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How Did Multinational Mining Enterprises from China Affect the Economic Development in Host Developing Countries?

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Abstract

This paper examines the impact of Chinese multinational mining enterprises on local economic development. We construct a novel database linking global mining activities to their ultimate owners, finding that Chinese firms target underdeveloped, resource-intensive regions. Using satellite data on nighttime lights and population, our econometric analysis reveals that Chinese mines significantly boost local economic activity. A new Chinese-owned mine increases both light intensity and population density in low and lower-middle-income countries. This positive, localized effect is not observed for investments from other nations, suggesting Chinese mining can be a unique catalyst for economic growth in developing regions.

Keywords

Chinese Multinational Enterprises; Chinese Outward Direct Investment; Mining Activities; Local Economic Development; Nightlight.

1. Introduction

The first two decades of the 21st century have witnessed a profound recalibration of the global economic order, marked by the meteoric rise of the People's Republic of China not only as a manufacturing powerhouse but also as a formidable source of global capital. This transformation is nowhere more evident than in the extractive industries, where Chinese multinational enterprises (MNEs) have emerged as dominant players, reshaping resource landscapes from the copper belts of Africa to the nickel-rich islands of Southeast Asia and the lithium triangle of South America. China's Outward Direct Investment (ODI) has surged, with total non-financial ODI reaching US143.9 billion in 2024, experiencing dramatic fluctuations that reflect the sector's sensitivity to global commodity cycles and shifting policy imperatives[1].

The proliferation of Chinese mining investments across the developing world has ignited a polarized and often contentious debate. On one side, proponents view Chinese capital as a vital catalyst for economic growth. In this narrative, Chinese MNEs provide much-needed investment in regions often overlooked by Western capital, creating jobs, transferring technology, and building critical infrastructure that can unlock broader economic potential[2]. For many developing nations, China presents an alternative development partner, one seemingly unencumbered by the political conditionalities, and historical baggage associated with traditional Western donors and financial institutions. Conversely, a growing chorus of critics presents a far more troubling picture. This perspective frames China's engagement as a modern form of resource colonialism, driven by a rapacious appetite for raw materials with little regard for the long-term well-being of host nations[3].

This research makes two primary contributions. First, we merge comprehensive mining activity databases with enterprise ownership databases to identify ultimate owners of global mining activities and map the transnational ownership network, revealing the true extent of Chinese control in global mining operations. Second, we employ empirical testing of mining

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activities' local economic impact in developing countries using geographical big data including nighttime lights and population distribution, providing unprecedented precision in measuring development outcomes within specific radii of mining operations.

2. Literature Review and Hypothesis

2.1. Chinese Enterprises' Foreign Investment

Chinese outward direct investment has evolved from resource-seeking opportunism to systematic policy-driven expansion, with state-owned enterprises leading mining sector investments[4]. China's overall ODI reached $146.5 billion in 2022, with mining representing a strategic priority despite comprising a smaller share of total flows. The "Going Global" strategy initiated in 2000 explicitly encouraged Chinese companies to invest overseas to secure natural resources and develop technological capabilities.

Chinese enterprises demonstrate distinctive characteristics in their foreign investment behavior, including infrastructure-for-minerals models exemplified by the "Angola model," state-backed financing through policy banks, and long-term infrastructure commitments alongside mining investments. The 2006 announcement of Strategic Mineral Reserves to stockpile uranium, copper, and aluminum illustrates the strategic nature of Chinese mining investments, driven by resource security rather than purely commercial motives[5].

Chinese mining companies exhibit operational preferences for resource-intensive areas with favorable geological conditions and underdeveloped regulatory frameworks, often accepting higher political risks than Western competitors. This pattern reflects competitive advantages in navigating complex political environments and securing bids in informal mining sectors or regions with weak governance structures.

2.2. Global Multinational Mining Corporations

The global mining industry remains dominated by Western corporations from Canada, Australia, and the UK, though experiencing significant expansion from emerging economy multinationals. Major players maintain concentrated market positions, with Chinese companies controlling approximately 3% of global mine production value despite perceptions of larger dominance. Industry investment patterns show increasing focus on critical minerals essential for renewable energy transitions, with lithium, cobalt, and rare earth elements attracting substantial capital flows[6].

Multinational mining corporations demonstrate varied operational approaches and development impacts. World Bank analyses reveal mining sector reforms generate average growth rate increases of nearly 6% compared to 1.1% globally, with Human Development Index improvements of 0.69 points (17%). Mining operations typically create direct employment plus 3-4 indirect jobs per mining position, though impact varies significantly based on company practices, local policies, and integration with broader development strategies[7].

2.3. Chinese ODI In the Mining Sector

Chinese mining investments concentrate heavily in Sub-Saharan Africa, Latin America, and Southeast Asia, with Zambia historically representing the largest destination followed by the Democratic Republic of Congo emerging as second after 2012, and India rising to third position by 2022. Investment flows show clear commodity preferences, with copper representing the largest investment category, followed by lead and gold mining operations.

Annual trends demonstrate fluctuating growth with rapid expansion during 2012-2017, followed by correction and strategic repositioning. The 2013 peak of $24.808 billion gave way to volatility including a record low of -$3.702 billion in 2017, indicating significant divestments and write-downs during commodity price downturns. Recent recovery shows more measured

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growth approaches with enhanced risk assessment and environmental, social, and governance considerations.

Hypothesis 1: Chinese mining multinational enterprises prefer to invest in underdeveloped regions and resource-intensive areas, accepting higher political risks in exchange for favorable resource access and lower entry costs.

2.4. Local Effects of Mining Activity

The literature on mining's local economic effects reveals complex relationships between resource extraction and development outcomes. Theoretical frameworks including the World Bank's Extractive Industries Value Chain identify five critical stages: legal frameworks for investment attraction, regulatory monitoring capacity, transparent revenue collection, revenue distribution and management, and sustainable development implementation. Countries successfully implementing these stages demonstrate sustained positive development outcomes.

Empirical evidence consistently shows positive correlations between mining investment and local economic indicators when appropriate institutional frameworks exist. Argentina demonstrated 256,000 job creation (259% increase) and $4.1 billion in exports (275% increase) following mining sector reforms, while Tanzania saw mining's GDP contribution rise from 1.5% to 3.5% between 2000-2007. Methodological approaches increasingly employ geographical big data to measure mining impacts with enhanced precision. Nighttime lights data provides elasticity to GDP of approximately 1.3, with VIIRS Day-Night Band offering superior measurement compared to DMSP sensors[8]. Integration with population distribution data, satellite imagery, and mobile device information enables real-time monitoring of economic activity changes within specific radii of mining operations.

Hypothesis 2: China's mining industry increases the intensity of economic activity in host developing countries, measurable through enhanced nighttime lights and population growth within operational areas.

3. Evolution of Mining Activity in Developing Countries

To describe the current distribution patterns of host countries in the global mining industry, we first present the major trends in global mining projects and ownership shown as figure 1. Drawing on the S&P Global Metals & Mining database[9] and combining it with corporate ownership structures, We map global mining projects located in developing countries from 2000 to 2022 by their ultimate controlling company. The definition of a developing country follows the World Bank's classification: according to 2023 gross national income (GNI) per capita, calculated using the World Bank Atlas method, countries with a GNI per capita below $14,005 are defined as developing countries.

Chinese outward mining investments exhibit clear patterns supporting resource-seeking behavior in underdeveloped regions, validating Hypothesis 1 through documented investment flows and geographic concentration. Annual trends reveal fluctuating growth with dramatic expansion during 2012-2017, reaching peak investment of $24.808 billion in 2013 before experiencing volatility including record divestments in 2017.

Country-specific patterns demonstrate Zambia's position as the largest historical destination for Chinese mining ODI, beginning with China Nonferrous Metal Mining Company's 1998 acquisition of Chambishi copper mine for $20 million. Chinese companies invested over $400 million in Luanshya copper mine recapitalization and commissioned a $300 million copper smelter, with 27% of Zambia's copper exports destined for China by 2006. The Democratic Republic of Congo emerged as the second-largest destination after 2012, reflecting Chinese strategic positioning in critical mineral supply chains. India's rise to third position by 2022 represents geographic diversification of Chinese mining investments beyond traditional

African focus. While specific Chinese mining acquisitions in India remain limited due to FDI restrictions, increasing engagement through equipment supply, technology transfer, and processing partnerships indicates evolving investment strategies in more regulated environments.

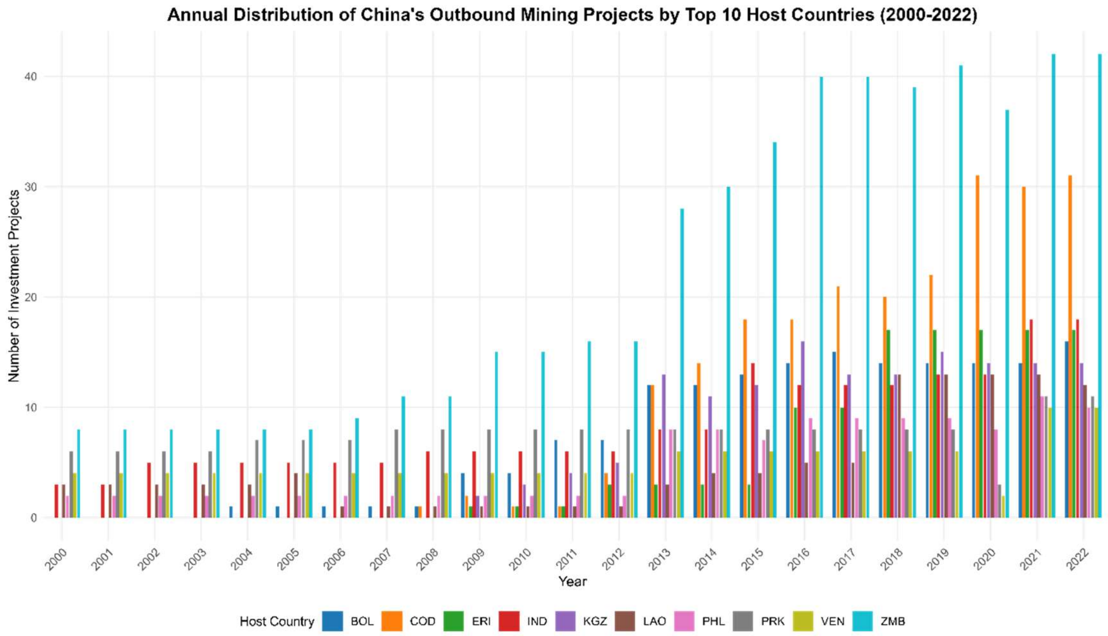

Figure 1. Annual Trends of China's Outward Mining Investments by Host Country (Top 10)

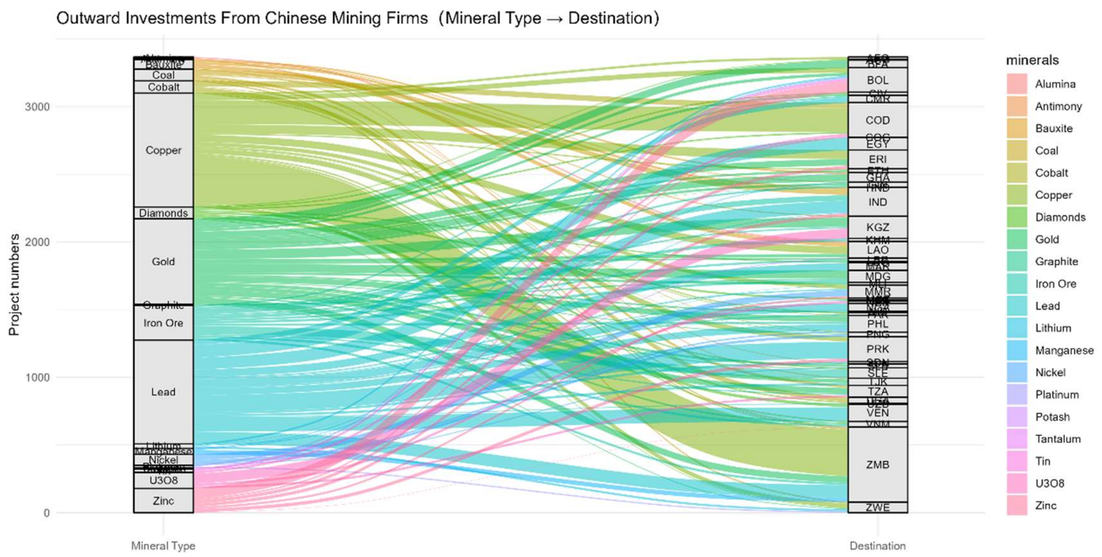

Figure 2. China's Outward Mining Investment Flows (Minerals → Host Countries)

More specifically, when taking a closer look at the host countries and mineral types, involved in these mining activities, we can refer to Figure 2. Each flow represents the volume of investments from a specific mineral category (e.g., copper, lithium, iron, etc.) to a corresponding host country. The width of each flow is proportional to the number of recorded investment projects, providing a straightforward overview of China's trade and aid of global mining footprint.

Commodity-specific investment patterns reveal copper as the largest investment category, concentrated in DRC and Zambia's copper belts, followed by lead mining focus in India and zinc

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operations in Bolivia. China's control of 72% of DRC's cobalt and copper mines, including major operations producing 12% of world's cobalt supply, demonstrates strategic positioning in critical mineral value chains essential for renewable energy transitions. Geographic concentration in resource-intensive regions with underdeveloped regulatory frameworks validates Hypothesis 1.

4. Local Economic Effects in Host Countries

4.1. Regression Design

In this paper, we will use regression analysis to further compare the impacts of MNEs from different source countries on host nations. This study focuses on local impacts measured by changes in population and nighttime light intensity around each mine. Following panel regression model with location and time fixed effects are designed to estimate the local effects:

$$\begin{aligned} Y_{i,t} = \ & \beta_1 CNMNE_{i,t} + \beta_2 OtherMNE_{i,t} \\ & + \gamma Controls_{i,t} + \alpha_i \times \theta_t + u_{i,t} \end{aligned} \tag{1}$$

$Y_{i,t}$ represents the population size and economic activity in year t within a 5km buffer zone centered on mine site i. Specifically, I create a 5km buffer around the geocoded location of each mining project and overlay it with high-resolution grids of population and nighttime light intensity. I use a satellite-derived proxy for population and nightlight intensity (from VIIRS or DMSP/OLS data) as a proxy for local economic activity. The core explanatory variables are three sets of dummy variables representing the source country of the project's owner: (1) a Chinese firm, or (3) a firm from another country. I include unit fixed effects and year fixed effects to control baseline differences and global confounding shocks (such as changes in commodity prices or host-country business cycles).

4.2. Dataset

The primary data source for this study is the S&P Global Metals & Mining database. This proprietary dataset (formerly known as SNL Metals) lists global mining projects, including their location (coordinates or administrative region), commodity, status (exploration, development, or production), and ownership. This database is widely used in research on the global distribution of metals and mining[10], deforestation effects[11], and related topics. This study classifies firms based on the ultimate parent company of the primary owning firm into two categories: (1) headquartered in China, and (3) headquartered in another developed/developing country. The project-level panel data runs from 2000 to 2022. We exclude projects located in developed host countries, focusing the analysis on developing host countries.

To measure local effects, this study uses Landscan, a global gridded population estimate, to track changes in the nearby population over time (2000-2022, with a resolution of 1km x 1km)[12]. To measure economic intensity, the study uses annual composite nightlight data from Chen[13], which converts NPP-VIIRS to DMSP-OLS-like NTL data between 2000 and 2022, with a precision of 1km x 1km. The use of nightlight data as a proxy indicator for local economic activity has been extensively validated in empirical research[14], [15].

4.3. Results of Local Effects

Empirical analysis using geographical big data provides robust evidence that Chinese mining projects generate significant positive economic impacts, validating Hypothesis 2 through measurable increases in nighttime light intensity and population growth within operational areas. Advanced satellite data analysis reveals that each additional Chinese mining project increases nighttime light intensity by 0.306 and population by 1,688 within a 5-kilometer radius in lower middle-income countries, demonstrating substantial localized economic activity enhancement.

In low-income countries, Chinese mining operations show even stronger development effects, increasing nighttime lights by 0.232 and population by 2,410 within 5-kilometer operational zones. These findings contrast sharply with mining operations from other source countries, which show no statistically significant effects on local economic indicators when controlling for project characteristics, investment scale, and host country factors.

The differential impact of Chinese versus non-Chinese mining operations reflects distinctive operational characteristics and investment modalities. Chinese mining companies typically implement infrastructure-for-minerals models involving substantial auxiliary investments in roads, power generation, and processing facilities that benefit broader local communities.

Table 1. Results of local effects of multinational mining firms

	(1)	(2)	(3)	(4)
	Lower middle income countries		Low income country	
VARIABLES	NTL	Population	NTL	Population
CN_investment	0.306**	1,688.024***	0.232***	2,409.859***
	(2.35)	(3.38)	(3.29)	(3.61)
Other_investment	-0.449	-2,949.079	-0.095	8,825.958
	(-1.35)	(-1.29)	(-0.59)	(1.08)
Constant	1.300***	43,681.718***	0.164***	25,779.063***
	(27.90)	(91.34)	(3.59)	(19.56)
Project FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	46,726	46,773	14,503	14,503
R-squared	0.916	0.950	0.842	0.971
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1				

5. Conclusion

This research provides comprehensive evidence that Chinese multinational mining enterprises significantly affect economic development in host developing countries through distinctive investment patterns and operational approaches. The analysis validates both primary hypotheses: Chinese mining companies demonstrate clear preferences for investing in underdeveloped regions and resource-intensive areas (Hypothesis 1), while generating measurable increases in local economic activity intensity (Hypothesis 2).

The transnational ownership network mapping reveals Chinese control of global mining operations, while remaining proportionally smaller than perceived, concentrates strategically in critical mineral supply chains essential for renewable energy transitions. Chinese companies control approximately 3% of global mine production value but hold dominant positions in specific commodities and regions, including 72% of DRC's cobalt and copper mines and substantial presence in Zambian copper operations.

Empirical findings using geographical big data demonstrate that Chinese mining projects generate statistically significant positive effects on local economic development, increasing nighttime light intensity by 0.232-0.306 and population by 1,688-2,410 within 5-kilometer operational zones. These effects contrast with mining operations from other source countries, which show no significant impacts on local economic indicators, suggesting distinctive Chinese approaches to mining investment and community engagement.

The evolution of Chinese mining investment from opportunistic resource-seeking to systematic policy-driven expansion reflects China's strategic imperative to secure critical mineral supplies while contributing to host country development through infrastructure investment and sustained operational commitment. Future research should examine long-term sustainability of these development impacts and comparative analysis of different mining company operational models to inform policy frameworks maximizing extractive industries' contribution to sustainable development.

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