



Mine suppliers: Understanding backward linkages in Kitwe, Zambia[☆]

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ABSTRACT

The integration of domestic firms into the mining global value chain (GVC) can bolster local economies, yet the scale and impact of these linkages remain largely unknown. This study examines the mining value chain in Kitwe, a key mining hub in Zambia's Copperbelt. Ten years of official government VAT data on domestic purchases and imports reveals that mine suppliers have a stronger presence in the Kitwe import market compared to other local firms. However, their demand for goods and services, both domestically and internationally, is influenced by fluctuations in the global copper price. In addition, our cross-sectional firm survey indicates that mine suppliers are older, larger, and more likely registered with tax authorities. The majority of surveyed firms express strong interest in entering the mining GVC but report that competition, low demand and lack of network connections constrain them from achieving their desired level of engagement. Policy efforts should focus on fostering stronger, higher value-added linkages and connecting more local firms to the mining sector, while also developing strategies to mitigate the deleterious effects of fluctuating copper prices.

1. Introduction

Zambia, a country abundant in minerals and metals, boasts a vibrant mining industry, with copper alone generating 80% of export earnings and accounting for about 14% of the national GDP (Sikamo et al., 2016; African Development Bank, 2019). Having been industrially mined for over a century in Zambia's Copperbelt Province, copper production is set to increase as the country aims to meet the growing global demand, projected to triple by 2040 due to the green energy transition's heavy reliance on copper (Hu and Gu, 2024; Mulder et al., 2024). Recently, the Copperbelt Province has seen a surge in new developments, further complemented by greenfield investments in the neighboring Northwestern Province.

Despite its economic significance, the mining industry has long been criticized for operating as an enclave, with a heavy reliance on pre-established supply chains and minimal integration into the local and domestic economy (Girvan and Girvan, 1970; Weldegiorgis et al., 2021). Limited and weak backward linkages from the mining industry

to domestic firms disproportionately affect small and medium enterprises (SMEs), hindering their ability to enter the mining global value chain (GVC) (Morris et al., 2011). This challenge is exacerbated in low- and middle-income countries like Zambia, where a significant proportion of firms are SMEs and face unique hurdles such as informality and limited access to essential inputs. In the face of an expected 'boom' in global copper demand and a reinvigoration of the Zambian copper mining industry, it is imperative to understand the local linkages and the constraints to deeper economic integration of the copper mining sector. This study set out to shed light on the larger mining value chain by focusing on Kitwe, a mining-centered city in the heart of the Zambian Copperbelt, and exploring the interactions between mines and domestic firms. Kitwe was selected for its strategic location near the majority of Zambia's large copper mines, and its role as a central hub for the country's mining industry, including emerald mining.¹

To gain insights into the economic landscape, we begin by analyzing two extensive tax datasets derived from the Value Added Tax (VAT)

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¹ The firm study conducted in Kitwe is part of a larger research initiative regarding industrial opportunities in the Copperbelt from the International Growth Centre, London.

reports submitted to the Zambia Revenue Authority (ZRA): (i) domestic firm-to-firm transactions, and (ii) taxable imports. Both datasets provide monthly transaction records spanning from late 2013 to late 2022. We categorize firms as either a (i) mine supplier, or (ii) non-mine supplier, with the former defined as firms that sold at least one good or service to one or more mining firms registered with Zambia Extractive Industries Transparency Initiative (ZEITI), within the data period. To narrow our analysis, we filter the data to include only transactions where the purchasing firm is classified as local to Kitwe, using their reported addresses.

Time series analysis reveals that local mine suppliers and non-mine suppliers follow similar time trends in domestic procurement and imports. Notably, while non-mine suppliers account for a larger share of the local economy, this is not reflected in imports, where mine and non-mine suppliers each account for roughly half of the total import value. The over-representation of mine suppliers in import share, compared to their smaller contribution to domestic procurement, may highlight the current reliance on imports in the mining industry and the potential opportunities for domestic industry development and value addition.²

Detailed regression analysis with over 65 thousand domestic observations confirms that mine suppliers are responsive to changes in the international copper price. A one unit increase in the international copper price is associated with a 0.308 million ZMW increase in domestic purchases among mine suppliers, equivalent to a 17% increase from the average firm's demand in a month. Similarly, using a dataset of over 22 thousand import observations, we find that the same one unit increase in the international copper price results in a 0.425 million ZMW increase in import value among mine suppliers, equivalent to a 15% increase from the average firm's import value in a month. We conclude that although mine suppliers have a stronger presence in the Kitwe import market, both their domestic and international demand for goods and services remain highly responsive to fluctuation in the international copper price. International copper price shows no significant correlation with domestic purchases or imports by non-mine suppliers.

To provide greater nuance, we collected a cross-sectional survey targeting firms in Kitwe that met two criteria: (i) have at least one full-time employee, and (ii) operate from a permanent structure. Firms supplying the mining industry were found to be older, larger and more likely to be registered with local authorities, underscoring the competitive advantage of more established firms in accessing the mining GVC. We do, however, recognize there may be a dynamic process whereby firms entering the GVC become more productive and ultimately formalize. Additionally, we found that the majority of surveyed firms expressed a strong interest in entering the mining GVC but cited several constraints that hindered their desired level of engagement. These barriers include competition, low demand, lack of network connections, as well as corruption and bribery.

Resource-dependent countries, like Zambia, ultimately face a double-edged sword. On the one hand, local and domestic firms may seek deeper integration into the mining GVC, aiming to leverage the positive effects such integration has on firm performance, including boosting revenue growth, profits, export capacity, and employment opportunities. Additionally, at its optimal level, procurement driven by backward linkages can boost government revenue via VAT, tariffs, and income tax, which can be redirected towards critical public services such as healthcare. On the other hand, the financialization of the global copper trade intrinsically ties Zambia to the volatility of international commodity prices. This dependence highlights the need for greater economic resilience to instability in copper mining and global markets. While deepening the linkages between local firms and the mining sector offers clear economic benefits, it also heightens vulnerability to

fluctuations in the mining sector, potentially putting these two policy recommendations at odds with each other. We must consider how these two aforementioned policy goals can be met concurrently: Are backward linkages to the mining industry able to serve as a springboard for fostering resilient, non-resource dependent firm growth? Country-level evidence generally suggests that this type of diversification is elusive.

2. Global value chains and backward linkages in Zambia

Foreign direct investment (FDI) by multinational corporations (MNCs) generates substantial economic spillovers (Barrios et al., 2011). However, the nature and magnitude of these spillovers depends not only on the sector and level of economic development in the host country but also on characteristics of the investing country—Chinese FDI, for example, is often met with skepticism and scrutiny (Kragelund, 2009). When foreign capital from MNCs is directed towards local suppliers, it can promote integration into the GVC. Studies find that firms integrated into multinational supply chains experience substantial growth in sales, workforce, and assets, highlighting the positive impact of inclusion into larger, established networks (Alfaro-Urena et al., 2022). Although the mining sector has been identified as a key opportunity for firms to increase local economic capture in an extractive, export-driven industry, mineral-based value chains have received little research attention (Fessehaie, 2012b).

Zambia, the seventh-largest copper producer in the world and second-largest in Africa (Kolala and Dokowe, 2021), is a case worth studying. Following independence in 1964, Zambia experienced high levels of local procurement in the mining sector due to Import Substitution Industrialization (ISI), despite diminishing copper production. However, the 1991 privatization of the mining sector and the abandonment of ISI, coupled with a dramatic drop in international copper price, led the local procurement to plummet, hampering inclusive economic growth (Lombe, 2018). Of the fifteen large mines,³ ZCCM Investment Holdings – under the management of the Zambian government – retained only between 10%–25% stake in ten of them, a 50% stake in one and full ownership (100%) of another. The remaining equity was acquired by a mix of Canadian, Indian, Middle Eastern, and Chinese investors (Ndikumana et al., 2024).⁴ Arguably, these foreign investments by MNCs further weakened backward linkages, as liberalization reinforced the dominance of original equipment manufacturers (OEMs) and their subsidiaries, reducing local demand (Caramento, 2020; Nsupilu, 2016).

Fessehaie et al. (2015) found that the mining sector in Zambia procures goods and services for a value of US \$2-4 billion annually. More than 20 years after mine privatization, in 2012, only a small share of said procurement was from firms that were overseas based (15.8%), and the lions share from firms that were locally registered subsidiaries of foreign firms (79.8%), with the rest defined as "wholly local", with Zambian citizens and residents as owners (4.4%) (Fessehaie et al., 2015). Nevertheless, domestic value creation, rather than simply ownership by local suppliers, is perceived as a more critical factor for development (Kragelund, 2017). Despite this, in Zambia, value creation continues to lag; although an estimated 84% of goods and services were locally procured in 2017 (the remainder imported), only 13% were classified as "true local procurement", referring to goods manufactured

² We do not have export records to explore differences in exports across the two types of firms.

³ In alphabetical order: (1) Bwana Mkubwa, (2) Chambishi Mines, (3) Chambishi Metals, (4) FQM Trident, (5) Grizzly Mining, (6) Kagem Mining, (7) Kansanshi Mines, (8) Kariba Minerals (Gems), (9) Konkola Copper Mines Plc, (10) Lubambe Copper mines, (11) Luanshya Mines, (12) Lumwana, (13) Lumwana Copper, (14) Mopani Copper Mine Plc, and (15) Munali Nickel Mine.

⁴ Ownership data for medium and small-scale mines is unavailable due to non-compliance with disclosure requirements set by the Patents and Companies Registration Agency (PACRA).

in Zambia, or provided by firms with Zambian ownership (African Development Bank, 2019).⁵ Similar low levels of “true local procurement” have been reported throughout Africa. For example, in South Africa 75%–90% of inputs to Platinum Group Metals (PGM) producers are sourced locally, but the “true local” value addition of finished goods is much lower, ranging from 5%–20% (Lydall, 2009).

Local content policies (LCPs) have been a popular tool to realize some of the potential for domestic value creation and combat the perceived “enclave” nature of mines. LCPs may, among other things, set minimum targets for multinational firms for local procurement of goods and services, the hiring and training of citizens, and contribute to infrastructure projects (Ba and Jacquet, 2022).⁶ LCPs in the extractive sector are not a new policy tool: Norway regulated its oil industry in the 1970s to include targets for hiring of domestic workers and technology transfer (Ramdoo, 2018). While Norway, with an educated workforce and low levels of corruption, managed to turn LCPs into economic growth, the same policies have led to inefficiencies in countries with weak institutional capacity, high levels of corruption (Ba and Jacquet, 2022), and significant elite capture (Hansen et al., 2016). Furthermore, LCPs have been criticized for promoting “mining-centric” local economies, where supply chains are overly reliant on the demands of mining firms, making them highly susceptible to the sector’s volatility. This dependence undermines efforts to build resilient and diversified economies capable of withstanding external shocks (Weldegiorgis et al., 2021).

In Zambia, LCPs were incorporated into the Mines and Mineral Act of 1995, with the most recent amendment made in 2015 introducing a *preference* for suppliers and service agencies based in Zambia and owned by Zambian citizens. However, these “soft” LCPs – relying on compliance through “win-win” outcomes or “shared value creation” – have proven inadequate in cultivating robust backward linkages (Caramento, 2020). It has been suggested that their effectiveness has been consistently undermined by persistent mistrust between the government and mining firms, largely thanks to an unstable tax regime (Kragelund, 2017). As a result, tax-data and survey findings indicate that OEMs and their Zambian subsidiaries – possessing a competitive advantage due to their advanced technological capabilities, strong buyer relationships and the ability to offer discounts – continue to account for a large share of the mining industry’s demand (Fessehaie, 2012a; Nsupila, 2016). “Hard” LCPs, such as tariffs, taxes, and pricing policies designed to favor domestically produced goods, are crucial for the integration of local firms (Ovadia, 2016). Nevertheless, “hard” LCPs may be poorly received by mining firms that prioritize both quality and pricing.

Recently, the entry of Micro, Small, and Medium Enterprises (MSMEs) – accounting for 97% of businesses, 88% of employment, and 70% of GDP (Mwamba et al., 2022) – into the mining GVC has been lauded once again as an opportunity for the sector to drive sustainable growth and poverty abatement in Zambia (Kanyinji and Tembo, 2019b; African Development Bank, 2019). In order to do so, targeted, research-based policies must be introduced. Up to this date, limited studies on Zambian firms found a wide variety of constraints that hinder firms’ competitiveness and prevent them from entering the GVC: from access to technology, credit, and managerial know-how, to legal and tax framework relating to licensing, product standards, and

tax compliance (Chisala, 2008; Fessehaie, 2012b).⁷ Published research on 15 years of firm data from Africa shows that these constraints are far from unique to Zambian firms or mine suppliers, but represent obstacles faced by SMEs across the continent in generating growth, attracting investment, and increasing exports (Bigsten and Söderbom, 2006).

2.1. The geography of mining

A large literature seeks to understand the economic and geographic footprint of large-scale mines. The effects can be examined at three levels: (i) the macro level, encompassing impacts on, for example, national accounts, government spending, exchange rates; (ii) the district level,⁸ focusing largely on the redistribution of mining taxes and royalties to sub-national areas; and (iii) the local level, referring to the immediate vicinity of the mines.

At the local level, there has been extensive empirical research over the past decade aimed at identifying the causal effects of the mining sector in Africa. The sector has been generally characterized as hyper-localized, with spillovers concentrated within 20 to 30 kilometers of mines. These effects include impacts on employment and income (Aragón and Rud, 2013; Coulibaly et al., 2024; Kotsadam and Tolonen, 2016; Lapeyronie and Szedlacsek, 2025; Mamo et al., 2019; Wilson, 2012), agricultural output (Aragón and Rud, 2016), health (Benshaul-Tolonen, 2019; Cossa et al., 2022; Von der Goltz and Barnwal, 2019), and political economy, particularly in relation to corruption and conflict (Axbard et al., 2021; Bhattacharyya and Mamo, 2021; Berman et al., 2017; Knutsen et al., 2017). In the case of Zambia, studies found that copper booms improved living standards and economic activity (Lippert, 2014), and reduced sexual risk-taking behavior (Wilson, 2012). The local level literature was comprehensively summarized by Cust and Poelhekke (2015), but has grown since.⁹ Notably, a geographic analysis across nine countries found that firms located in close proximity of mines (< 20 km) face greater infrastructure and input constraints than those farther away (De Haas and Poelhekke, 2019). More recent research on green energy transition minerals – copper among them – has reaffirmed the localized economic impacts of new mines, though these effects depend on pre-existing local institutions (Lapeyronie and Szedlacsek, 2025).

The literature clearly identifies hyper-local spillovers, challenging the enclave theory. However, if the enclave theory is to be understood in relative terms as the degree to which the mining industry is integrated into the local economy in proportion to its scale, the literature does not yet offer a definitive answer. We contribute to the sub-national understanding of backward linkages by our strategic focus on Kitwe: a city situated in the heart of the Copperbelt Province, central to Zambia’s hub-and-spoke road network and distanced from Lusaka’s difficult roads that restrict access to Angola and the Democratic Republic of Congo (Mulder et al., 2024). Kitwe (Fig. 1A) is tactically located near major copper mines in the region; within the city are Mopani Copper Mine and Konkola Copper Mine, while additional mines, such as Chambishi and NFC, are located in the surrounding vicinity. The restricted area for emerald mining is located approximately 50 kilometers south of Kitwe. Fig. 1B shows the city of Kitwe, highlighting main roads, railways, and mines, – several are located within the city boundaries – as well as mining headquarters.

⁷ Recent empirical evidence from Zambia revealed fluctuations in local procurement, highlighting the vulnerability of the economy to business cycles. Benshaul-Tolonen and Fernandez Musso (2025) found, using dyadic data on VAT-registered transactions, that international copper price fluctuations drive changes in copper production in Zambia, and mining firms’ local procurement. A difference-in-difference analysis shows that firms entering a large copper mine supply network experience a boost in terms of revenue.

⁸ A study from Peru found that mining districts experience higher levels of consumption (Loayza and Rigolini, 2016), while research from Chile revealed that the backward linkages from copper mining are predominantly concentrated in the capital (Atienza et al., 2021).

⁹ We do not capture the full extent of this literature here.

⁵ Other sources cite even lower estimates of share of goods and services purchased from Zambian owned firms, with 2.1% quoted in Ross and Werker (2024).

⁶ The definition of local varies across countries: Local can refer to the geographic area surrounding an extractive industry, the region, or the country (Ba and Jacquet, 2022).

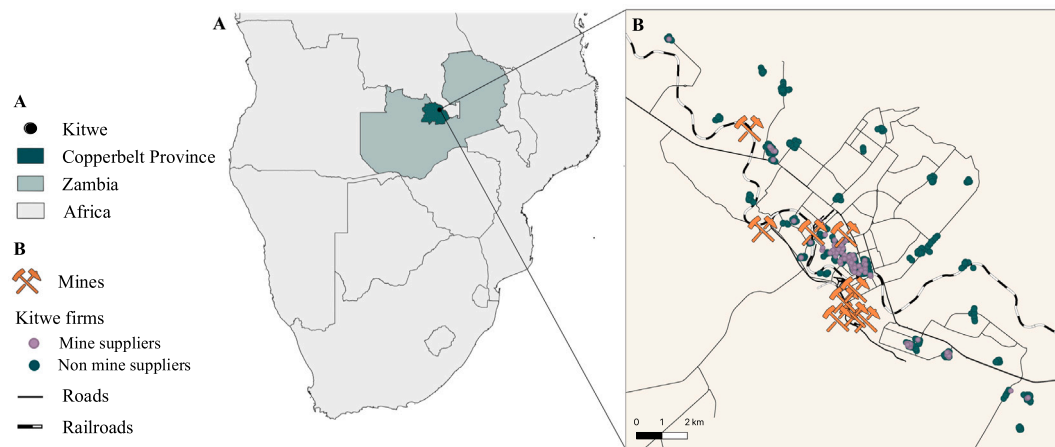


Fig. 1. A. Map of Southern Africa. B. Map of Kitwe, Copperbelt Province, Zambia, showing mine locations and firm distribution (including mine and non-mine suppliers).

3. Panel data on domestic and international transactions for firms in Kitwe

3.1. Data

Building upon previous research on the local procurement of the mining industry in Zambia (Benshaul-Tolonen and Fernandez Musso, 2025), we utilize data derived from the VAT reports submitted to the ZRA on domestic and import transactions to shed light on firm behavior in Kitwe. To generate the final datasets used for analysis, we first classify all firms in the domestic firm-to-firm dataset as either (i) mine suppliers – defined as firms that sold at least one good or service to one or more of the 216 ZEITI registered mining or quarrying firms in Zambia between late 2013 and late 2022 – or (ii) non-mine supplier. Since imports involve foreign sellers, the classification process used for the domestic firm-to-firm dataset cannot be directly replicated. Instead, for the imports dataset, we use the list of mine suppliers from the domestic firm-to-firm dataset to classify importers as either (i) mine suppliers, or (ii) non-mine suppliers. After incorporating mine supplier information, we exclude all observations where the purchasing firm is classified as a mine or quarry according to the ZEITI list, and retain only observations where the purchasing firm is registered in Kitwe, based on public domestic records. The largest mining firms in the datasets include 10 large-scale copper producing mines, in addition to two large emerald mines (located near Kitwe), along with numerous medium- and small-scale mining operations. The majority of these mining firms fail to comply with the disclosure requirements for beneficial ownership, as regulated by Patents and Companies Registration Agency (PACRA), rendering ownership information too incomplete for inclusion in the dataset and subsequent analysis.

Ultimately, we retain a sample of 1,784 unique firms registered in Kitwe, of which 34.6% ever supplied a mining firm (Table 1). These mine suppliers transacted with 133 unique mining firms out of the total 216 mining firms registered with ZEITI. The highest number of transactions involve large copper mines, such as Mopani Copper Mine and Konkola Copper Mine. In addition to copper operations, Kitwe mine suppliers engage with emerald mines and limestone companies. As shown in Appendix Table 5, the largest supplier sectors by number of recorded transactions are wholesale and retail trade, manufacturing, and professional, scientific and technical activities, followed by mining and quarrying, which accounts for 75,054 transactions, or 6.7% of the total.

Additionally, we identify 1,264 unique companies located in Kitwe who also import goods and services from abroad, 38.8% of which are classified as mine suppliers (Table 1). Mining and quarrying-related imports stand for 10,656 import transactions, representing 2.5% of all

recorded imports (Appendix Table 5). This excludes imported goods or services directed to the mining industry which are not classified as a mining-related product (e.g., food for employees), as well as direct imports by mines.

Table 1 shows that approximately one third of the firms in Kitwe can be categorized as mine suppliers. Fig. 2 illustrates that these firms contribute significantly to the local economy through the procurement of domestic goods and services. However, they still represent a smaller portion of the local economy compared to non-mine suppliers. It is important to note that, as these are dyadic identifiable supplier-purchaser transactions, the firms classified as mine and non-mine suppliers in the data are actually purchasers, while the actual suppliers can be located anywhere in Zambia, not just Kitwe. Interestingly, the time trends in local procurement for mine and non-mine suppliers in Kitwe follow similar patterns, with a few notable exceptions.

The patterns for imports differ from those for domestic procurement. In fact, importing firms in Kitwe that are classified as mine suppliers have, on average, similar levels of imports (in million ZMW, inflation adjusted) to non-mine suppliers (Fig. 3). This suggests that mine suppliers are overrepresented in imports relative to their domestic footprint, seen in Fig. 2. This discrepancy may be partly explained by mine suppliers importing goods specifically for the mining industry in response to the pressure from the LCPs mandating domestic sourcing. Additionally, the difference could reflect firms entering the GVC becoming more established and internationally oriented.

The dashed vertical line marks the implementation of the most recent amendment to Zambian local procurement policy in 2015. In Fig. 2, there is no clear visible change in procurement before and after the policy implementation. However, in Fig. 3, by 2016, the small differences in import levels between mine and non-mine suppliers observed prior to the policy was implemented seem to disappear, suggesting that the policy may have redirected some imports from the mines to mine suppliers.

3.2. How the copper price drives local demand: regression analysis

Next we leverage our two datasets on domestic transactions and imports from firms located in Kitwe to understand how their demand shifts in response to fluctuations in the mining industry. We model changes in copper mining intensity using the international copper price. Fig. 4 illustrates significant variation in the international copper price within the study period, with two significant periods of price increases: (i) 2016–2018 and (ii) 2020–2022. Previous research has shown a strong correlation between the international copper price, Zambian copper production, domestic demand from mining

Table 1

Summary statistics domestic and import datasets for firms in Kitwe.

	Mean	Std. Dev.	Min.	Max.	N
Domestic VAT transaction dataset					
Mine supplier	0.346				1,784
Monthly procurement value (million ZMW)	1.817	20.939	0.000	1770.511	65,300
Monthly procurement value mine suppliers (million ZMW)	1.415	6.312	0.000	400.282	20,321
Import VAT transaction dataset					
Mine supplier	0.388				1,264
Monthly import value (million ZMW)	2.883	11.538	0.000	667.334	22,443
Monthly import value mine suppliers (million ZMW)	3.621	14.693	0.000	524.557	8,819

Notes: All monetary values are pre-tax, in Zambian Kwacha and adjusted for inflation using the December 2023 Consumer Price Index (CPI). The domestic and import transaction datasets span from December 2013 to October 2022.

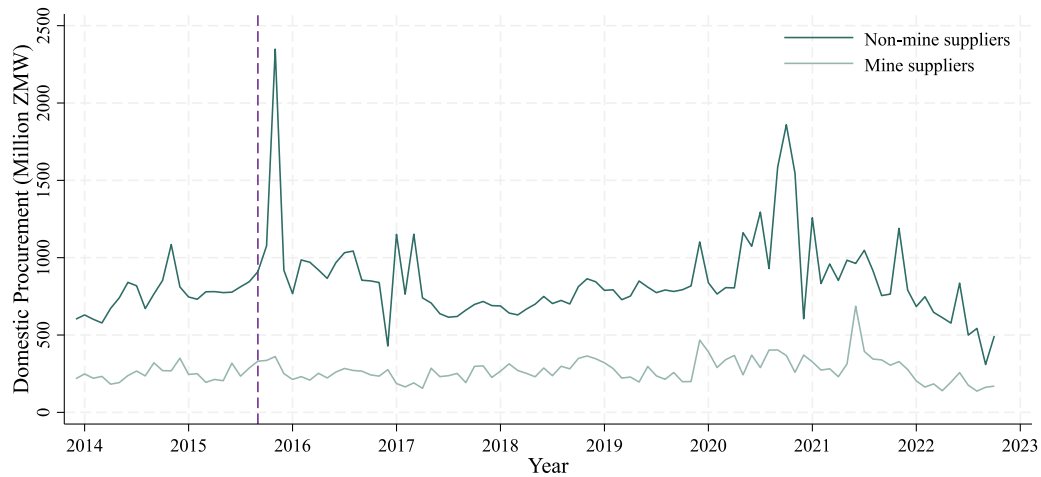


Fig. 2. Domestic procurement by mine suppliers and non-mine suppliers in Kitwe

Notes: The figure displays monthly domestic procurement in millions of ZMW, split by firms that are categorized as mine suppliers and non-mine suppliers. Purchasing firms are classified as local to Kitwe if their registered address is in Kitwe, while the supplier may be located anywhere in Zambia. The dashed vertical line marks the implementation of the most recent amendment to Zambian local content policy.

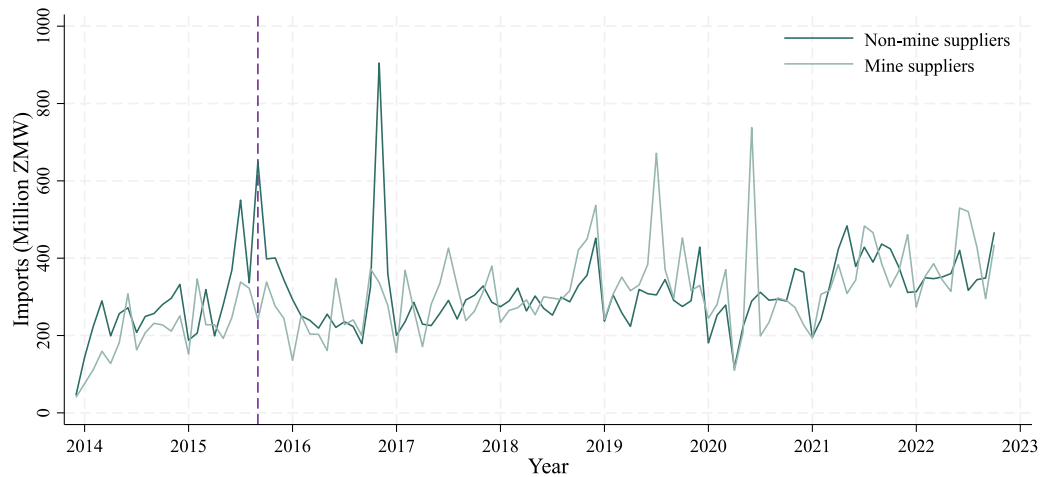


Fig. 3. Imports by mine suppliers and non-mine suppliers in Kitwe

Notes: The figure displays monthly imports in millions of ZMW, split by firms that are categorized as mine suppliers and non-mine suppliers. Purchasing firms are classified as local to Kitwe if their registered address is in Kitwe. The dashed vertical line marks the implementation of the most recent amendment to Zambian local content policy.

firms (Benschaul-Tolonen and Fernandez Musso, 2025), and the local Zambian economy (Wilson, 2012; Lippert, 2014).

One advantage of this model is that the copper price is exogenous to the Kitwe economy, allowing for the use of an interaction effect model to assess how the copper price drives local demand changes. However, a potential concern is that the international copper price is determined by the Kitwe economy, meaning that any effect identified in a regression model suffers from reverse causality—namely, that the Kitwe economy drives the international copper price. This is unlikely

for several reasons: (i) While the Kitwe economy is integral to the Zambian mining industry, the Zambian copper production hovers around 4% of the global production and may not be a price setter (Barry, 2019); (ii) We exclude mining companies from the analysis, so while copper mining companies' behavior may affect the international copper price, it is highly unlikely that local suppliers to the copper mines drive the international copper price; (iii) The copper price is driven by a range of complex factors, plausibly orthogonal to the Kitwe economy, including fundamentals factors like supply and demand of copper, as well as

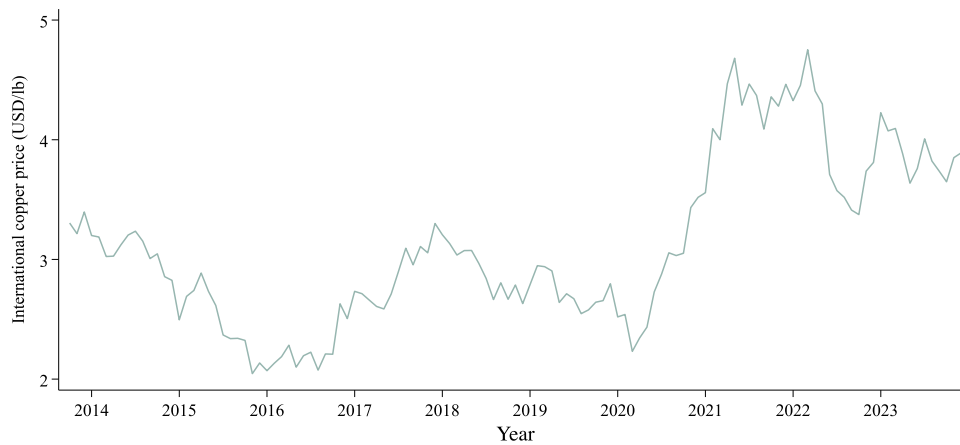


Fig. 4. International Copper Price.

non-fundamentals factors such as copper as an asset and financial speculation (Guzmán and Silva, 2018).

We estimate the following regression model:

$$\begin{aligned} \text{PurchaseValue}_{imys} = & \beta_0 + \beta_1 \text{MineSupplier}_i + \beta_2 \text{CopperPrice}_{imy} \\ & + \beta_3 \text{MineSupplier}_i \times \text{CopperPrice}_{imy} \\ & + \theta_m + \kappa_y + \gamma_s + \epsilon_{imys} \end{aligned} \quad (1)$$

Where subscript i stands for firm, and we include fixed effects m for month, y for year and s for sector. We use robust standard errors and cluster at year–month level. The main coefficients of interest are *MineSupplier*, *CopperPrice* and the interaction between said two.

Looking at the domestic data, we confirm that mine supplier status is negatively associated with domestic purchases (Table 2, Panel A, columns 1 and 2); that is, a mine supplier, on average, purchases less from domestic firms than a non-mine supplier in a month, when controlling for year, month and sector fixed effects. In general, the copper price does not drive demand for firms in Kitwe, as given by the coefficient for “copper price” (column 3). The last column (4) includes the interaction effect between mine supplier and the copper price, allowing for a heterogeneous effect of the copper price on such firms. While mine supplier is associated with a negative effect on domestic purchases, the interaction effect is positive and statistically significant. The interpretation is that the copper price has a strong effect on mine suppliers’ demand for goods and services: A one unit increase in the monthly copper price (equivalent to roughly 1/3 of its mean), is associated with a 0.308 million ZMW increase in domestic procurement of mine suppliers, in the same month. This is equivalent to a roughly 17% increase from the average monthly procurement value of a firm in Kitwe.

We then turn to the import dataset. First, mine supplier status is positively associated with imports, controlling for year, month and sector FE. Second, the interaction effect of mine supplier and price drives a lot of the demand changes in imports by mine suppliers (Column 4). This means that local firms who are linked to mines respond strongly to changes in the international copper price. Higher copper prices leads to such mines importing more, while concurrently driving greater procurement of goods and services from Zambian firms. A one unit increase in the monthly copper price is associated with a 0.425 million ZMW increase in the import value of mine suppliers, which is equivalent to a roughly 15% increase in the average monthly import value by firm.

The copper price has large, statistically significant, and contemporaneous effects on firms in Kitwe that are connected with mining firms. An increase in the international copper price affects both local demand and imports levels, highlighting the existence of backward linkages

and integration of local firms into the mining network.¹⁰ To better understand what these mine supplying firms look like, we collected a cross-sectional firm survey in Kitwe. The results are described in the following section.

4. Kitwe firm survey

For deeper insight into the constraints faced by domestic suppliers in Zambia’s mining industry, we collected a structured survey from 1,055 firms in the city of Kitwe, in the Copperbelt. The module was collected between January and March 2024 as part of a research study undertaken by UC Berkeley and the International Growth Centre (IGC). The survey team visited different areas of Kitwe and followed a left hand rule to construct a random sample. The sample inclusion criteria required firms to meet two conditions: (i) having a permanent structure from which they operate, and (ii) employing at least one full time worker. As a result, most small and informal firms were excluded from our analysis. Additionally, the sample may have underrepresented large firms due to lower response rates. Baseline characteristics are presented in Table 3.

4.1. Baseline characteristics

89.9% of surveyed firms in our sample qualify as MSMEs under Zambia’s employment-based definition¹¹—fewer than 10 employees for micro enterprises, 11 to 50 for small enterprises, and 51 to 100 for medium enterprises (Ministry of Small and Medium Enterprise Development, 2023). The Zambian Ministry of Small and Medium Enterprise Development emphasizes the role of MSMEs in national development policy, citing their importance for employment creation, poverty reduction, and inclusive growth. Indeed, MSMEs account for 70% of Zambia’s GDP and provide 88% of total employment (Ministry of Small and Medium Enterprise Development, 2023).

Moreover, out of the 1,055 surveyed Kitwe firms, 91.5% were registered, formal firms.¹² The level of registration among surveyed

¹⁰ A major limitation to this analysis is that not all mining firms located near Kitwe are involved in copper production. In fact, near Kitwe is the Ndola Rural Emerald Restricted Area, which contains both large and small emerald mines. Since there is no internationally traded price for emeralds, we are not able to conduct a comparable analysis to that performed for copper. The failure to take the prices of other precious gems, minerals and metals into account risks biasing our estimates towards zero.

¹¹ We lack access to additional firm characteristics that could help ensure accurate firm classification using a multifaceted definition.

¹² Registration can be with any agency; the city of Kitwe, Zambia Revenue Authority or other.

Table 2
Fluctuations in demand from local firms with the international copper price.

	(1)	(2)	(3)	(4)	(5)
Panel A					
	Monthly average domestic purchase value (million ZMW)				
Mine supplier	−0.583*** (0.064)	−0.700*** (0.062)	−0.700*** (0.062)	−1.624*** (0.329)	−1.638*** (0.336)
Copper price (USD/lb)			−0.123 (0.175)	−0.214 (0.195)	−0.426 (0.312)
Mine supplier ×Copper price (USD/lb)				0.308*** (0.105)	0.311 (0.317)
Copper price (USD/lb) lag t-1					0.300 (0.226)
Mine supplier ×Copper price (USD/lb) lag t-1					−0.003 (0.316)
N	65,300	65,265	65,265	65,265	63,488
R-squared	0.000	0.034	0.034	0.034	0.035
Mean copper price (USD/lb)			3.017	3.017	3.017
Mean purchase value (million ZMW)	1.817	1.817	1.817	1.817	1.817
Mean purchase value mine suppliers (million ZMW)	1.415	1.415	1.415	1.415	1.415
Panel B					
	Monthly average import value (million ZMW)				
Mine supplier	1.216*** (0.132)	0.926*** (0.109)	0.925*** (0.109)	−0.352 (0.513)	−0.528 (0.565)
Copper price (USD/lb)			0.030 (0.198)	−0.134 (0.193)	−0.434 (0.342)
Mine supplier ×Copper price (USD/lb)				0.425*** (0.159)	0.039 (0.343)
Copper price (USD/lb) lag t-1					0.538 (0.339)
Mine supplier ×Copper price (USD/lb) lag t-1					0.463 (0.392)
N	22,443	22,429	22,429	22,429	21,169
R-squared	0.003	0.015	0.015	0.016	0.015
Mean copper price (USD/lb)			3.010	3.010	3.010
Mean monthly import value (million ZMW)	2.883	2.883	2.883	2.883	2.883
Mean monthly import value mine suppliers (million ZMW)	3.621	3.621	3.621	3.621	3.621
Year FEs	No	Yes	Yes	Yes	Yes
Month FEs	No	Yes	Yes	Yes	Yes
Sector FEs	No	Yes	Yes	Yes	Yes

Notes: Standard errors, clustered by year-month, are reported in parentheses. Monthly average domestic purchase value and import value represent the total monthly pre-tax domestic purchases and imports by firms, respectively. The values are adjusted for inflation using the consumer price index and are cleaned of major outliers. 'Mine supplier' is a binary value equal to one if a firm sold at least one good or service to one or more mining firms in Zambia registered with ZETI between 2013 and 2021, as reported to tax authorities. The monthly copper price (USD/lb) comes from investing.com. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Statistical significance levels are robust to using wild cluster bootstrapped standard errors following [Cameron et al. \(2008\)](#).

firms is high and not representative of the broader business landscape in Zambia, where approximately 70% of the economic activity occurs in the informal sector ([Elgin et al., 2021](#)). This discrepancy is likely a by-product of the survey's inclusion restrictions. The Zambia Business survey found that micro and small enterprises in urban areas are more likely registered (at a level of 21%) compared to in rural areas (3%) ([Clarke, 2019](#)).

Out of the 1,055 firms surveyed, 9.10% of firms regularly (0.9%) and occasionally (8.2%) sold to mining firms in the past 5 years. Among these, 82.92% reported regularly (66.67%) and occasionally (15.62%) selling to mining firms in the past 12 months. Of those firms who count mines as customers (mine suppliers), 12.66% did not sell anything to mines in the last year, and the remainder sold regularly (18.99%) or occasionally (68.35%). Across all firms, the average revenue from mining or mining-related firms was 2.816%. Among firms that we classify as mine suppliers in the last year, this percentage was 24.38%.

4.2. Geographic location of firms

The map in [Fig. 1B](#) highlights the spatial distribution of business opportunities available to local companies in Kitwe, who may benefit from proximity to mine operations. In fact, [Fig. 1B](#) shows

a clear pattern: Mine suppliers, indicated by purple dots, are clustered near mines, while non-mine suppliers, indicated by green dots, are more geographically spread. Past research indicates that certain mines offer preferential treatment to suppliers located in geographic proximity ([Nsupila, 2016](#)).

4.3. Mine contract characteristics

Recurring and longer contracts with mining firms are suggested to (i) help suppliers plan for the future and make informed investments in the business, and (ii) enable purchasers to avoid fees, time delays and potential issues associated with new contracts ([Fessehaie, 2012b](#)). [Fig. 5](#) (left) shows the length of firms' contracts with mines. The majority of purchases were one-time transactions, with some contracts spanning a duration of 1 to 6 months. The right side of [Fig. 5](#) shows a distinctly different pattern for firms that report regularly selling to mining firms within the past year—fewer than 1% of total firms. The typical contracts are 1–6 months, followed by a contract length of 12 months or longer. This correlation between contract length and recurring orders indicates that some firms may face a hurdle when switching from occasional, short contracts, to recurring, longer contracts.

An analysis of the nature of goods and services sold to the mines reveals personal protective equipment to be the most common option,

Table 3
Summary statistics Kitwe firm survey.

Variable	Mean	Std. Dev.	Min.	Max.	N
Age of business	11.320	7.666	0	70	1,055
Registered business	0.915	0.279	0	1	1,046
Profits	69,480	711,607	70	20 mil	1,037
Full-time wage workers	5.545	26.820	0	800	1,055
Casual or daily-paid workers	1.691	3.821	0	90	1,055
Business owner is male	0.714	0.452	0	1	1,055
Micro Enterprise (<11 employees)	0.898	0.303	0	1	1,055
Small Medium Enterprise (<100 employees)	0.996	0.061	0	1	1,055
Did you sell to mining firms:					
... in the last 5 years?	0.091	0.288	0	1	1,055
... in the last 12 months	0.075	0.263	0	1	1,055
Revenue from mines or mining-related firms (%)	2.816	10.466	0	100	1,048
... Non-mine suppliers (%)	1.058	6.916	0	100	969
... Mine suppliers (%)	24.380	19.167	0	85	79
If you sold to mining firms in the last 12 months, how long were the contracts?					
... one-time purchase	0.506		0	1	79
... 1–6 months long	0.354		0	1	79
... 6–12 months long	0.063		0	1	79
... more than 1 year long	0.076		0	1	79
If you sold to mining firms in the last 12 months, what goods and services did you sell?					
... Catering and food services	0.025	0.158	0	1	79
... Cement	0.013	0.113	0	1	79
... Electrical services	0.038	0.192	0	1	79
... Food and beverages	0.089	0.286	0	1	79
... Lubricants, oils, and greases	0.127	0.335	0	1	79
... Machines, machine tools and spare parts	0.177	0.384	0	1	79
... Personal protective equipment	0.354	0.481	0	1	79
... Plant services	0.101	0.304	0	1	79
... Stationary and other office materials	0.076	0.267	0	1	79
... Tires and vehicles parts	0.177	0.384	0	1	79
... Transportation services	0.051	0.221	0	1	79
... Other	0.049	0.217	0	1	79
What is preventing you from selling more to the mines?					
... No constraints apply	0.262	0.440	0	1	1,055
... Not interested	0.041	0.198	0	1	1,055
... Competition	0.224	0.417	0	1	1,055
... Bribes and/or corruption	0.154	0.361	0	1	1,055
... Government policies	0.024	0.152	0	1	1,055
... Lack of capacity and/or training	0.049	0.217	0	1	1,055
... Lack of connections	0.383	0.486	0	1	1,055
... Lack of supplies	0.172	0.377	0	1	1,055
... Low demand from mining firms	0.264	0.441	0	1	1,055

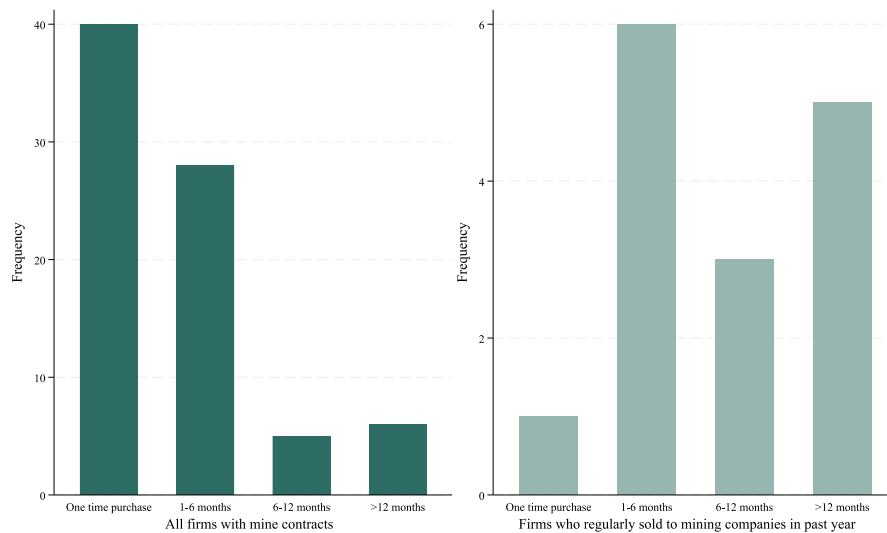


Fig. 5. Mine contract length.

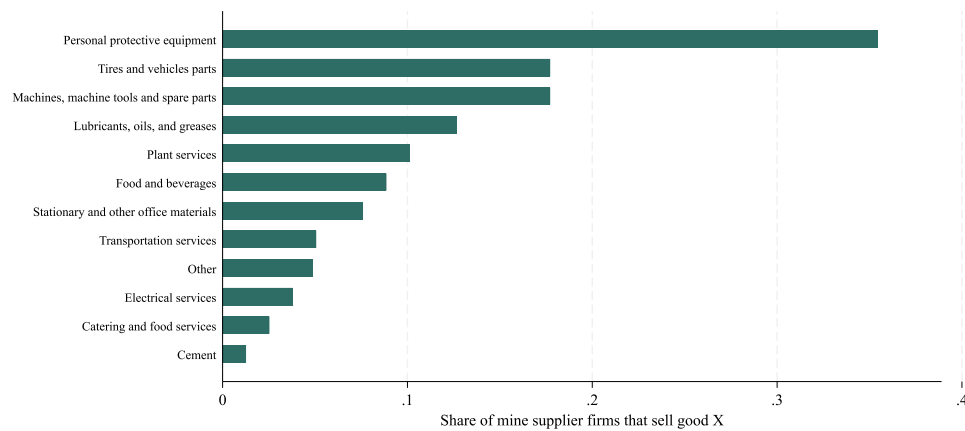


Fig. 6. Goods and services sold to the mines.

followed by tires/vehicle parts, machines/tools/spare parts, and lubricants and greases (Fig. 6). Food and beverages are fairly common, while services related to food and catering are relatively uncommon.

4.4. Constraints to entering the global value chain

Out of the surveyed firms, 71.5% wish to sell more to mining firms. Only 4.38% of firms who stated not to have had any mine contracts in the last 5 years, expressed that they were uninterested in entering the mining GVC. Firms that sold occasionally to mining firms in the past 5 years were the most likely to list at least one constraint (90.7%), compared to firms that regularly sold to mining firms (40%), and those that never sold to mining firms in the last 5 years (70.1%). This indicates that both firms with and without mining contracts desire more demand from mining companies, but are constrained by various factors that prevent them from penetrating the technical and high-skill sectors that mining firms source from (Ba and Jacquet, 2022). The results underscore inefficiencies in the Zambian copper mining sector: Although firms express a desire to join the GVC, and previous findings indicate that large copper producers – such as First Quantum Minerals – favor supporting local businesses and fostering development opportunities, integration with the domestic economy remains weak (Wirth et al., 2016).

The existing body of literature maintains that local procurement is “low” (Fessehaie et al., 2015). We suggest this may largely stem from a significant level of unmet demand from firms seeking to break into the mining GVC. If it is indeed true that local firms are eager to form connections, attention must then turn to the barriers that suppress the development of strong backward linkages. Thus, we explored the constraints the firms listed as experiencing. Surveyed firms were allowed to select all constraints that hinder their ability to supply more goods and services to mines. Fig. 7 shows that the most common constraint among all firms is a lack of connections, followed by low demand and high competition. Our survey question did not distinguish between competition from other domestic firms and international firms. The right side of Fig. 7 shows that firms who are mine suppliers also cite high competition and low demand as the main constraints, followed by lack of connections—despite being connected with at least one firm within the last year. Bribes and corruption, along with a lack of supplies, are commonly cited as reasons across both groups.

We contribute additional nuance to existing research on Zambia by exploring the obstacles to entering the mining GVC. Previous studies found that access to technology, credit, managerial know-how, standards, and taxes were major hurdles (Chisala, 2008; Kanyinji and Tembo, 2019b). In contrast, the respondents participating in our study laid emphasis on the competitiveness of the market, the low demand from mines, lack of connections, as well as bribes and corruption. The option “government policies”, which can be taken to include both tax

policies and regulations, was generally not listed as a constraint. In addition, we note an interesting contradiction: Mines in Zambia claim to have a hard time securing goods from local suppliers of the required quality and standards (Fessehaie et al., 2015; Kragelund, 2017) yet, only around 7% of prospective mine suppliers – defined as those interested in joining the GVC but who did not sell to mines in the last 12 months or 5 years – reported lack of capacity or training as obstacles to securing mine contracts.

An open ended question allowed firm representatives to state their own reason. Only one firm mentioned access to credit, while several mentioned the scale at which they operate, noting that mines prefer to procure in bulk or from larger companies. Although credit constraints were under reported, supply and capacity limitations could be alleviated, in part, by investments enabled through improved credit access. An analysis of the World Bank Enterprise survey in Zambia revealed that access to finance is one of the primary obstacles to firm growth in the Copperbelt Province and country as a whole (Mulder et al., 2024). Specifically, inadequate financing creates bottlenecks for MSMEs, preventing them from acquiring, maintaining, and attracting critical resources (Mwamba et al., 2022).

4.5. Opinions towards the mining sector

Lastly, we asked the firm representatives to answer seven agree or disagree statements relating to the mining industry (Fig. 8). The respondents disagree that their firms are strongly dependent on copper mining firms,¹³ although they agree that the Zambian economy is heavily reliant on copper mining (average of 4.68 out of 5). That said, firms still strongly agree that copper mining firms should procure more domestic goods and services (average of 4.56 out of 5).

4.6. Regression analysis

Next, we turn to regression analysis to explore the characteristics of mine suppliers, the proportion of their revenue derived from mines, and their profit margins. The regression results cannot be interpreted as causal; while we explore correlations between variables, the causative factor behind the correlations has not been determined.¹⁴ The basic

¹³ We ask this question directly. Mine suppliers do not feel dependent on the mining industry. On a scale of 1 to 5, where 5 is strongly agree, their average is 2.83 out of 5. Non-mine suppliers also do not feel dependent on mining firms with an average of 1.62 out of 5.

¹⁴ For example, it may well be that being a mine supplier predicts the independent variables, such as firm age and number of full time employees, if being a mine supplier results in firm growth and longevity.

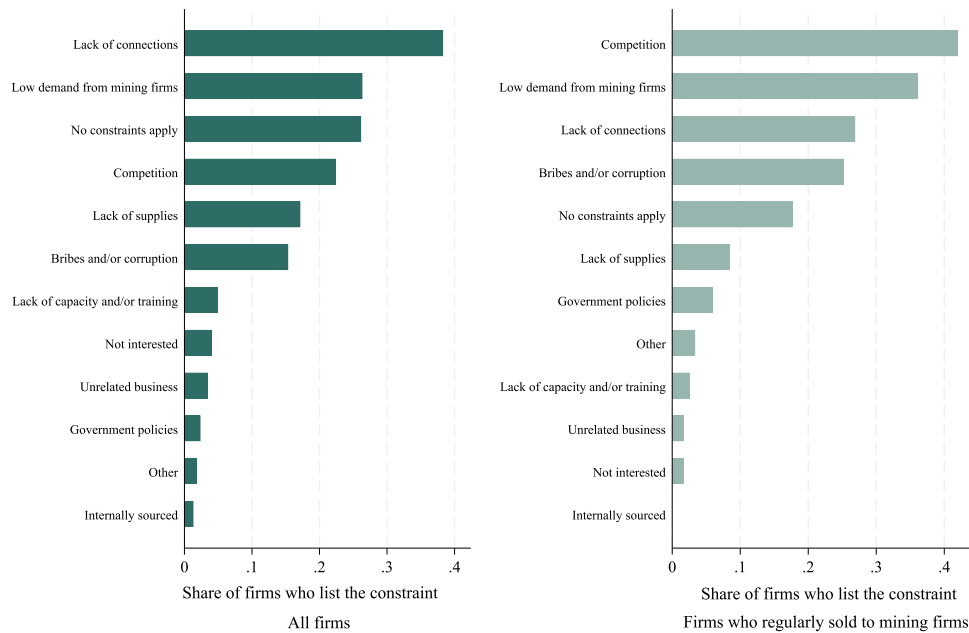


Fig. 7. Constraints to supply to the mining industry.

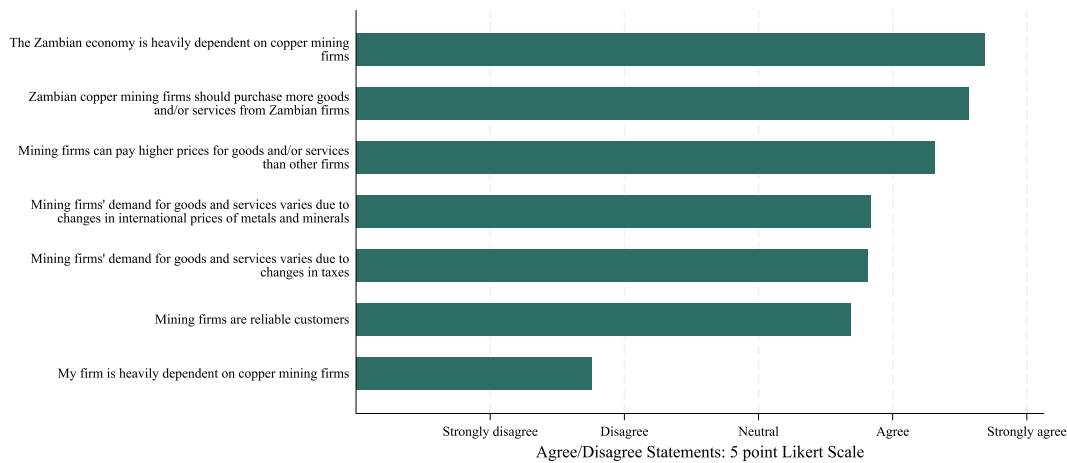


Fig. 8. Agree and disagree statements: 5 point likert scale Notes: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5).

regression model can be described as follows:

$$\begin{aligned}
 \text{MineSupplier}_{is} = & \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{MicroEnterprise}_i + \beta_3 \text{Credit}_i \\
 & + \beta_4 \text{Registered}_i + \beta_5 \text{MaleOwner}_i \\
 & + \gamma_s + \epsilon_{is}
 \end{aligned} \quad (2)$$

The subscript i denotes the firm. We include fixed effects s for sector. We use robust standard errors. The outcome variable *MineSupplier* is binary and modeled using linear probability. The outcomes in columns 3 and 4 – share revenue from mines in the last month and profits in the last month (in 10,000 Kwacha) – are continuous and we model the relationship using ordinary least squares.

Table 4 shows that firms that are mine suppliers are older and have more full time workers. A male business owner is not associated with a change in the likelihood of having supplied at least one mine in the last 12 months. This is in contrast to previous research which found that women owners have a harder time entering the mining GVC in Zambia (Kanyinji and Tembo, 2019b). A survey focusing on sustainability practices of SMEs supplying to four large copper mines (Kansanshi Mine, Konkola Copper Mines, Lumwana Mine and Mopani

Copper Mine) found that 15.9% of owners were women (Choongo et al., 2016),¹⁵ in contrast to 28.5% in our survey.

These results are all representing the extensive margin: if a firm is a mine supplier or not. We change the outcome variable to reflect an intensive margin: Share of revenue stemming from mines in the last month. We find that older firms report a higher share of their revenue in the last month stemming from mines: One extra year is associated with roughly a 10% increase in the mean of the outcome variable. Turning to profits, we do not find that being a mine supplier correlates with profits in the last month.

5. Discussion

5.1. Limitations

We explore three distinct sets of data from Kitwe, Zambia: (i) firm-level monthly domestic VAT transaction data from Kitwe, (ii) firm-level

¹⁵ The survey focused on SMEs with 10–250 employees, thus excluding micro enterprises.

Table 4
Determinants of mine supplier status and profits in the Kitwe survey data.

	(1) Mine supplier Last 5 years	(2) Mine supplier Last 12 months	(3) Share Revenue Mines Last month	(4) Profits Last month (in 10,000 ZMW)
Firm age (years)	0.010*** (0.003)	0.006*** (0.002)	0.228*** (0.065)	2.543 (2.018)
Micro enterprise	-0.102* (0.055)	-0.058 (0.043)	-1.193 (1.484)	-9.412 (7.867)
Access to credit	-0.015 (0.020)	-0.016 (0.017)	-0.228 (0.648)	-3.560 (2.160)
Registered	0.059*** (0.017)	0.054*** (0.016)	1.235 (1.225)	-5.299 (5.855)
Male owner	0.003 (0.021)	0.000 (0.018)	0.587 (0.611)	-1.815 (2.539)
Mine supplier (last 12 months)				21.534 (16.503)
Constant	1.033*** (0.066)	0.015 (0.052)	-0.168 (2.152)	-7.588 (21.055)
N	1,046	1,046	1,046	1,028
Mean of outcome variable	1.100	0.075	2.816	6.948
Sector FEs	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. In column 4, we lose 18 observations due to those firms reporting zero profits. All regressions control for sector fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

monthly import VAT data, and (iii) a cross-sectional firm survey conducted in 2024. While it is clear that these datasets cannot be used to make generalizations about Zambia as a whole, they should also not be interpreted as a comprehensive representation of the entire firm landscape in Kitwe. The domestic and import tax data includes transactions by formally registered firms with tax identification numbers, while the firm survey required firms to have a permanent structure and at least one full time employee. These restrictions reduce the generalizability and representativeness of the results, as many firms – especially micro and small enterprises – may be informal and unregistered, located in nearby rural areas, or lack a permanent structure (Mwamba et al., 2022). In fact, approximately 70% of Zambian firms are estimated to be informal (Elgin et al., 2021), with a significant over-representation in rural areas (Clarke, 2019). These rural firms face even steeper challenges trying to enter the mining GVC due to poor road infrastructure and prohibitive costs of electricity and electricity connectivity, all not captured in our data (Kanyinji and Tembo, 2019a). We note that excluding informal firms could introduce bias into the survey results, potentially distorting the perceived constraints to joining the mining GVC and overlooking key barriers. Future research must focus on delving into the characteristics and complexities of informal firms.

Regarding the domestic and import VAT datasets, firms are classified as local to Kitwe if their address registered with the ZRA is in Kitwe. However, the dataset does not include location information for all firms, with approximately 2% of domestic transactions and 1% of import transactions lacking this detail. Consequently, in addition to informal firms, those without geographic information may also be excluded from the analysis.

Beyond limitations in the total firm count, there is also a potential measurement error in classifying mine suppliers. We define mine suppliers as firms that have ever (within the data period) supplied a mining company (registered with ZETI), independent of time. However, this approach may misclassify observations recorded before a firm's first-ever interaction with a mining company, incorrectly labeling them as a mine supplier transaction. As a result, our estimation may be biased.

Moreover, while Kitwe lies at the heart of the Copperbelt Province, the region is not only a hub for copper production, as its name suggests, but also rich in other valuable minerals. Notably, the Copperbelt Province is also home to the Ndola Rural Emerald Restricted Area, the site for Zambian emerald mining (Zwaan et al., 2005). The definition

of mine supplier accurately includes all types of mines. However, the regression analysis using the international copper price does not consider price fluctuations in other important metals and minerals. Future analyses could incorporate the price of all relevant metals and minerals mined in Zambia, to better understand demand fluctuations in Kitwe. However, this is challenging due to the absence of a standardized global price for many rare minerals, metals and gemstones, such as emerald.

5.2. Policy discussion

Panel data covering 10 years of firm-level monthly domestic transactions and imports indicates that mine suppliers in Kitwe: (i) constitute roughly one-third of all local firms across various sectors and (ii) adjust their procurement of goods and services, both domestically and internationally, in response to fluctuations in the international copper price. These findings highlight the presence of backward linkages between the mining industry and domestic firms. While the significant share of mine suppliers across various sectors suggests a notable breadth of these linkages, the tax data does not capture their depth, defined as the level of value addition (Fessehaie, 2012b).

Our cross-sectional firm survey reveals strong interest among local firms in integrating into the GVC and expanding their supply to the mining industry. However, the surveyed firms identify several key barriers such as lack of connections, low demand, competition, bribes and corruption, and lack of supplies. These results suggest that the full potential for both the breadth and depth of backward linkages has yet to be realized. Beyond strengthening the integration of local firms with higher value-added activities into the mining GVC, Zambia must adopt effective strategies to ensure that the anticipated benefits of the green energy transition extend beyond mine suppliers, reaching other areas of the economy.

To stimulate demand from mines and achieve broader and deeper backward linkages, it is crucial to first understand the factors behind the low levels of procurement from the mining industry's perspective. In previous studies, mines reported a lack of scale, quality, and adherence to standards among local firms (Fessehaie et al., 2015). As long as these concerns from mines persist, policies enforced in the short-term, such as LCPs, are unlikely to result in significant real procurement. Instead, we hypothesize two undesirable outcomes: (i) continued reliance on imports from OEMs and their subsidiaries, which provide

minimal value addition to the Zambian economy; and (ii) increased corruption, bribes and elite capture. Surveyed mine suppliers notably identified bribes and corruption as a greater obstacle to integrating into the copper mining GVC compared to non-mine suppliers. This disparity may reflect non-mine suppliers' greater willingness to engage in these practices, potentially as a means to facilitate their entry into the copper mining GVC.

The Zambian mining expert [Lombe \(2018\)](#) argued that the solution lies instead in long-term policy interventions, particularly those aimed at strengthening education and the research and development (R&D) environment. He draws from a few examples; (i) South Africa, that became a regional dominant force for mining equipment and services due to an educated workforce and high-quality educational institutions, and (ii) Sweden, that was successful in generating innovation and patents, also in SMEs, through government support of R&D. In the face of advancements in education and R&D, local firms could provide goods and services of apt quality and standards, helping them overcome low demand, increased competition, and support economic diversification. Concurrently, government regulation and financing must play a critical role in curbing bribes and corruption while enabling firms to scale effectively.

The million-dollar question lies in whether Zambia can and ought to radically increase spending on building globally competitive higher educational institutions when the government faces urgent policy needs in critical areas such as poverty and health care. Moreover, while the mining sector plays a vital role in the Zambian economy, the relatively small domestic market limits actors' ability to achieve economies of scale by solely servicing the local economy, pushing them to adopt an export-orientated approach early on. However, in international markets, Zambian firms face competition not only from well established players, such as South African firms, but also from low-cost, high-innovation competitors from China. Additionally, entering firms may encounter "unfair competition", arising from the dumping of goods, particularly those of Chinese origin, or through public turnkey projects involving Chinese firms. These challenges suppress export potential and raise concerns about whether Zambia can build the competitive advantage needed – through strategic investment – to establish a firm presence in the higher value-added segments of the mining GVC, thereby increasing the depth of backward linkages.

Long-term policies, if effectively implemented to address mining firms' perceived low capacity, insufficient quality and poor adherence to standards of local firms – which we interpret as contributing to the low demand constraint reported by these local firms – could lead to stronger backward linkages with higher value-added contributions. This, in turn, may generate technological and know-how spillovers and promote network integration, addressing reported barriers including competition and lack of connections, thereby linking more local firms to the mining sector. Additionally, increased participation in the GVC would boost government revenue stemming from VAT, tariffs and income taxes. While these revenues are ultimately derived from a depletable asset with fluctuating price, which increases the economy's vulnerability, they could be reinvested into other sectors, driving positive economic effects beyond the lifespan of mineral resources.

5.3. Conclusion

This paper strategically focused on the city of Kitwe, a key hub for the mining industry located in the heart of Zambia's Copperbelt region. Utilizing official tax records and collected cross-sectional survey data, this study explored the linkages between local firms and the mining industry, providing insights into the complexities of the region's mining value chain.

We began the analysis by leveraging data reported to the tax authorities (ZRA) on domestic firm-to-firm transactions and imports from Kitwe, spanning from late 2013 to late 2022. The results revealed 34.6% of firms in Kitwe are mine suppliers, thus forming part of the

copper mining GVC. Furthermore, said mine suppliers maintain a low share of domestic demand, while accounting for approximately half of international demand. Subsequent regression analysis shows that while the copper price has a negligible independent effect on Kitwe firms as a whole, the demand for both domestic and international goods and services by mine suppliers is highly dependent on the copper market: an increase in copper price leads to a higher average transaction value within the same month. Ultimately, this indicates a local multiplier effect for mine suppliers, but no such effect for Kitwe firms as a whole.

To gain a more qualitative perspective, we collected and analyzed cross-sectional survey data from 1,055 firm representative in Kitwe, offering insights into the factors influencing entry into the mining supply chain and the enhancement of firms' participation within it. Surprisingly, we found that there is very high demand for entering the supply chain, with only 4.38% of companies stating that they are not interested. The respondents identified lack of connections, low demand, competition, and bribes and corruption as key obstacles hindering their participation in the copper mining GVC.

With over a third of Kitwe firms integrated into the copper mining GVC, it is clear that the Kitwe copper mining industry generates significant local economic spillovers—lending further support to the literature that challenges the enclave theory. However, from a relative standpoint, the current level of integration may still reflect a suboptimal breadth and depth of backward linkages, as mine suppliers remain overrepresented in the imports market and the vast majority of non-participating firms (95%) express a desire to enter the mining GVC. An increase in procurement would not only generate a positive effect on firms, but undoubtedly boost government revenue, through VAT, tariffs and income tax—triggering broader spillover effects across other sectors.

We argue that short-term policies, such as enforced domestic procurement without further firm productivity support, are unlikely to succeed as the primary constraints holding local firms back stem from capacity limitations, inadequate standards and corruption. Such measures may instead unintentionally further entrench mine suppliers in the import market, positioning themselves as intermediaries between foreign producers and mining firms, with little to no local value creation. In contrast, long-term strategies, such as investment in education and R&D may be essential to broaden and deepen backward linkages between local firms and mines, while fostering resilient, non-resource dependent growth that can withstand the volatile nature of the mining sector. Further research is needed to determine whether Zambia can, and should, implement these strategies.

CRedit authorship contribution statement

Anja Benshaul-Tolonen: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Paula Fernandez Musso:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

See [Table 5](#).

Table 5
Summary statistics sectors Kitwe domestic and imports datasets.

Sector	Total count
Kitwe domestic VAT transaction dataset	
Public administration and defense; compulsory social security	628
Water supply; sewerage, waste management and remediation	2,031
Real estate activities	11,312
Transportation and storage	34,639
Other service activities	49,296
Mining and Quarrying	75,054
Professional, scientific and technical activities	108,347
Manufacturing	132,741
Other	208,513
Wholesale and retail trade; repair of motor vehicles and motorcycles	505,414
Total	1,128,149
Kitwe import transaction dataset	
Real estate activities	70
Water supply; sewerage, waste management and remediation	222
Transportation and storage	4,120
Mining and Quarrying	10,656
Other service activities	13,544
Professional, scientific and technical activities	32,462
Manufacturing	35,602
Other	78,018
Wholesale and retail trade; repair of motor vehicles and motorcycles	243,569
Total	418,290

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