sector indicator to test if extractive activity affects service firms differently than those in manufacturing and construction. Second, we assess firm-level heterogeneity by ownership structure, interacting mining proximity with a dummy for foreign-affiliated firms (those with at least 10% foreign ownership) to examine whether foreign and domestic firms respond differently to mining activity.

The last rows of Panel A, Appendix Table A.5, show the difference in sector-specific effects, highlighting how the impact of proximity to active versus inactive mines varies across sectors, particularly within the service sector relative to others. The results reveal significant heterogeneity in firm outcomes. For instance, service-sector firms near active mines experience a 4.237 log-point larger increase in annual sales, after accounting for selection effects, compared to non-service firms (column 1). Additionally, imported input usage shows a differential response, with only non-service firms shifting to local inputs. This makes sense, as service firms typically require fewer inputs.

Employment effects also exhibit heterogeneity. Total employment increases more substantially (column 2), while the workforce composition shifts—female employment declines (column 3), and changes in temporary employment (column 4) differ, though the latter is not statistically significant. These results, combined with the β_1 and β_2 estimates, highlight that the effects of mining activity hold for both service and non-service industries, with development being more pronounced in the service sector.

The last rows of Panel B in Appendix Table A.5 report the differential effects for foreign versus domestic firms. Foreign firms show slightly larger increases in both annual sales (column 1) and employment (column 2) in response to active mining. Other outcomes, like imported input usage, also display sizable gaps but are not statistically significant, likely due to the smaller number of foreign-affiliated firms in the sample.

4.4 Mechanisms

To assess the improvement of local business environment as potential mechanisms, we draw on firm responses to a series of standardized questions regarding operational obstacles. Firms were asked to evaluate the severity of various potential barriers to their business activities, including electricity supply, transportation infrastructure, customs and trade regulations, informal competition, access to land, court efficiency, crime and security, tax rates, tax administration, business licensing, political instability, corruption, access to finance, labor regulations, and the availability of adequately educated workers. Responses were recorded on a five-point ordinal scale: "No obstacle," "Minor obstacle," "Moderate obstacle," "Major obstacle," and "Very severe obstacle." These variables provide a nuanced view of how firms perceive different dimensions of the local institutional and infrastructural environment.

The results in Table 5 illuminate the mechanisms through which active gold mining operations generate positive spillovers for local firms. Specifically, in Panel A, proximity to active mines—measured by the number of active operations within a 30km radius—is significantly associated with reductions in reported obstacles related to power supply (Columns 1 and 2), transportation infrastructure (Columns 3 and 4), and customs procedures (Columns 5 and 6). These patterns suggest that mining activity improves local infrastructure and administrative efficiency, which in turn facilitates firm operations.

In Panel B, we focus on three additional variables. The reduction in court efficiency and tax issues further supports the argument that mining activity enhances the local legal and tax environment, making it more conducive to business operations. Specifically, mining activities, especially those led by foreign or joint ventures, prompt local governments to improve their tax management and judicial systems, benefiting all nearby firms. Additionally, the decrease in uneducated labor indicates that mining activities attract more skilled labor, which improves the overall quality of the workforce and alleviates concerns about labor quality.

Furthermore, the insignificant or even positive coefficients on inactive mines within a 30km radius (Columns 2, 4, and 6) highlight the importance of active mining operations, rather than simply reflecting a bias from location selection. These results support the interpretation that mining operations contribute to broader economic growth not only through direct channels like employment and procurement but also by enhancing the local business environment. This, in turn, enables firms to grow, hire more full-time workers, and engage in more resilient forms of international trade.

While gold mining operations are associated with improvements in several key business constraints, we find no statistically significant reductions in perceived obstacles related to political instability, labor regulations, access to finance, informal competition, access to land, or crime and security (see Appendix Table A.6). One possible explanation for this is that these dimensions reflect deeper, structural or institutional challenges that are less responsive to localized economic activity. For instance, political instability and labor regulations are often influenced by national-level policy environments, and therefore, may not be easily affected by local mining operations. Similarly, access to finance tends to depend on the broader development of financial markets, which is outside the scope of localized infrastructure changes.

Moreover, informal competition, land access, and crime and security are embedded in more entrenched institutional settings, such as weak property rights enforcement, ineffective policing, and pervasive market informality. These issues are unlikely to be directly altered by the presence of mining operations, as they are shaped by longer-standing legal, social, and economic systems.

These findings suggest that while mining activities can stimulate improvements in infrastructure and specific local institutional dimensions, their capacity to reshape more entrenched regulatory, legal, or political constraints remains limited.

5 Conclusion

Our study provides compelling evidence that gold mining operations generate significant positive spillovers for local firms in Africa. Using a comprehensive firm-level panel dataset and robust fixed-effects models, we find that proximity to active gold mines is associated

Table 5: Removing the obstacles

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	How much of an obstacle?					
	electricity		transport		custom and trade reg.	
ActiveMine (30km)	-0.484**	-0.494**	-0.539**	-0.535**	-0.637***	-0.571**
	(0.222)	(0.248)	(0.250)	(0.264)	(0.245)	(0.272)
InactiveMine (30km)		-0.055		0.019		0.323**
		(0.152)		(0.140)		(0.130)
Differences ($\beta_1 - \beta_2$)		-0.439		-0.554		-0.894
F-test: $\beta_1 - \beta_2 = 0$		3.142		4.719		10.300
p-value, F-test		0.077		0.031		0.001
No. of observations	9,325	9,325	9,227	9,227	8,668	8,668
Panel B	How much of an obstacle?					
	court		tax administration		less-educated workers	
ActiveMine (30km)	-1.093***	-1.126***	-0.459*	-0.426	-0.544***	-0.516***
	(0.188)	(0.235)	(0.241)	(0.260)	(0.171)	(0.140)
InactiveMine (30km)		-0.187		0.167		0.144
		(0.144)		(0.145)		(0.115)
Differences ($\beta_1 - \beta_2$)		-0.940		-0.592		-0.661
F-test: $\beta_1 - \beta_2 = 0$		16.524		4.939		18.493
p-value, F-test		0.000		0.027		0.000
No. of observations	6,850	6,850	9,247	9,247	9,159	9,159

Notes: The dependent variable in each column measures how severe each obstacle is perceived to be by firms, based on a Likert scale. *ActiveMine (30km)* refers to firms located within a 30 km radius of an active mine, while *InactiveMine (30km)* refers to firms located within a 30 km radius of an inactive mine. All regressions control for firm age, ownership structure (private, government, and foreign shares), legal status, and whether the firm is part of a larger business group. Standard errors, clustered at the sector-year level, are in parentheses. The rows labeled "Differences" report the coefficient difference between ActiveMine and InactiveMine, followed by the F-test and its corresponding p-value.

with substantial improvements in firm performance across multiple dimensions.

Specifically, firms located near active gold mines experience significant increases in annual sales and employment levels, with a notable shift toward more stable, full-time positions. While the absolute number of female employees increases slightly, the relative share of female employment decreases, suggesting that mining activities disproportionately stimulate job creation in roles traditionally dominated by men. Additionally, these firms exhibit enhanced export capabilities while potentially reducing their reliance on imported inputs, indicating a move toward more autonomous and resilient forms of international trade participation.

Importantly, our analysis reveals that these improvements are not merely reflections of location-specific advantages but rather causal effects of mining activity. This is evidenced by the stark contrast between firms near active mines and those near inactive mines, with the latter showing either insignificant or opposite-signed effects. Furthermore, the benefits of mining activity appear highly localized, diminishing rapidly beyond the 50-kilometer threshold.

The heterogeneous effects across governance contexts suggest distinct adjustment channels. In less-corrupted countries, proximity to active mines primarily boosts firm productivity—reflected in substantial increases in annual sales and reduced reliance on imported inputs—indicating stronger market integration and localized supply chains. In contrast, in more-corrupted countries, the main adjustment margin is employment expansion, particularly through temporary jobs, implying that labor absorption rather than productivity gains dominates the response to mining activity in weaker institutional environments.

The mechanisms driving these positive spillovers primarily involve reductions in business constraints related to power supply, transportation infrastructure, customs procedures, court efficiency, tax administration, and access to educated workers. These findings suggest that mining operations contribute to local economic development not only through direct channels like employment and procurement but also by enhancing the broader business environment.

Importantly, these benefits are not automatic—they depend on effective governance and strategic policy coordination. Governments should prioritize integrating mining operations into local supply chains to promote sustainable and broad-based economic development.

In more corrupt environments, where mining primarily stimulates temporary employment rather than productivity gains, policies should also focus on improving job quality and transitioning workers into more stable positions. At the same time, mitigating risks such as environmental degradation and social tensions is essential to preserve long-term gains. Finally, targeted efforts to enhance gender inclusion and reduce dependence on imported inputs can help build more inclusive and resilient local economies. By addressing these areas, policymakers can better leverage mining activities to foster sustainable and equitable growth in resource-rich regions.

References

Allcott, H., & Keniston, D. (2018). Dutch disease or agglomeration? The local economic effects of natural resource booms in modern America. *The Review of Economic Studies*, 85(2), 695-731.

Aragón, F. M., & Rud, J. P. (2015). Polluting industries and agricultural productivity: Evidence from mining in Ghana. *The Economic Journal*, 126(597), 1980-2011.

Aragón, F. M., & Rud, J. P. (2013). Natural resources and local communities: Evidence from a Peruvian gold mine. *American Economic Journal: Economic Policy*, 5(2), 1-25.

Bazillian, M., Sagar, A., Detchon, R., & Yumkella, K. (2020). Mines: The local wealth and health effects of mineral mining in developing countries. *Resources Policy*, 58, 232-249.

Bellemare, M. F., Fajardo-Gonzalez, J., & Gitter, S. R. (2018). Foods and fads: The welfare impacts of rising quinoa prices in Peru. *World Development*, 112, 163-179.

Benshaul-Tolonen, A. (2019). Gold Mining and Education: A Long-run Resource Curse in Africa? *The Journal of Development Studies*, 55(10), 2115-2136.

Benshaul-Tolonen, A. (2019). Local industrial shocks and infant mortality. *The Economic Journal*, 129(620), 1561-1592.

Berman, N., Couttenier, M., Rohner, D., & Thoenig, M. (2017). This mine is mine! How minerals fuel conflicts in Africa. *American Economic Review*, 107(6), 1564-1610.

Chuhan-Pole, P., Dabalen, A., Kotsadam, A., Sanoh, A., & Tolonen, A. (2017). At Africa's expense? Disaggregating the employment effects of Chinese mining operations in sub-Saharan Africa. *World Development*, 105, 400-418.

Chuhay, R., & Papyrakis, E. (2021). Unintended consequences of sanctions for human rights: Conflict minerals and infant mortality. *Journal of Health Economics*, 76, 102413.

Cust, J., & Poelhekke, S. (2015). The local economic effects of natural resource extraction. *Annual Review of Resource Economics*, 7(1), 251-268.

De Haas, R., & Poelhekke, S. (2019). Mining matters: Natural resource extraction and firm-level constraints. *Journal of International Economics*, 117, 109-124.

Edwards, R. B. (2016). Good mine, bad mine: Natural resource heterogeneity and Dutch disease in Indonesia. *Journal of Environmental Economics and Management*, 92, 101-117.

Fafchamps, M., Koelle, M., & Shilpi, F. (2017). Gold mining and proto-urbanization: Recent evidence from Ghana. *Journal of Economic Geography*, 17(5), 975-1008.

Harding, T., & Javorcik, B. S. (2011). Roll out the red carpet and they will come: Investment promotion and FDI inflows. *The Economic Journal*, 121(557), 1445-1476.

Hilson, G. (2016). The local socioeconomic effects of gold mining: Evidence from Ghana. *World Development*, 78, 131-141.

Kotsadam, A., & Tolonen, A. (2016). African mining, gender, and local employment. *World Development*, 83, 325-339.

Loayza, N., & Rigolini, J. (2018). Mining and quality of public services: The role of local governance and decentralization. *World Development*, 107, 163-175.

Loayza, N., Mezza-Cuadra, J., & Paris, J. (2013). The local impact of mining on poverty and inequality: Evidence from the commodity boom in Peru. *World Development*, 84, 219-234.

Mamo, N., Bhattacharyya, S., & Moradi, A. (2019). Intensive and extensive margins of mining and development: Evidence from Sub-Saharan Africa. *Journal of Development Economics*, 139, 28-49.

Parker, D. P., & Vadheim, B. (2017). Resource cursed or policy cursed? US regulation of conflict minerals and violence in the Congo. *Journal of the Association of Environmental and Resource Economists*, 4(1), 1-49.

Sánchez, F., & Polanco, D. (2018). Blessing and curse. The gold boom and local development in Colombia. *World Development*, 106, 337-355.

Santos, R. J. (2018). Mining and human capital accumulation: Evidence from the Colombian gold rush. *Journal of Development Economics*, 134, 591-608.

Stevens, P., Lahn, G., & Kooroshy, J. (2015). Winning the oil lottery: The impact of natural resource extraction on growth. *Chatham House Research Paper*.

Van der Ploeg, F. (2011). Natural resources: Curse or blessing? *Journal of Economic Literature*, 49(2), 366-420.

Venables, A. J. (2016). Using natural resources for development: Why has it proven so difficult? *Journal of Economic Perspectives*, 30(1), 161-84.

Wilson, N. (2012). Economic booms and risky sexual behavior: Evidence from Zambian copper mining cities. *Journal of Health Economics*, 31(6), 797-812.

Zabsonré, A., Agbo, M., & Somé, J. (2018). Gold exploitation and socioeconomic outcomes: The case of Burkina Faso. *World Development*, 109, 206-221.

Appendix A: Tables

Table A.1: Employment effects

	(1) Sales per capita	(2) Female emp.	(3) Male emp.	(4) Temporary emp.	(5) Full-time emp.
ActiveMine (30km)	3.937***	0.175	0.625***	-0.495**	0.578***
	(1.437)	(0.140)	(0.099)	(0.250)	(0.109)
Firm FE	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y
No. of observations	7,572	5,453	5,453	7,264	7,264

Notes: The dependent variables are the natural logarithm of the amount in sales per capita and the number of employees in each category: female, male, temporary, and full-time workers, respectively. In contrast to the baseline results, where the dependent variables are employment shares, here we focus on employment levels. The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Inclusion of concentric distance bands

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
ActiveMine 0-30km	6.331***	0.527***	-12.690**	-10.534**	0.699	-12.919
	(2.159)	(0.100)	(5.278)	(4.283)	(1.133)	(8.171)
ActiveMine 30-100km	-0.432***	-0.003	1.085*	-1.088	0.135	2.520**
	(0.139)	(0.020)	(0.602)	(0.872)	(0.175)	(1.132)
ActiveMine 100-150km	-0.362**	0.050*	0.460	-1.705	0.422	1.325
	(0.156)	(0.027)	(0.820)	(1.300)	(0.282)	(1.580)
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. *ActiveMine 0–30km*, *30–100km*, and *100–150km* refer to firms located within 0–30 km, 30–100 km, and 100–150 km of an active mine, respectively. The coefficients capture how firm outcomes vary by distance from active mining operations. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Replacing to dummy variable

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
ActiveMine (30km)	6.849***	0.677***	-13.478***	-27.469***	2.242*	-9.466
	(0.637)	(0.105)	(3.947)	(5.410)	(1.163)	(8.648)
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Confounding factors

	(1) Sales per capita	(2) Experience of manager	(3) Gender of manager	(4) Annual sales
Annual sales - 3 years ago				0.519***
				(0.058)
ActiveMine (30km)	3.872***	-1.804	0.100	1.846*
	(1.430)	(1.332)	(0.065)	(1.026)
InactiveMine (30km)	-1.224**	-2.156	0.084	-1.726***
	(0.502)	(1.993)	(0.071)	(0.451)
Differences ($\beta_1 - \beta_2$)	5.096	0.352	0.017	3.572
F-test: $\beta_1 - \beta_2 = 0$	13.978	0.027	0.034	14.362
p-value, F-test	0.000	0.870	0.855	0.000
Firm FE	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y
No. of observations	7,572	8,977	8,979	5,285

Notes: The dependent variables are the manager's years of experience, an indicator for whether the manager is female, and the log of annual sales, respectively. Column (3) additionally controls for the log of annual sales three years ago. *ActiveMine (30km)* and *InactiveMine (30km)* indicate firms located within a 30 km radius of an active or inactive mine, respectively. All regressions include firm fixed effects, sector-year fixed effects, and firm-level covariates. Standard errors are clustered at the sector-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Heterogeneous across industries and ownership structure

	(1) Annual sales	(2) Employees	(3) Female emp.	(4) Tem. emp.	(5) Export sales	(6) Imported inputs
Panel A						
ActiveMine (30km)	3.059*	0.517***	-3.725	-19.251***	0.529	-8.151
	(1.593)	(0.113)	(3.250)	(4.986)	(0.994)	(7.543)
InactiveMine (30km)	-1.087*	-0.024	3.131	-2.103	0.269	9.495**
	(0.636)	(0.142)	(3.407)	(3.302)	(1.301)	(4.572)
ActiveMine (30km)*Service	4.777***	0.181	-11.868*	9.777	3.670**	39.777**
	(1.713)	(0.144)	(6.280)	(8.571)	(1.743)	(17.398)
InactiveMine (30km)*Service	-0.620	-0.323*	0.979	17.558***	1.186	-11.102
	(0.996)	(0.172)	(4.277)	(5.339)	(1.761)	(7.167)
Differences ($\beta_3 - \beta_4$)	5.398	0.504	-12.848	-7.781	2.485	50.879
F-test: $\beta_3 - \beta_4 = 0$	9.198	5.850	3.842	0.752	1.099	9.100
p-value, F-test	0.003	0.016	0.051	0.387	0.295	0.003
Panel B						
ActiveMine (30km)	4.237***	0.537***	-8.128**	-14.867***	2.114**	-8.497
	(1.519)	(0.095)	(3.841)	(4.126)	(0.928)	(8.188)
InactiveMine (30km)	-1.305**	-0.090	4.902**	2.142	0.220	9.336**
	(0.504)	(0.123)	(2.138)	(3.202)	(0.966)	(4.648)
ActiveMine (30km)*Foreign	1.372	0.271	-5.682	-5.443	-2.346	16.713
	(0.886)	(0.213)	(6.797)	(7.890)	(3.311)	(13.689)
InactiveMine (30km)*Foreign	-0.177	-0.159	-1.403	5.814**	1.161	-9.840
	(0.186)	(0.117)	(0.913)	(2.910)	(0.956)	(8.844)
Differences ($\beta_3 - \beta_4$)	5.542	0.628	-13.030	-17.009	1.894	-17.833
F-test: $\beta_3 - \beta_4 = 0$	2.787	2.789	0.410	1.870	1.178	2.450
p-value, F-test	0.096	0.096	0.523	0.172	0.279	0.119
Firm FE	Y	Y	Y	Y	Y	Y
Sector#Year FE	Y	Y	Y	Y	Y	Y
Firm-level controls	Y	Y	Y	Y	Y	Y
No. of observations	7,678	8,885	5,453	7,264	8,568	4,383

Notes: The controls include firm age (measured by the number of years since establishment), ownership structure (percentages of private, government, and foreign ownership), legal status (e.g., shareholding company with traded or non-traded shares, sole proprietorship, partnership, limited partnership, or others), and whether the firm is affiliated with a large enterprise. *ActiveMine (30km)* refers to firms located within a 30 km radius of an active mine, while *InactiveMine (30km)* refers to firms within a 30 km radius of an inactive mine. The service-sector dummy and foreign-share dummy are interacted with proximity to active and inactive mines in Panels A and B, respectively. The lower part of each panel reports the difference in outcomes for service-sector firms or firms with foreign ownership compared to others. Standard errors, clustered at the sector-year level to account for potential autocorrelation, are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Removing the obstacles II

	(1)	(2)	(3)	(4)	(5)	(6)
	How much of an obstacle?					
	political instability	labor regulation	access to finance	informal competitor	access to land	crime
ActiveMine (30km)	-0.551**	-0.320***	-0.160	-0.177	-0.489*	-0.257*
	(0.260)	(0.119)	(0.254)	(0.243)	(0.272)	(0.137)
InactiveMine (30km)	-0.554***	-0.030	-0.237*	-0.037	-0.516***	-0.193**
	(0.187)	(0.144)	(0.138)	(0.154)	(0.128)	(0.080)
Differences ($\beta_1 - \beta_2$)	0.003	-0.290	0.077	-0.141	0.027	-0.065
F-test: $\beta_1 - \beta_2 = 0$	0.000	2.798	0.091	0.267	0.011	0.185
p-value, F-test	0.991	0.095	0.763	0.605	0.917	0.668
No. of observations	7,474	9,286	9,065	8,885	7,449	8,630

Notes: The dependent variable in each column measures how severe each obstacle is perceived to be by firms, based on a Likert scale. *ActiveMine (30km)* refers to firms located within a 30 km radius of an active mine, while *InactiveMine (30km)* refers to firms located within a 30 km radius of an inactive mine. All regressions control for firm age, ownership structure (private, government, and foreign shares), legal status, and whether the firm is part of a larger business group. Standard errors, clustered at the sector-year level, are in parentheses. The rows labeled "Differences" report the coefficient difference between ActiveMine and InactiveMine, followed by the F-test and its corresponding p-value.