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The impact of geographical location on inclusion of small and medium enterprises in the mining global value chain in Zambia: A case of selected small and medium enterprises (SMES) in the mining area

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The global value chain approach has become a useful strategy to reduce poverty in the mining area by forming linkages among various players. This approach gives an opportunity to all stakeholders to participate in any suitable activity along the value chain. Once small and medium enterprises (SMEs) enter the value chain, they supply and earn sustainable income. Unfortunately, geographical location of the mines acts as a barrier for SMEs to supply their goods and services. The geographical location comes with a challenge for both urban and rural based SMEs to access the mines due to poor roads and expensive electricity infrastructure. The main objective was to examine the impact of geographical location on inclusion of SMEs in the mining global value chain. The global value chain literature focusing on challenges that SME face to supply to the mines was reviewed to give insight on how these barriers affect SMEs participation. A random sampling was conducted among the SMEs whose age ranges from below 20 to above 40 from the mining area to determine the extent to which geographical location affects their inclusion to supply to the mines. Findings show that SMEs below the age of 30 are greatly affected to supply to the mines. In addition, rural based SMEs who are the majority had greater challenges to supply to the mines due to poor road and expensive electricity infrastructure. The female genders were also affected with the geographical factors. The study recommends that the government through Road Development Agency as well as the Ministry of Energy constantly repair the roads and improve energy sources, respectively so that SMEs can afford to access the mines services.

Key words: Electricity and road infrastructure barriers, small and medium enterprises, mining global value chain.

INTRODUCTION

The mining sector has become lucrative in engaging local small and medium enterprises (SMEs) to participate in the mining global value chain. The global value chain (GVC) covers the full range of activities performed by

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various firms to bring a product from its inception to the end user and beyond (OECD, 2013a, b). The cost-benefit analysis of participating in the mining global value chain has become crucial for researchers and policy makers, and it has become apparent that most governments promote the engagement of SMEs in the chains (IFC, 2002; Hoermann et al., 2010). In South America as well as Malaysia, research shows that there are beneficial effects for SMEs to participate in the mining value chain as they earn sustainable income (IFC, 2002; Ata et al., 2013). A recent survey carried out on the Zambian SMEs in most of the economic sectors (Chibwe, 2008) reveals that SMEs continue to stagnate in growth due to inherent barriers such as tax, licensing, registration process, financial and skills barriers. Although the study for Chibwe (2008) recommended setting up a one stop shop to overcome registration and process barriers, and offering tax incentives to local SMEs; the study did not discuss geographical location barriers and how to overcome them. In addition, OECD (2009) discusses top barriers for SMEs internationalization but never mentioned of geographical location barriers that SMEs face to supply to the mines. In the study, geographical barriers focus on the distance of the mines in relation to the SME accessibility and the lack of electricity for households around the mines which is a common factor for most mines in Zambia. Most mines in Zambia are located far away from the central districts and some SMEs have made some settlement closer to mines in a bid to access the high grade markets.

The Zambian SMEs will continue to live in poverty unless a complete set of barriers are identified and necessary action taken. This study is set to examine how geographical location affects SMEs in the mining value chain. Geographical location will focus on the state of roads, state of electricity and the distance to the mines (Peters and Hertwich, 2008). The relationship between geographical location and SME inclusion to the mines has not been reported in the Zambian academic papers as well as policy reports. It is argued that geographical distance from key trading partners affects both urban and rural based SMEs (Peters and Hertwich, 2008), but it is not clear how this problem affects SMEs in Zambia. In addition, the geographical location of the mines in most cases is faced with the problem of un-serviced roads as there is little government mandate to repair the roads leading to the mines. The poor roads affect mobility of SMEs in the mining value chain and increases their transportation cost but it is not clear how this affects the Zambian SMEs. Electricity cost too have been very high affecting SMEs potential for their production technologies but it is not clear how this affects the Zambian SMEs in the mines.

This study, henceforth, responds to the research objective regarding the geographical location affecting SMEs to supply to the mines. The research process begins with a review of the available literature to gain insight on how the geographical location affects SMEs in the global value chain. Thereafter, the research methodology is explained and its rationale behind the selection of methods. The research presents findings based on primary data collected from SMEs around the mining areas and is registered by the mining suppliers and contractors association of Zambia and supplemented by secondary sources. Finally, the main findings are discussed to flag way for conclusions, implications and recommendations.

LITERATURE REVIEW

In this study, GVC theory is being used to gain insight in the relationship between commercial activities and SMEs integration to the activities. The theory specifically focuses on the role of GVC in international networks of companies for a win-win situation. Alongside the GVC theory, the study also uses the geographical location theory (Weber, 1909) which contends that SMEs close to other economic agents have easy access to external resources and reduced transportation costs. This means that it is logical that firms choose locations that maximize their profits but unfortunately this is a difficult decision for SMEs located in distant locations. Further, the use of Marshall (1920) theory which stresses the benefits of location advantage helps to understand why SMEs choose business locations that form better and cheaper interaction between them. Most firms' location choices may create competitive advantage by improving access to key resources as failure to have SME support for agglomeration; SMEs continue to be marginalized (Johansson and Forslund, 2006). However, the benefits of agglomeration ultimately reflect gains when proximity reduces transport costs. Co-location has been used as a strategy help cluster SMEs and creates synergy in a quest to improve SME connectivity to the global value chain. Overall, the ideologies of global value chain, geographical location theories and location advantage help to position SMEs in a win-win situation among various stakeholders. This implies integration of various SMEs that mutually benefit from each other's proximity. While the GVC theory advocates for providing linkages among various stakeholders for a win-win situation, the geographical location of the mining value chain drawback SMEs (Cattaneo et al., 2013; OECD, 2013a). Most SMEs are located geographically far from commercial activities and linking them to the global value chain may be limiting. In addition, energy sources have not only been unavailable but the tariffs are also beyond SMEs payment ability.

The geographical location of the global value chains may pose as barriers to SME to supply to the mines. The location may impact the competitiveness of the global mining value chain when located too far from its high-value markets. There are also limitations to certain

regions due to lack of supporting infrastructure, resources, knowledge and capabilities which may enable or constrain value chain upgrading (Trienekens, 2011: 54-56). Some regions may lack reliable energy and water resources which are cardinal factors that drive cost competitiveness in capital-intensive assembly. It has been stressed by OECD, WTO and World Bank (2014: 24) that there are cost and quality implications for fragmented production as this means that inputs and intermediate goods must be transported between multiple locations. The efficient logistics lower costs for SMEs while structural difficulties are encountered by SMEs in remote areas. The effective approaches require supporting countries in designing and implementing tailored solutions that are able to meet specific needs In addition, Hernández et al. (2014: 178) emphasized that efforts to promote economic integration need to take account of many different factors including regional policy.

On one hand, the theory of geographical location as a determinant of SME participation in the supply chain dates back to the 1900s when Weber (1909) underpinned the hypothesis that suppliers and financial providers close to other economic agents have easy access to external resources and reduced transportation costs. Further, Marshall (1920) theorizes that the external economies perspective states that business location triggers different forms of interaction between firms and firms and their environment. On the other hand, the poor quality of electricity supplies in many developing countries is perceived by SMEs to impact their operations negatively. Voltage fluctuation and power outages can halt production, damage equipment and affect product quality. Enterprise development organizations, similarly, often regard insecure electricity supplies to be a serious constraint on SME development and expansion. The impact of the quality of electricity supply on firm productivity is less well understood. Infrastructure quality overall has a significant impact, at least as important as factors such as crime and access to finance, and unreliable electricity supply seems to be the infrastructure element with the strongest negative effect on enterprise productivity, especially in Africa (Escribano et al., 2009). Electricity insecurity tends to negatively affect the total factor productivity and labour productivity of manufacturing SMEs. World Bank (2010) stressed that electricity access for SMEs in African economies is limited. The impact of electricity insecurity on productivity varies depending on factors related to both the external context that a firm operates in and its internal capabilities (Cissokho and Seck, 2013). In addition to the absence of electricity infrastructure in rural based SMEs, Moyo (2012) stressed that power outages appear to affect SMEs more than multinational enterprises. The duration of outages has far greater negative impact on firm productivity than the frequency of outages.

As regards road infrastructure, most SMEs in various sectors of the economy especially in the mines are negatively affected by poor transport in the aspect of input supply and consumer markets. This negative effect is a consequent of having un-serviced available routes which in turn increases unit costs of doing business (Goedhuys and Sleuwaegen, 2010). Road infrastructures enhance “ease of access to physical resources such as communication and transportation whose price does not discriminate against SMEs” (Porter et al., 2002). In addition, GEM Global Report (2010) found physical infrastructure and commercial infrastructure as most important conditions that drive entrepreneurship in factor-driven economies, especially when most SMEs are involved in primary production and occupy a small part of the value chain. The access into the global value chain requires substantial investments in sustainable physical infrastructure such as road and electricity and therefore continued partnerships between stakeholders to implement supportive measures yields improved outcomes.

In respect to electricity energy which is by far the most important obstacle that most businesses in Africa experience (Kaseke and Hosking, 2013), most SMEs find it very expensive to acquire the commodity. Lack of electricity supply as well as reliance on electricity with growing energy demand has driven up prices. The cost of electricity in sub-Saharan Africa is high (Ndulu et al., 2007). In addition to a critical lack of investment in energy production, investment in transmission lines has been lagging severely affecting the cost of energy and its availability at a lower cost (Kaseke and Hosking, 2013; Adenikinju, 2005). In addition, the frequent power outages slow down economic activities (Yepes et al., 2008). Moreover, most SMEs have continued to face stiff competition from the multinationals in accessing energy. In times of power outages, larger companies invest in diesel aggregates as alternative source of energy increasing production cost (Escribano et al., 2009; Peters et al., 2011). According to Aterido et al. (2011), improving access to electricity requires heavy investments in electricity production and transmission coupled with better regulation and public involvements which is out of reach of SMEs. However, there has been suggestions by Molina-Moreno et al. (2018) on the use of renewable energy in both rural and urban areas where there is lots of the biodegradable fraction of agricultural products, waste and residues including plant and animal substances, forestry, and related industries, as well as the biodegradable fraction of municipal and industrial waste. Messineo et al. (2012) indicated that most European countries are striving towards the development and use of energy from renewable sources, with the objective of a final gross consumption of renewable energy of 75% in 2050, reaching 97% in the future. This implies the reduction in the use of coal and unreliable water for power generation. In addition, there will be no loss of power for productivity as well as transforming

communities to innovation, competitiveness and sustainability

METHODOLOGY

In the quest to improve the understanding of the geographical locational barriers that SMEs face to supply to the mines in Zambia, a positivist paradigm was adopted. The main variable in the study includes: road, electricity and location distance. The adoption of this approach is in line with the epistemological orientation in the normative paradigm in order for the results to be subjected to scientific means (Creswell, 2014; Saunders et al., 2009). In response to the main proposition, a cross-sectional survey research was utilized to obtain quantitative data and estimate a population covariance matrix that was compared with the observed covariance matrix with a view to minimize the difference between the estimated and observed matrices. The respondents selected were the SMEs who are members of the mining suppliers and contractors association of Zambia. These are easily accessible during their monthly, quarterly, and yearly meetings. This study then adopted a global value chain theory which breaks down the variables under discussion and makes it easier to collect and analyze relevant data. The analysis of the global value chains is central to policy implementers to identify areas for intervention in the chains. In line with the positivist paradigm which demands to collect primary data through quantitative methods, a standardized questionnaire was developed for quantitative data.

Selecting samples

The selection criteria were done to ensure adequate representation of all segments of the mining global value chain in Zambia. The study considered suppliers who have been registered with the mining suppliers and contractors association of Zambia and are well familiar with the complexities of the mining value chain. The sampling method was simple random for quantitative data to ensure that everyone has equal opportunity of being selected. The total number of respondents selected was 350 out of 600 who participated in the study

Data collection

Primary data collection was done over a period of 6 months starting October 2018 to the end of April 2019. This study used standardized questionnaires which were completed by respondents through a cross section survey. In designing the questionnaire for the study, the development process proposed by Neelankavil (2015) was used. It involves clarifying objectives and research questions and interpreting them into specific needs, developing questions to address each information need, re-evaluating the wording of the questions, reworking the questions to elicit interest of respondents, arranging the questions to produce a logical sequence, improving style and presentation and finally pretesting the questionnaire. The internal consistency method as estimated by the Cronbach's alpha was used to measure reliability. This measure is very important as it reveals the similarity of items in the instrument that is used to tap the constructs. To avoid discrepancies in the answers, some follow-ups were conducted. Further, to improve the validity, a desk review was done using current literature to assess the collected data

The process of data collection resulted into delivery of 600 questionnaires to the respondents. There was a pen, a calendar and small diary for them to use. These items were proposed to be retained for the respondents after answering the questionnaire as a token of appreciation as well as offering them convenience in answering the questionnaire while acknowledging the conflict nature of respondent incentive. The respondents were sent a friendly reminder after two (2) weeks and this strategy worked very well as 350 questionnaires were returned. Further, the researcher checked the questionnaire for correct answering upon receiving them. Thereafter, the questionnaires were numbered for easy identification for future review. The data was loaded into an Excel software package after which it was transferred into the IBM SPSS software package for subsequent analysis

Data analysis

Firstly, questionnaire items were measured using the "five-point Likert scale from 1 to 5" rating, with choices from "strongly disagree" to "strongly agree". Secondly, a descriptive statistic was performed to determine the levels of agreements on whether road infrastructure, electricity and locational distance affected SMEs to supply to the mines. Thirdly, a cross-tabulation was done between gender and geographical barriers, age and geographical barriers to determine how each of the variables (age and gender) is affected by the geographical location to supply to the mine. Fourthly, a multiple regression analysis was done to determine if geographical location is a predictor of SME inclusion in the mining global value chain. The researcher used Microsoft excel to develop a data sheet then transferred it into the IBM SPSS statistical package. In addition, data was reviewed several times for the purpose of cleaning against possible errors and omissions.

Questionnaire response rate

A total of 400 out of 600 suppliers completed and returned the questionnaires. There were 50 badly answered questionnaires. The useable questionnaires were 350 giving us a response rate of 58% of the total sample of the identified mining global value chain suppliers. This sample was adequate for the study.

Statistical analysis

In the study, Cronbach's alpha was used to check the reliability of the questionnaire items. Cronbach's alpha allows the estimation of consistency in the questionnaire items (Hair, 2010). It ranges from 0 to 1 with those alpha coefficients closest to 1.0 revealing highest internal consistency on the items. However, values above 0.6 can be accepted as posing satisfactory item reliability (Hair, 2010). Table 1 shows the Cronbach's alphas for the items used in this study.

Descriptive statistics

The descriptive statistics on the state of the roads and the cost of electricity show the different levels of responses from the SMEs. The statistics show responses on the state of the roads and the cost of electricity respectively and how they affects SMEs in the mines. The responses were drawn from the ordinal scale which is a universal method of collecting data, it is easy to understand and draw conclusions, reports, results and graphs from the responses.
Table 2 shows responses on the state of road infrastructure to the mines and how they affect SMEs to supply. SMEs were asked to choose on the levels of agreement and out the 350 respondents, 49 (14%) strongly disagreed, 105 (30%) disagreed, 46 (13.1%) neutral, 63 (18%) agreed and 87 (24.9%) strongly agreed. This shows that the state of road infrastructure could not enhance SMEs'

Table 1. Cronbach's alpha for the items used in this study.

Reliability statistics	
Cronbach's alpha	**No. of items**
0.608	9

Table 2. Descriptive statistics on how the state of roads affects SMEs.

Variable		The state of roads to the mines support SMEs to supply to the mines			
		Frequency	**Percent**	**Valid percent**	**Cumulative percent**
Valid	Strongly disagree	49	13.9	14.0	14.0
	Disagree	105	29.8	30.0	44.0
	Neutral	46	13.1	13.1	57.1
	Agree	63	17.9	18.0	75.1
	Strongly agree	87	24.7	24.9	100.0
	Total	350	99.4	100.0	-
Missing	System	2	.6	-	-
Total		352	100.0	-	-

Table 3. Descriptive statistics on how the cost of electricity affect SMEs

Variable		The cost of electricity is supportive for SME business development to the mines			
		Frequency	**Percent**	**Valid percent**	**Cumulative percent**
Valid	Strongly disagree	63	17.9	18.0	18.0
	Disagree	81	23.0	23.1	41.1
	Neutral	84	23.9	24.0	65.1
	Agree	83	23.6	23.7	88.9
	Strongly agree	39	11.1	11.1	100.0
	Total	350	99.4	100.0	-
Missing	System	2	0.6	-	-
Total		352	100.0	-	-

competitiveness to supply to the mines as shown by the majority.

Table 3 shows how the responses on cost of electricity and how it affect SMEs to supply to the mines. The assumption regarding electricity was supportive enough to empower SMEs to supply to the mines. Out of 350 respondents, 63 (18%) strongly disagree, 81 (23.1%), 84 (24% neutral), 83 (23.7%) agree and 39 (11.1%) strongly agree. This means that electricity infrastructure act as barriers for SMEs to supply to mines as most respondents assent to it as a barrier.

CROSS TABULATION

Gender and geographical barrier

Table 4 shows a cross-tab of gender and geographical barriers to inclusion in the mining global value chain shows that out of 350 respondents 260 SMEs were of male gender and the rest 90 were female. 94 male (26.85%) were reported as not affected by geographical location to supply to the mines while 110 (34.28%) were greatly affected by geographical barriers. On the other hand, only 33 (9.42%) female gender out of the total respondents indicated that geographical barriers did not affect them to supply to the mines while the majority of the female gender with 46 (13.14%) respondents were greatly affected to supply to the mines. The rest of the male and female were neutral and did not indicate whether they were affected or not. This means that geographical location in terms of accessibility to the mines with poor road infrastructure and higher cost of energy sources impedes SMEs participation.

Location barriers

Table 5 shows the location where SMEs reside include urban and rural areas, and the crosstab was done

Table 4. Gender × Geographical locational barriers cross-tabulation.

Variable			Geographical barriers have greatly affected my inclusion to supply to the mines					Total
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Gender	Male	Count	31	63	46	55	65	260
		% within geographical barriers	77.5	72.4	80.7	73.3	71.4	74.3
	Female	Count	9	24	11	20	26	90
		% within geographical barriers	22.5	27.6	19.3	26.7	28.6	25.7
Total	Count		40	87	57	75	91	350
	% within geographical barriers		100.0	100.0	100.0	100.0	100.0	100.0

Source: Field Study (2019).

Table 5. location area × Geographical locational barriers cross tabulation.

Variable			Geographical barriers have greatly affected my inclusion to supply to the mines					Total
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
location area	Urban area	Count	4	16	18	24	6	68
		% within geographical barriers	10.0	18.4	31.6	32.0	6.6	19.4
	Remote area	Count	36	71	39	51	85	282
		% within geographical barriers	90.0	81.6	68.4	68.0	93.4	80.6
Total		Count	40	87	57	75	91	350
		% within geographical barriers	100.0	100.0	100.0	100.0	100.0	100.0

to determine which of the locational areas affected SME inclusion in the mining value chain. Whereby (68)19.4% of the SMEs in the study live in urban areas, 282 (80.6%) of them live in remote area. The findings as shown in the crosstab indicate that 136 (38.8%) of the total respondents are rural based and greatly affected by geographical barriers to supply to the mines. 30 (8.57%) of the total respondents are urban based and are affected by the geographical location while 20 (5.71%) are not. This means that the SMEs who live in remote areas are greatly affected by geographical barriers to supply to the mines.

Age and inclusion

Table 6 show a cross-tabulation between age and inclusion was done and among the 350 SMEs who participated in the study, 28 were under the age of 20; 117 respondents were between the ages of 21 to 29; 111 ranging 30 to 39 and the rest 94 were above 40. This means most SMES are in the ages between 21 and 39. In addition, the SMEs below 20 years of age show that 24% of them do not have problems to supply to the mine and 17% face many difficulties to supply due to geographical barriers. Overall, 166 respondents experience great barriers to supply to the mines while 127 do not have difficulties to supply. This

Table 6. Age × Geographical locational barriers cross-tabulation.

Variable			Geographical barriers have greatly affected my inclusion to supply to the mines					Total
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Age	under 20	Count	9	2	3	8	6	28
		% within geographical barriers	22.5	2.3	5.3	10.7	6.6	8.0
	21-29	Count	13	31	14	18	41	117
		% within geographical barriers	32.5	35.6	24.6	24.0	45.1	33.4
	30-39	Count	12	29	16	26	28	111
		% within geographical barriers	30.0	33.3	28.1	34.7	30.8	31.7
	over 40	Count	6	25	24	23	16	94
		% within geographical barriers	15.0	28.7	42.1	30.7	17.6	26.9
Total		Count	40	87	57	75	91	350
		% within geographical barriers	100.0	100.0	100.0	100.0	100.0	100.0

means that despite the different age distribution, most SMEs experience difficulties to supply to the mines

Multiple regression

A regression analysis was carried out to identify whether state of road or electricity impact on SME inclusion to supply to the mines. This analysis was also done to determine which of those factors mattered most, which factors can be ignored, and how these factors influence each other.

Table 7 shows the model summary with Multiple R of 71.7%. This means that there is a 71.7% correlation between the independent variables (road and electricity) with inclusion of SMEs to the mining value chain. On the other hand, the R-squared show 51.4% which means that geographical location account for 51.4% of the variance in inclusion of SMEs in the mining chains. Table 8 shows the ANOVA test in which overall, the geographical location (road infrastructure & electricity) are predictors of SME inclusion in the mining global value chain. The test show a p-value of less than 0.001 indicating that geographical location affect SMEs to supply to the mines.

Table 9 shows the regression analyses show that road and electricity infrastructure barriers are both statistically significant predictor of SME inclusion in the mining value chain.

DISCUSSION

The state of roads and electricity

The descriptive statistics show that the state of the roads and the cost of electricity prevent SMEs to engage in the supply chains. The road infrastructure leading to the mine is poor and un-serviced in most countries in developing economies. Studies of Goedhuys and Sleuwaegen (2010) as well as Porter et al. (2002) show that road infrastructure enhance “ease of access to physical resources, communication and transportation whose price does not discriminate against SMEs”. Unfortunately, infrastructure such as roads and electricity are undesirable and exist in poor condition or are very expensive for SMEs. Whereas infrastructure is a critical factor for economic development; its existence is expensive as it interacts with the economy through the production processes (Adenikinju, 2005). Although there is direct link between the availability and quality of infrastructure such as road, and electricity to economic development (Oseni and Pollitt 2013), the World Bank (2014) reports that the availability of quality infrastructure in most countries is undesirable and makes SME uncompetitive as they fail to cope up. The use of Public-Private Partnership approaches to mobilize

Table 7. Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.717[a]	0.514	0.511	0.963

[a]Predictors: (Constant), electricity, road.

Table 8. Analysis of variance (ANOVA).

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	340.879	2	170.440	183.685	0.000[b]
	Residual	321.978	347	0.928	-	-
	Total	662.857	349	-	-	-

[a]Dependent variable: Inclusion of SMEs to supply. [b]Predictors: (Constant), electricity and road.

private sector financing and expertise in infrastructure is very important to improve the position of SMEs to compete favorably in the global value chain (World Bank, 2014). Government policy initiative may help support entrepreneurship development and reduction of uncertainty as well as transaction costs (Naude, 2013).

Age and gender and their inclusion in the mine

A cross-tab of gender and geographical barriers to SME inclusion in the mining global value chain shows that the male genders have found more presence in the mining value chain. Business entrepreneurship plays a major role in job creation, innovation and growth. Whereas women entrepreneurship was driven by the theory of equity, social inclusion and equality; its development makes economic sense. Although the male gender is leading in becoming entrepreneurs, women get the chance through development programs aimed at enhancing education and awareness about their rights, vocational training, a basic education, psychological support and most importantly, tools that will enable their development and reintegration within the community. Further, a cross-tabulation between age and SME inclusion in the mining global value chain shows that the youthful SMEs are the majority to participate in the supply of good and services in the mines. The mining task or mining related task has proven a hard job for the too young or too old. Therefore, the youths in the age group above 20 years of age seem to be more concentrated in the mining activities

The impact of road and electricity infrastructure of SME inclusion

A multiple regression showed that the model used in the study showed a Multiple R of 71.7%. This means that there is a 71.7% correlation between the independent variables (road and electricity) with inclusion of SMEs to the mining value chain. The R-squared shows 51.4% which means that geographical location accounts for 51.4% of the variance in inclusion of SMEs in the mining chains. The ANOVA test shows that overall; the geographical location (road infrastructure and electricity) is a predictor of SME inclusion in the mining global value chain. The test shows a p-value of less than 0.001 indicating that geographical location affects SMEs to supply to the mines. The regression coefficients also show that both road and electricity infrastructure sit statistically significant to SME inclusion in the mining value chain

CONCLUSION AND RECOMMENDATIONS

The study shows that there is a significant relationship between road and electricity infrastructure with SME inclusion with their p-values all less than 0.005. This means that these factors greatly affect inclusion of SMEs in the mining value chain. The study recommends that the government of the republic of Zambia empower the SMEs with good road net system and cheap electricity. This may be done by continuous repairs and maintenance of road infrastructure and provision of transport facilities such as rail. Further the government may subsidize electricity tariffs for SMEs in the mining area.

LIMITATION OF THE STUDY

In spite of the excellent methodological approach in this study, there were some obvious inherent limitations. The use of structured questionnaires provides a generalized insight with the possibility of disregarding some pertinent context-specific insights. The researcher tried to address some imitations by recommending a robust data set to capture a wider data set which is representative and relevant. There is a further need for refining the the geographical barriers through an internal review supported by further collection of feedback from more

Table 9. Regression coefficients.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower bound	Upper bound
1	Constant	0.900	0.139	-	6.494	0.000	0.628	1.173
	Road infrastructure	0.574	0.044	0.594	12.997	0.000	0.487	0.661
	Electricity infrastructure	0.202	0.049	0.186	4.078	0.000	0.104	0.299

[a]Dependent variable: Geographical barriers have greatly affected my inclusion to supply to the mines.

more stakeholders from within the global mining value chain.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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