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Entering the mining value chain: A firm survey from the Copperbelt, Zambia

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Abstract

We explore the characteristics of firms participating in the mining global value chain (GVC) in the town of Kitwe, in the heart of the Copperbelt, Zambia. Firms that supply mines are slightly older and more likely registered with local authorities. Micro-enterprises—those that have fewer than 10 employees—are 10 percentage points less likely to supply a mine. Exploring self-reported constraints to entering the mining GVC, we find that competition, low demand from mines, and lack of connections are the main obstacles, followed by bribes and corruption—in contrast to previous literature, that has placed the emphasis on tax policy, regulation and credit access. A majority of business representatives agree that the Zambian economy is heavily reliable on copper mining firms, but disagree that their own firms are dependent on the sector. Respondents uniformly agree that mining firms should procure more goods and services from Zambian firms, and most firms report they want to join the global value chain.

*Notes: Corresponding author Anja Benshaul-Tolonen, Barnard College, Columbia University, atolonen@barnard.edu. Paula Fernandez Musso, Barnard College, Columbia University. All errors are our own. We are grateful for the support from IGC, in particular to Benjamin Shawa, Shahrukh Wani, and Twivwe Siwale. We are exceptionally grateful to Edward Miguel and Nicholas Swanson at UC Berkeley who generously helped collect the data, and to the Uptick survey team. Research assistance was provided by Smiti Modhurima, Julia Neely and Reda Shaikh. UC Berkely Committee for Protection of Human Subject protocol number 2023-08016599. University of Zambia Biomedical Research Committee REF. No. 4466-2023.

1 Introduction

The mining industry has long been accused of acting like an enclave industry with weak linkages to the domestic and local economy in which it operates. Weak backward linkages especially affect small and medium enterprises (SMEs) in low and middle income countries who struggle to enter the mining global value chain (GVC), reducing the potential for domestic economic growth and development. We set out to shed light on firms in the mining town of Kitwe, Zambia, focusing on their recent supplier experiences with the mining industry and the constrains they face in reaching their desired level of engagement. We surveyed firms with at least one full-time employee and with a permanent structure.

Zambia, a country rich in copper alongside other metals and minerals such as gold and emeralds, has a vibrant mining industry with a long history (Sikamo *et al.*, 2016). An estimated 14% of national GDP and more than 70% of foreign exchange stems from copper mining alone (African Development Bank, 2019). Industrially mined for over a century in the Copperbelt, and in recent years, new copper mines have opened up in the nearby Northwestern Province (Mulder *et al.*, 2024). The country plans to significantly boost its copper production in the coming decades to meet the growing global demand driven by the green energy transition, which relies heavily on copper for electric vehicles and other electronics. In the face of an expected 'boom' in global copper demand, it is imperative we understand the local linkages and constraints to deeper economic integration of the mining sector.

2 Global Value Chains and Backward Linkages

Foreign direct investment by multinational companies can lead to economic spillovers (Barrios *et al.*, 2011), although this may vary by sector and the level of economic development of the host country.

Previous research on Zambian firms found a wide variety of constraints that hinder firms from entering the global value chain: from access to technology, credit and managerial know-how, to legal and tax framework relating to licensing, standards and tax compliance (Chisala, 2008). A survey of published research on 15 years of firm data from Africa showed that these constrains are far from

unique to Zambian firms, but represent obstacles for SMEs across the continent to generate growth, investment and exports (Bigsten and Söderbom, 2006). In fact, business managers report financing as the leading constraint to firm growth, alongside corruption, infrastructure and inflation (Bigsten and Söderbom, 2006).

The mining sector has been pointed out as an opportunity for firms, and in particular, SMEs in Africa, and a way to increase local economic capture of an extractive and export-oriented industry. Local content policies (LCPs) have been a popular policy tool to realize some of the potential, and combat the perceived "enclave" nature of mines. LPCs may 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)[1]. LPCs 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 corruption institutions, managed to turn LPCs into economic growth, the same policies can result in inefficiencies in countries with lower institutional capacity, high corruption (Ba and Jacquet (2022), and elite capture Hansen *et al.* (2016)). A study of LCPs in West Africa found that while three West African countries had adopted LCPs, there was a lack of monitoring and enforcement (Ba and Jacquet, 2022) leading to unknown efficiency of the policies.

After independence in 1964, Zambia experienced higher levels of local procurement in the mining sector due to import-substitution, despite diminishing copper production. Post-privatization of the sector and the abandonment of import-substitution in 1991, following a dramatic drop in the international price of copper, the local procurement plummeted, hampering inclusive economic growth (Lombe, 2018). Recently, the entry of SMEs into the high value global value chain for mining has, again, been lauded as an opportunity for the mining sector to generate sustainable growth and poverty abatement in Zambia (Kanyinji and Tembo, 2019b; African Development Bank, 2019).

Fessehaie *et al.* (2015) found that the mining sector procures goods and services for a value of US $2-4 billion annually in Zambia. In 2012, only a small share of the procurement of Zambian

[1]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))

mines was from firms that are overseas based (15.8%), and the lions share by firms that are 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). Yet, the latter category does not constitute "truly local", which is commonly defined by domestic origin of the goods. Domestic value creation remains an important issue: In 2017, an estimated 84% of goods and services were locally procured (the rest imported), although only 13% were "true local procurement", goods manufactured in Zambia, or provided by firms with Zambian ownership (African Development Bank, 2019).

Recent empirical evidence from Zambia shed light on the fluctuations in local procurement, highlighting the vulnerability of the economy to business cycles. Benshaul-Tolonen (2024) 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. In addition, mine suppliers (categorized as those who supplied at least one mine in the last 12 months) procure more from other domestic companies when the copper production is high. In contrast, there is no clear link between copper prices, copper production and the value of imports when controlling for inflation and the exchange rate.

2.1 The geography of mining

A large literature seeks to understand the economic footprint of large-scale mines. The effects can be examined at the (1) macro level, which include impacts on exchange rates and government spending, or at the (2) district level, considering the redistribution of mining tax and royalties to sub-national areas, or (3) locally, meaning in the vicinity of the mines. To our knowledge, no district level analysis of government mining revenue redistribution has been undertaken in an African natural resource rich country. Previous examples include from Peru (Loayza and Rigolini, 2016).

In contrast, many research studies shed light on the local impact. The economic footprint of the mining sector is often categorized as hyper-localized—often within 20 to 30 km—where employment Aragón and Rud (2013); Kotsadam and Tolonen (2016), agricultural output (Aragón

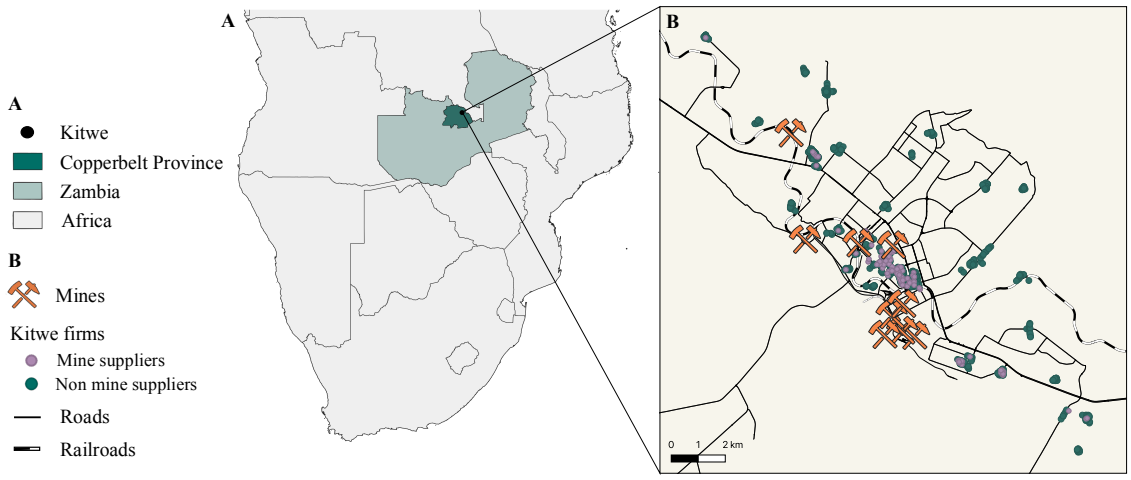


Figure 1: A. Map of Southern Africa. B. Map of Kitwe, Copperbelt Province, Zambia

and Rud, 2016), and the political economy changes (Knutsen *et al.*, 2017). A geographic analysis of constraints among mining suppliers across nine countries, showed that the tradeable sector is more constrained in the absolute proximity of mines (< 20km), compared to further away (21-150 km) (De Haas and Poelhekke, 2019). There is especially strong pressure on infrastructure and access to inputs suffer in the absolute vicinity of mines (De Haas and Poelhekke, 2019).

Our survey focuses on Kitwe, a larger town situated in the heart of the Copperbelt, and strategically located near large copper mines in the area, such as Mopani Copper Mine and Konkola Copper Mine, both located in Kitwe, and close to for example Chambishi and NFC. The restricted area for emerald mining is located around 50km south of Kitwe. Figure 1 shows the town of Kitwe, with main roads, railways and mines. We included actual mines, such as mine shafts (which there are several, inside of the town of Kitwe), as well as mining headquarters. The reason for this is to better understand the spatial distribution of business opportunities for local companies, who may derive a business advantage from proximity to any type of mine operation, or, in fact, be strategically located close to mines or mining company head quarters. In fact, Figure 1 clearly shows a pattern with mine suppliers, indicated by purple dots, being located near a cluster of mines, in contrast to green dots signifying non-mine suppliers that are more geographically spread.

3 Data and analysis

To shed further light on the constraints that domestic suppliers to the mining industry in Zambia face, we collected a short questionnaire from 1,055 firms in the city of Kitwe, in the Copperbelt. The module was collected as part of a research study undertaken by UC Berkeley and the IGC. The data collection took place during January to March 2024. The survey team visited the different areas of Kitwe and followed a left hand rule to construct a random sample. The sample may be undersampling large firms, due to lower response rates.

The sample inclusion restrictions were that the firm has a) a permanent structure from where it operates, b) at least one full time employee. Out of the surveyed 1,055 firms, 91.5% were registered[2], formal firms. The level of registration is high and not representative of firms in Zambia—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). This oversampling of registered firms is likely a by-product of the inclusion restrictions.

The Zambian Ministry of Small and Medium Enterprise Development focuses on Micro, Small and Medium Enterprises (MSMEs) in their national development policy report, highlighting their role in employment creation, poverty reduction and inclusive growth. In fact, MSMEs contribute 70% of GDP and 88% of employment in Zambia. Definitions of MSMEs and SMEs vary, and Zambia has adopted a multifaceted definition including a) annual turnover, b) total fixed investments[3], c) total number of employees, and d) legal status. We use the employment threshold, which is below 10 persons for micro enterprises, 11-50 for small enterprises, and 51-100 for medium enterprises (Ministry of Small and Medium Enterprise Development, 2023), to define companies. We do not have access to the other firm factors determining their classification.

Out of the 1,055 firms surveyed, 9.10% of firms are regularly (0.95%) and occasionally (8.15%) selling to mining firms. Of those firms who count mines as customers—mine suppliers—17% did not sell anything to mines in the last year, and the remainder sold regularly (16%) or occasionally (67%).

[2]Registration can be with any agency; the town of Kitwe, Zambian Revenue Authorities or other.
[3]The investment levels vary by sectors; for mining and quarrying the thresholds are higher.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Age of business	11.32	7.666	0	70	1055
Registered business	0.915	0.279	0	1	1046
Income the business last month after paying	69,480	71,1607	70	20 mil	1037
log profits	9.204	1.67	4.248	16.811	1037
Full-time wage workers	5.545	26.82	0	800	1055
Casual or daily-paid workers	1.691	3.821	0	90	1055
Business owners is male	0.714	0.452	0	1	1055
Micro Enterprise (<11 employees)	0.898	0.303	0	1	1055
Small Medium Enterprise (<100 employees)	0.996	0.061	0	1	1055
Did you sell to mining firms:					
... in the last 5 years?	0.091	0.288	0	1	1055
... in the last 12 months	0.075	0.263	0	1	1055
Revenue from mines or mining-related firms (%)	2.816	10.466	0	100	1048
If you sold to mining firms in the last 12 months, how long were the contracts?					
... one-time purchase	50.63		0	1	40
... 1-6 months long	35.44		0	1	28
... 6-12 months long	6.33		0	1	5
... more than 1 year long	7.59		0	1	6
If you sold to mining firms in the last 12 months, what goods and services did you sell?					
...Catering and food services	0.013	0.113	0	1	79
...Cement	0.013	0.113	0	1	79
...Electrical services	0.038	0.192	0	1	79
...Food and beverages	0.076	0.267	0	1	79
...Lubricants, oils, and greases	0.127	0.335	0	1	79
...Machines, machine tools and spare parts	0.139	0.348	0	1	79
...Personal protective equipment	0.304	0.463	0	1	79
...Plant services	0.101	0.304	0	1	79
...Stationary and other office materials	0.038	0.192	0	1	79
...Tires and vehicles parts	0.177	0.384	0	1	79
...Transportation services	0.051	0.221	0	1	79
Other, specify	0.19	0.395	0	1	79
What is preventing you from selling more to the mines?					
No constraints apply	0.26	0.439	0	1	1055
Not interested	0.041	0.198	0	1	1055
Competition	0.223	0.416	0	1	1055
Bribes and/or corruption	0.154	0.361	0	1	1055
Government policies	0.024	0.152	0	1	1055
Lack of capacity and/or training	0.049	0.217	0	1	1055
Lack of connections	0.382	0.486	0	1	1055
Lack of supplies	0.169	0.375	0	1	1055
Low demand from mining firms	0.263	0.44	0	1	1055

3.1 Mine contract characteristics

Recurring contracts with mining firms and longer contracts can help companies plan for the future and make suitable investment in the business. Figure 2 (left) shows the contract length for the firms' contracts with mine suppliers. The majority of purchases were one time purchases, with some contracts running 1-6 months. The right side of Figure 2 shows a very different pattern for firms that report to regularly sell to mining 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 switching from occasional, short contracts, to recurring, long contracts.

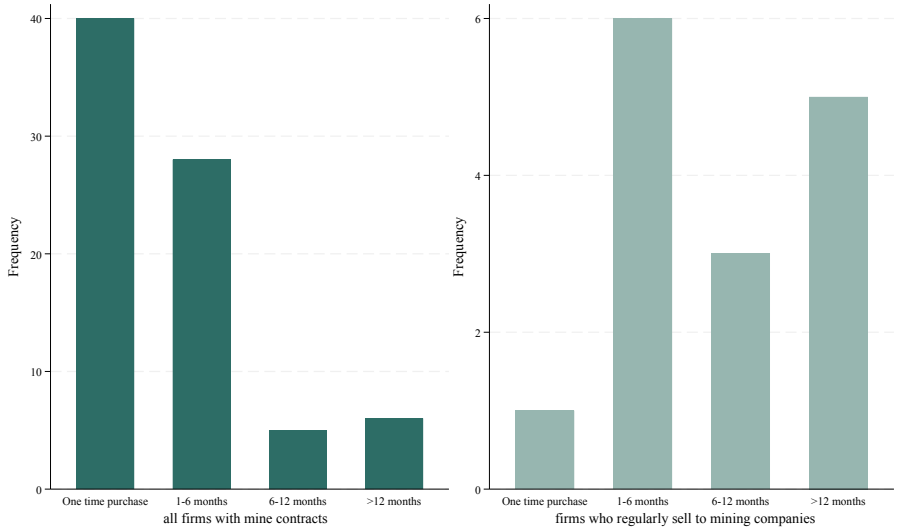


Figure 2: Mine Contract Length

An exploration into the types of goods and services that the firms sell to the mines, show personal protective equipment to be the most common option, followed by tires/vehicle parts, machines/tools/spare parts, and lubricants and greases (Figure 3). Food and beverages are fairly common, but services around food and catering are relatively uncommon.

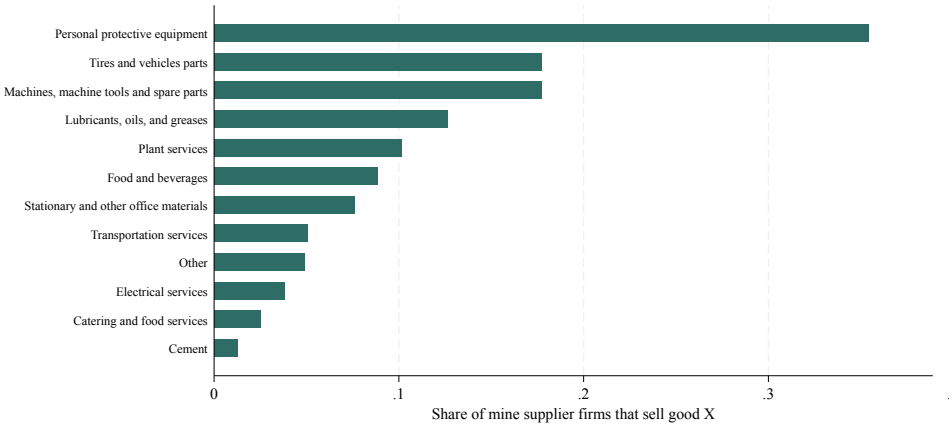


Figure 3: Goods and services sold to the mines

3.2 Constraints to entering the global value chain

Out of the surveyed firms, 74% wish to sell more to mining firms. Firms that sold occasionally to mining firms in the last years, are the most likely to list constraints (91%), compared to firms that regularly sell to mining firms (60%), and those that never sold to mining firms in the last 5 years (73%). This means that among firms with and without mining contracts, there is a wish for more demand from mining firms. As a matter of fact, only 2.7% of firm representatives who stated not to have had any mine contracts in the last 5 years, expressed that they were uninterested in entering the mining supply chain.

To further disentangle these results, we explore what constraints the firms listed. Firms were allowed to select all constraints that hinder them from selling more to mines. Figure 4 shows that lack of connection is the most common constraint among all firms, followed by low demand and high competition. The right side of Figure 4 shows that firms who are mine suppliers cite high competition and low demand as the main reasons, followed by lack of connections–despite being connected with at least one firm within the last 5 years. Bribes and corruption, as well as, lack of supplies are commonly listed reasons across both groups.

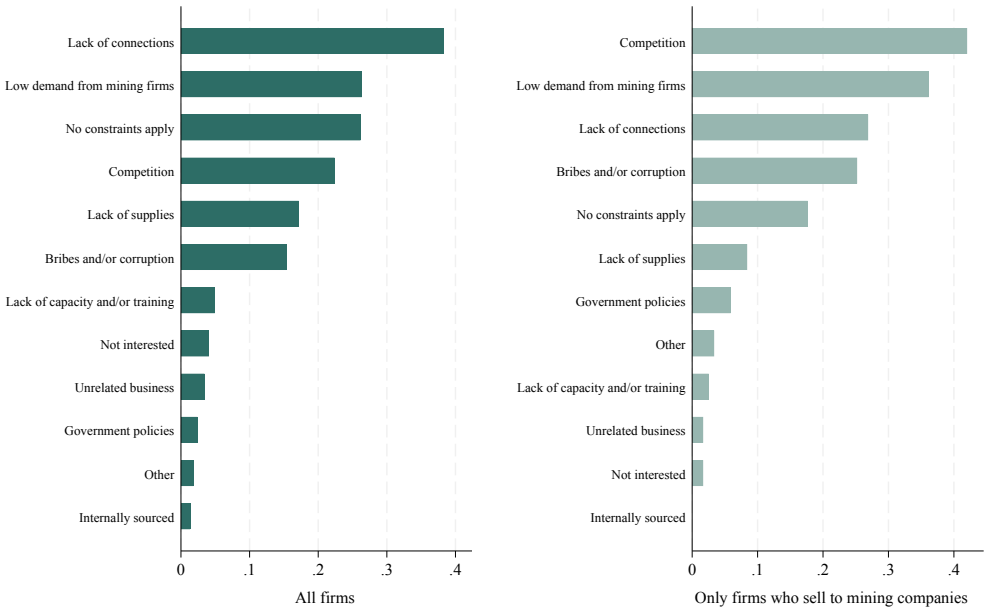


Figure 4: Constrains to supply to the mining industry

We add more nuance to research in Zambia by exploring obstacles to entering the global value chain, especially that of the mining industry. Previous research found that access to technology, credit, managerial know-how, standards and taxes were important obstacles (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. Government policies, which can be taken to include both tax policies and regulations, had the least support among existing mine suppliers. An open ended question allowed firm representatives to state their own reason. Only one firm mentioned access to credit, but several mentioned the scale at which they operate, as mines prefer to procure in bulk or from larger companies. Such capacity constraints could, of course, partly be alleviated with investments made possible by credit access. An analysis of the World Bank Enterprise survey in Zambia showed that access to finance and electricity are the main obstacles to firm growth in Zambia as a whole, and in the Copperbelt. Bribes and corruption was reported by around 10% of firms (Mulder *et al.*, 2024).

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) yet, prospective mine suppliers in our data rarely reported lack of capacity or training (1.5-3.2%) as obstacles to secure mine contracts. Firms interviewed in our survey focus largely on external factors, such as competition, low demand, corruption, than internal factors, such as capacity and training[4].

3.3 Agree/Disagree statements

Lastly, we asked the firm representatives to answer seven agree and disagree statements relating to the mining industry (Figure 5. The firms disagree that their firms are strongly dependent on copper mining firms, although they agree that the Zambian economy is heavily reliable on copper mining (with an average of 4.68 at a scale out of 5). The subset of firms that are mine suppliers do not feel dependent on the mining industry (average of 2.8, not shown). Non-mine suppliers do not feel dependent on mining firms (average 1.8). In contrast, firms strongly express that copper mining firms should procure more domestic goods and services (4.6).

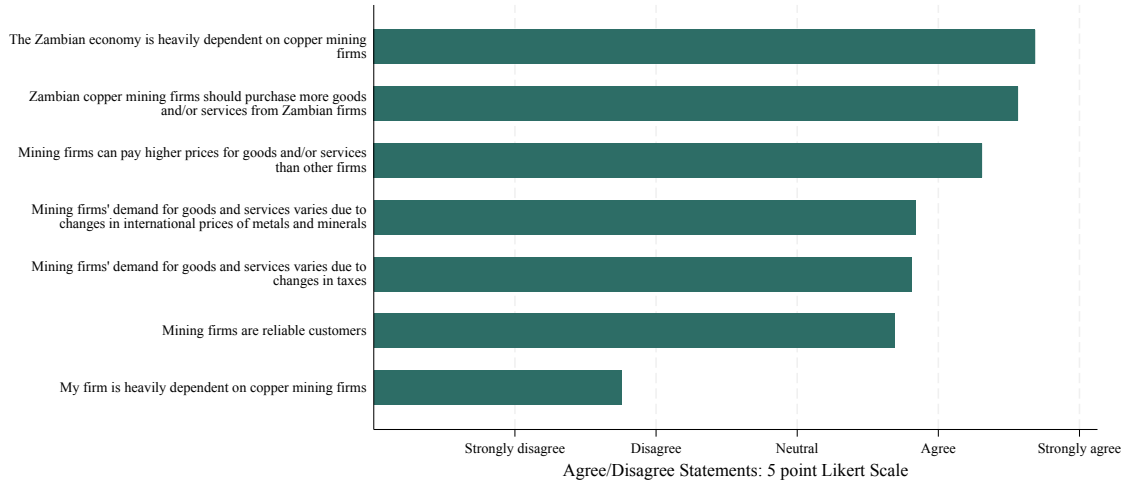


Figure 5: Agree and Disagree Statements: 5 point Likert Scale

Notes: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5).

[4]We did not provide a list option that "quality and product standards", but respondents were able to report additional constraints under "other". It was not commonly reported.

3.4 Firm characteristics of mine suppliers

In Table 2 we explore the characteristics of mine suppliers, share of revenue from mines, and profits. The regression results cannot be interpreted as causal; while we explore correlations between variables, the causative factor behind the correlations has not been determined[5].

Firms that are supplying to mines are older and have more full time workers. A male business owner is associated with an insignificant, but quantitatively large, effect on the likelihood of having supplied at least one mine in the last 12 months. This echoes previous research which found that women owners (who constitute 28% of owners) have a harder time entering the mining global value chain 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)[6].

Column 3 highlights that business age, full time employees and registration are positively correlated with log profits in the last month, although having had mining contracts in the last year are not.

4 Imports and local procurement among firms in Kitwe

Building upon research on the local procurement of the mining industry in Zambia (Benshaul-Tolonen, 2024), we use data from the Zambian Revenue Authorities on VAT transactions and imports to shed light on firms in Kitwe. First, we identify companies that sold to a mining company at least once between 2013 and 2023 (with a transaction included in the VAT dataset), and classify them as mine suppliers. Second, we try to identify companies that are located in or near Kitwe by using a dataset on imports that contain the city of the holding company or logistics company[7]

[5]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.

[6]The survey focused on SMEs with 10-250 employees, thus excluding micro enterprises.

[7]An issue with this matching is that this results in a failure to match companies that never import throughout the time period of 2013-2023.

Table 2: Determinants of mine supplier status and profits

	(1) Mine supplier Last 5 years	(2) Mine supplier Last 12 months	(3) Share Revenue Mines Last month	(4 log(Profits) Last month
Business established (years)	0.0063***	0.0061***	0.228***	0.0642***
	(3.62)	(3.44)	(3.52)	(8.53)
Micro enterprise	-0.104*	-0.0581	-1.193	-1.565***
	(-2.20)	(-1.34)	(-0.80)	(-11.15)
Credit	-0.0105	-0.0159	-0.228	-0.208*
	(-0.57)	(-0.96)	(-0.35)	(-2.37)
Registered business	0.0626***	0.0538***	1.235	1.134***
	(3.92)	(3.37)	(1.01)	(9.15)
Male owner	0.0103	-0.000382	0.587	0.110
	(0.55)	(-0.02)	(0.96)	(1.25)
Mining contract (last 5 yrs)				-0.251
				(-0.82)
Mining contract (last 12 months)				0.448
				(1.33)
Share of revenue from mines				-0.0005
				(-0.12)
Constant	0.0522	0.0150	-0.168	8.829***
	(0.94)	(0.29)	(-0.08)	(43.11)
N	1046	1046	1046	1028
Sector fixed effects	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. In column 3, we lose 17 observations due to those firms reporting zero profits. All regressions control for sector fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

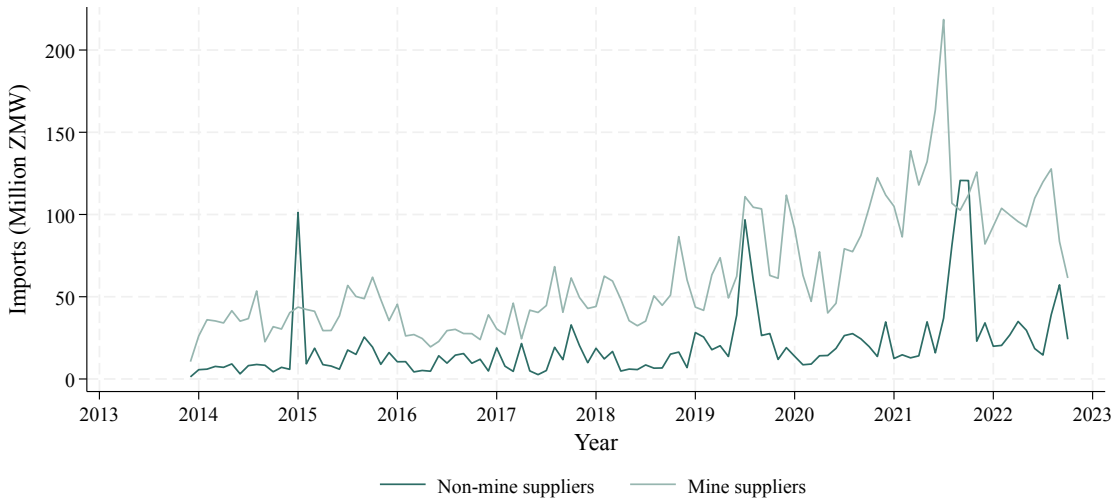


Figure 6: Imports by Mine Suppliers and Non-Mine Suppliers in Kitwe

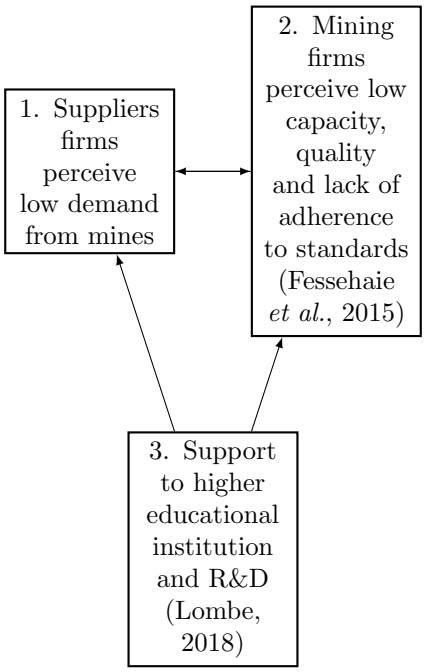
Notes: The figure shows monthly imports in millions of ZMW, split by firms that are categorized as mine suppliers and non-mine suppliers. Firms are classified as local to Kitwe if the address listed for the holding company or logistics company is located in Kitwe. Only firms who ever import are included in the sample.

Figure 6 shows that firms deemed to be located in Kitwe who sell to mining companies, have on average higher levels of imports (in million ZMW, inflation adjusted) than firms who are not classified as mine suppliers. Toward 2020, the gap between the two lines seems to widen due to an upward trend in imports among mine-suppliers.

5 Limitations

Our survey was limited to urban firms with a permanent structure located in the town of Kitwe, who had at least one full time employee. This reduces the generalizability of the results since many firms may be informal, lack a permanent structure, or be located in nearby rural areas. Rural location can pose particular challenges to firms trying to enter the mining global value chain due to poor road infrastructure and prohibitive costs of electricity and electricity connectivity (Kanyinji and Tembo, 2019a), and firms in rural areas are less likely registered (Clarke, 2019). In addition,

Figure 7: Constraints to successful local content procurement



the survey oversampled registered firms (likely due to the inclusion restrictions), which affects the representability especially among micro and small enterprises that are less likely registered (Clarke, 2019).

6 Policy recommendations

We note that the firms interviewed generally disagree with the mining firms regarding why the local procurement is low. Both parties may be understood to put (partial blame) on the other. The two findings from our study and previous studies of the mining industry may however be reconciled. As a matter of fact, "Low demand" may stem from lack of scale, quality, and standards (Fessehaie *et al.*, 2015), reported by the mining firms.

If that's the case, LCP can result in little real procurement; rather we foresee two undesirable outcomes (1) corruption, bribes, elite capture and (2) imports through locally registered firms,

which have low value added to Zambia economy and introduces an inefficiency that mines have to pay through higher prices.

The Zambian mining expert Lombe (2018) argued that the solutions lies in strengthening education and the research and development (R&D) environment (see Figure 7). He draws from a few examples; how South Africa became a regional dominant force for mining equipment and services due to the educated workforce and high quality educational institutions, and Sweden, that was successful in generating innovation and patents, also in SMEs, through government support of research and development.

The million dollar question lies in whether Zambia can and ought to radically increase spending on building globally competitive higher educational institutions, when many Zambians would be excluded from such opportunities, and the government have urgent policy needs relating to poverty, education and health care. Moreover, while the mining sector is vital in the Zambian economy, the size of the sector is limited compared to South Africa. A smaller domestic market would force actors to be export oriented early on, where they would face the competition not only from established actors, such as South African firms, but also low cost, high innovation competitors from China.

7 Conclusions

We conducted a survey conducted with 1,055 representatives for firms operating in Kitwe, in the heart of the mining district in the Copperbelt region of Zambia. The survey focused on MSMEs past and current interactions with the mining industry. We shed particular light on the demands for entering the mining supply chain or solidifying the companies' participation in the supply chain.

Surprisingly, we found that there is very high demand for entering the supply chain, with only 4.1% of companies stating that they are not interested. The main obstacles reported included lack of connections, low demand from mining firms, and fierce competition. These results indicate that policies may aim at matchmaking SMEs to mining firms to create stronger networks, fostering more local interactions. The perceived fierce competition can partly be driven by what (African Development Bank, 2019) call "unfair competition" stemming from dumping of goods, especially of

Chinese origin or through public turnkey projects with Chinese firms. Moreover, loopholes in the tariff system may unfairly impede Zambian firms (Fessehaie *et al.*, 2015).

These obstacles were followed by lack of supplies (16.9%), indicating that firms perceived their size and access to supplies limiting in securing the right contracts, and bribes and corruption (15.4%). This is especially interesting given that registered firms in Zambia experience more bribes and corruption than unregistered firms (Clarke, 2019), and all the firms (except one) in the data who supplied the mines were registered. The intricate relationship between local content policies, firm registration and corruption warrants further research.

Government policy, which may include tax policies and regulations, were generally not perceived as a main hindrance, in contrast to earlier literature. Further analysis would have to inquire if firms perceive government policy as aiding them in entering the mining GVC.

We perceive that these results indicate that forging stronger linkages between local SMEs and mining firms in Kitwe ought to take a two sided approach. On the one hand, increase the demand from the mines. This is also supported by the results from the agree/disagree statements, where the majority of respondents agreed that copper mining firms operating in Zambia should purchase more goods and services from Zambian firms. On the other hand, help build networks and linkages between SMEs and mines. In parallel, bribes and corruption may pose an hinder to artificially increasing the demand from the mines through local content policies (Ba and Jacquet, 2022), and must be tackled.

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