Development and Knowledge Intensification in Industries Upstream of Zambia's Copper Mining Sector

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Making the Most of Commodities Programme (MMCP)

MAKING THE MOST OF COMMODITIES PROGRAMME

Like many other developing economy regions, Africa is benefitting from a sustained boom in commodities prices. Received wisdom has been that commodities production is an inherently enclave activity and that it undermines the viability of industry. The Making the Most of Commodities Programme challenges this negative view of the commodities sector. It's research analyses the determinants of backward and forward linkages, identifying policy responses which will broaden and deepen them. In so doing it contributes both to achieving sustainable growth and the spreading of benefits to a wider population. By incorporating younger researchers, building a research network, and dialogue with policymakers, the MMCP also seeks to build analytical and policy capacity, and to influence policy outcomes.

The MMCP focuses on a diverse range of commodity sectors in a number of African economies, as well as on key infrastructural determinants of effective linkage development. A number of common factors are identified which will increase linkages beneficially and which lend themselves to policy intervention - the role of ownership, the nature and quality of infrastructure, the national system of innovation, spillover of skills to and from the commodities sector, linkages in regional economies and the nature and consistency of policies directed towards the commodities sectors.

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A MMCP Synthesis Monograph is currently being written by the MMCP Project Leaders: Raphael Kaplinsky (Open University), David Kaplan and Mike Morris (UCT).

The MMCP is a collaborative research and policy programme between Policy Research in International Services and Manufacturing (PRISM), Economics and CSSR, University of Cape Town and Development Policy and Practice, Open University. The International Development Research Centre of Canada is the principal funder, with additional funding from the William and Flora Hewlett Foundation, Harry Oppenheimer Institute, and Open University. Further information and other Discussion Papers can be downloaded from: http://commodities.open.ac.uk/discussionpapers or www.cssr.uct.ac.za/prism/projects/mmcp

Abstract

This research, part of the Making the Most of Commodities Programme, focuses on development and knowledge intensification in industries upstream of Zambia's copper mining sector. It explores the hypothesis that localisation and deepening of upstream linkages are driven by six factors: ownership, sectoral policies, the National System of Innovation, skills' spillovers, regional capabilities and infrastructure. In particular, the role of ownership in shaping value chain governance and in promoting industrialisation and knowledge-intensification of local industries is analysed in detail. Zambia represents an interesting case-study, with the recent, sizeable entry of China and India in its mining value chain. As China's investment in Africa attracts increasing interest from academia and Governments, this research on the effect of China's entry into Zambia's copper mining industry on the localisation of upstream linkages contributes to this debate from an evidence-based position. The report discusses comprehensively the policy implications of the empirical findings. The report is based on field research undertaken in the Copperbelt, North-Western Province and Lusaka in 2009.

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Executive summary

The Making the Most of Commodities Programme (MMCP) investigates the extent and quality of SSA insertion in commodity-based global value chains, in terms of upstream and downstream linkages. The MMCP focuses on the opportunities for local upstream and downstream linkages as a basis for industrial development and knowledge intensification. The core hypothesis is that localisation of linkages is driven by ownership, sectoral policies, the National System of Innovation, skills' spillovers, regional capabilities and infrastructure. This research focuses on development and knowledge intensification in industries upstream of Zambia's copper mining sector. The MMCP hypotheses frame the analytical discussion, with particular emphasis on the role of ownership in shaping value chain governance and in promoting local industrialisation and knowledge-intensification processes. Zambia represents an interesting case-study, with the recent, sizeable entry of China and India in its mining supply chain. As the impact of China's investment on Africa's development attracts increasing interest from the academia and the policy arena, this research focuses on the effect of China on Zambia's local supply chain.

Mining companies directed a significant share of their expenditures to the local supply chain. The depth of these local linkages, nevertheless, was low. Most suppliers engaged in low value-added activities, and were highly uncompetitive.

The past two decades brought major changes to the depth and composition of the local supply chain to Zambia's mining sector. Privatisation, and trade and investment liberalisation in the 1990s led to a higher presence of foreign suppliers, the progressive demise of the manufacturing sector and dominance of services providers, including one-man, trading businesses called 'briefcase suppliers'. The 2008/2009 copper price decline forced many buyers to increase supply chain efficiency by excluding the latter and focusing on capable suppliers.

The ownership structure of Zambia's copper mining sector was diversified: it included companies from developed countries and South Africa – hereafter defined as 'traditional buyers' - as well as from emerging economies, India and China. Small-scale mining was also relevant in terms of the number of companies involved. This heterogeneous structure was a fertile ground for an investigation of the relationship between ownership and value chain governance. Recent research argued that the institutional framework of Chinese FDI led to distinctive behaviour of Chinese firms. Strong State support created soft budget constraints and determined policy-driven, rather than only profit-driven corporate objectives. This enabled Chinese firms to pursue higher-risk investment of a counter-cyclical nature. This FDI was natural resources and market seeking, and privileged wholly-owned entry. While private sector-led investment grew, increasing the heterogeneity of China FDI actors, institutions remained a major force in shaping outward FDI, especially for State Owned Enterprises (SOEs).

China's entry into the Zambia copper value chain had a distinctive impact on the localisation of upstream linkages. Firstly, this report challenges the expectation that the Chinese mines would operate as an enclave. Whilst the objective of CNMC and ExIm Bank was to promote Chinese exports through outward FDI, the Chinese mine supply chain was driven by economic efficiency considerations. Mine development

was undertaken by Chinese firms, but the bulk of extractive operations relied on a diversified basis of local, regional and foreign suppliers. If suppliers met their requirements, Chinese buyers were open to do business with new entrants. Secondly, counter cyclical investment to expand mining and refining capacity meant that pressure to cut costs, experienced by other mining companies, did not play a major role in the Chinese supply chain. This had implications for the modality of engagement with local suppliers. Moreover, for critical supply links, buyers were on a learning process path, in which quality became an order-winning critical success factor (CSF). Lastly, the Chinese mine relied on Government to Government interaction, as suggested by previous studies. They minimised their interaction with local industry associations and did not participate in the IFC suppliers' development programme. They indeed failed to internalise such issues in their corporate strategy. No formal or informal cooperation was taking place with their suppliers.

As price plummeted in 2008, traditional buyers came under pressure to cut operations and capital costs. Selection of participants in the value chain was tightened and the supply chain was increasingly price-driven. They engaged in different forms of cooperation with their suppliers. Informal cooperation took place to improve their supply chain management. Cooperation with highly-skilled, specialised and critical suppliers was motivated by the need to support a base of local reliable suppliers. More particularly, buyers wanted to ensure such a base would not be disrupted by the economic crisis and would be available when full production resumed. Cooperation also targeted a few firms positioned in supply links where there was no competition, but in non-core activities that buyers wanted to outsource. Cooperation involved the provision of capital and a commitment to purchase goods. Buyers invested more resources because of very low suppliers' capabilities. Lastly, formal cooperation through the IFC Suppliers Development Programme was undertaken in fulfilment of CSR policies and of the Development Agreements (Das).

Indian and small buyers dealt with their suppliers through arms' length market-based relationships. Indian buyers specifically leveraged on unequal bargaining power to squeeze suppliers' profit margins. Moreover, low levels of trust and delayed payments reduced the quality of buyer-supplier relationships, and curtailed upgrading opportunities. Small mines' supply chains had higher engagement with the local manufacturers, such as joint product development, which nevertheless could not tap into resources for upgrading.

Quality, lead times and trust were order-qualifying critical success factors for all buyers. As mentioned, the supply chain to traditional buyers was increasingly price-driven, while Chinese buyers were increasingly more aware of quality considerations, but only for critical supply links. Traditional buyers considered learning and innovative capabilities an order-winning CSF. This was important because it implied that suppliers' investment in this area would be rewarded. Local suppliers, by and large, failed to understand these dynamics.

Different governance types co-existed within the same sector, and governance types changed with ownership, but also over time, most recently in light of the economic crisis. Suppliers were left with the challenge of meeting different critical success factors. The relationship between ownership and governance affected the trajectory of the local supply chain, in terms of growth and upgrading.

The report reviewed firm-level data, on performance and upgrading, to identify and explain underlying patterns. Three trajectories were identified: dynamic, static and declining. Suppliers positioned on a positive growth and upgrading path fell into two categories: those tightly inserted into foreign GVCs and those engaged in formal and informal cooperation with traditional buyers. In the first case, foreign GVCs required subsidiaries, branches and sole distributors to upgrade, and provided the resources for such upgrading, in terms of capital and knowledge. Reputation, ISO certification and better understanding of the CSFs were also transferred to local suppliers.

A positive trajectory was also a function of suppliers' cooperation with traditional buyers. Firms engaged in cooperation in a variety of forms, both formal and informal. Our research found that the intensity and efficiency of such cooperation was positively correlated to how critical such outsourcing was for the buyer, and indirectly correlated to suppliers' capabilities. When traditional buyers needed a reliable supplier, they would invest resources in building its capability. More resources would be invested if capabilities were low.

Our findings suggest that a minimum size and some level of specialisation on critical supply links were required in order to accommodate upgrading processes. Otherwise, firms would likely be trapped in a static trajectory. Moreover, a significant number of firms were on a declining trajectory, with poor performance and no capability to upgrade. A striking share of them were manufacturers, established in the 1960s and 1970s. In the absence of effective policies or strong cooperation with buyers or foreign GVCs, they lacked both the incentive and the resources for product or process upgrading.

The results on functional and chain upgrading were mixed. Some suppliers moved into more profitable and technological intensive value chains. Others moved into value chains with less stringent requirements, as an exit or diversification strategy. Moving into new value chains, therefore, did not always coincide with chain upgrading. These firms were all Zambian-owned. Suppliers tightly inserted into foreign GVCs had no interest in functional or chain upgrading, as they were part of a global distribution of roles controlled by the lead firms in their GVCs.

With regard to the other MMCP linkages drivers, weak policy and NSI were found to have a negative impact on the localisation of upstream linkages. The formulation of the tax regime for capital equipment imports disadvantaged local suppliers. The poor implementation of the local suppliers' development provisions in the DAs, coupled with weak government support to the private sector, implied that the upgrading processes were left to internal value chain governance. The weakness of the NSI also contributed negatively to the deepening of local linkages, by forcing local firms in a low technology trap and 'truncating' technology transfer to subsidiaries and other firms tightly inserted into foreign GVCs.

Poor skills availability constrained the possibility for suppliers to expand their markets and to upgrade into highly-skilled activities. The problem was particular acute for engineering firms. Skills spillovers from the mines to the supply chain were significant but not critical for growth and upgrading processes. They were effective when taking place in conjunction to tight cooperation with foreign GVCs or traditional buyers.

South Africa was a regional hub for supply of mining-related equipment to Zambia. Many suppliers were inserted into South Africa-based value chains, from which they tapped capital, skills and knowledge. The expansion of the DRC mining sector opened an opportunity for the Zambian suppliers to achieve the economies of scale they earlier lacked to undertake higher value-added activities within the regional supply chain. This would be supported by infrastructural development within the framework of the North-South Corridor.

	Expanding linkages	Deepening linkages
Policy	Negative impact	Negative impact
NSI	-	Negative impact
Skills' spillover	Reinforces the ownership variable	Reinforces the ownership variable
Regional capability	Positive impact	Potential positive impact
Infrastructure	Potential positive impact	Potential positive impact

The discussion on the policy implications takes into consideration two factors: firstly, within the copper mining sector, there was not one, but many value chains. Secondly, there were different possible industrial growth paths, namely: expanding the number of local firms that enter the mining supply chain; increasing the market size of individual firms; and fostering upgrading processes. The Table in the next page summarises the findings.

The policy discussion resulted in the following recommendations:

Policy recommendation 1: Easing access to the supply chain
Policy recommendation 2: Building on the IFC suppliers development programme
Policy recommendation 3: Encouraging Chinese and Indian mines to deepen cooperation with local suppliers
Policy recommendation 4: Skills creation
Policy recommendation 5: Promotion of FDI
Policy recommendation 6: State to State dialogue with the DRC
Policy recommendation 7: Building the NSI
Policy recommendation 8: Horizontal and sector-specific measures
Policy recommendation 9: Strengthening private sector cooperation

			Industrial developmental path		
		Suppliers type	**Expanding the basis of the supply chain**	**Increasing market size for individual firms**	**Upgrading**
Buyers' ownership	**Traditional buyers**	Non-critical suppliers	high entry barriers	selective opportunities	selective opportunities: process functional chain upgrading
		Skills-intensive firms	low entry barriers	yes	yes: process upgrading
		K-intensive, critical suppliers	low entry barriers	yes	yes: process functional chain upgrading
	Chinese buyers	Non-critical suppliers	L ow entry barriers	limited	No
		Skills-intensive firms	no entry l ow entry barriers	no	no
		K-intensive, critical suppliers		yes	yes: process upgrading
	Indian buyers	Non-critical suppliers	low entry barriers	no	no
		Skills-intensive firms	low entry barriers	no	no
		K-intensive, critical suppliers	low entry barriers	no	no

1. Introduction

1.1 Literature review

The Making the Most of Commodities Programme (MMCP) investigates the extent and quality of SSA insertion in commodity-based global value chains (GVCs), in terms of upstream and downstream linkages. In particular, the MMCP explores the opportunities for resource-driven industrialisation and knowledge intensification paths. By doing so, this research programme challenges the scepticism of the 'resource curse' literature on the developmental impact of the natural resource sectors (Isham *et al.*, 2003; Gylfason, 2001; Sachs and Warner, 1997 and 2001).

Australia, Canada, Scandinavia and the US are examples of well-managed, resource-rich economies in which the mineral sectors spurred knowledge-intensification processes, created jobs and foreign exchange earnings and resulted in spill-overs into new industrial and service sectors (Lorentzen, 2008; World Bank, 2003; Wright and Czelusta, 2004). Localisation of linkages and knowledge-intensification processes, nevertheless, were supported by appropriate policies, particularly relevant in the context of market imperfections and low levels of industrial and technological capabilities (Blomström and Kokko, 2007; Maloney , 2007; Wright and Czelusta , 2007). Two literatures provide the framework for investigating such issues: Global Value Chains (GVCs) and the National System of Innovation (NSI) literature.

The GVC literature analyses the different value-added links - composed of many activities - required to bring a product from conception and design to its delivery to the final consumer and, finally, to its disposal (Kaplinsky and Morris, 2001). This analytical framework allows researchers to understand the distributional outcome of GVCs for firms/countries. It also helps to frame the discussion of how firms/countries can upgrade into more sustainable, remunerative stages of the global value chain. Lastly, it eases the identification of systemic issues affecting the efficiency of value chains (Kaplinsky and Morris, 2001).

A particularly important concept in GVC literature is value chain governance, introduced by Gereffi (1994). Governance refers to a wide range of functions: selecting participants in the value chain and determining their roles; setting key performance standards; monitoring and, in case of failure, punishing or assisting suppliers (Kaplinsky and Morris, 2006). Governance determines how different industries participate in the value chain, their economic returns and their opportunity to innovate/upgrade (for example Gereffi, 1999; Bair and Gereffi, 2001).

With the growth of industrial capabilities in developing countries, and new developments in ICT allowing integration of distant activities and codification of complex information, increasingly different governance types are found across sectors, regions and time horizons (Sturgeon, 2008). Governance, which ranges from arm's length market relationship, to increasingly tight forms of cooperation, to vertical integration, is determined by a number of factors, a key one being reduction of transaction costs. Further work by Gereffi *et al. 2005* suggested that governance was determined by changing relationships between three parameters: the complexity of knowledge embedded in a transaction (in terms of product and process specification), the extent to which this knowledge could be codified, and the

capabilities of potential suppliers. Governance can also be affected by the participation of firms in more than one value chain, which leads them to be subject to competing strategic interests (value chains are seen as *nodal points of power*) (Morris, 2001: 128). The role of institutions, social capital and firms' corporate strategies in shaping governance, on the other hand, has been under-researched. A research gap also exists with respect to minerals-based value chains. Giuliani *et al.* (2005) undertook one of the few empirical works on resource-based GVCs and found that, as technological innovation was characterised by low rent appropriability, joint actions between public institutions and firms were critical for product and process upgrading[1].

The interaction of firms and institutions in promoting the firms' technological sophistication is the core subject of the NSI literature. This builds on an evolutionary approach to technological progress. Being characterised by difficult appropriability of returns on knowledge, knowledge and information markets tend to be imperfect in many respects: imperfect competition, localised learning which limits the possibility for spillovers in less developed countries, the requirement of initial learning capabilities in order to access technologies, low-level equilibrium traps, and path dependences (Stiglitz, 1989). Firms' access to knowledge and new technologies, therefore, is not effortless, but risky, imperfect and costly (Lall and Teubal, 1998). In order to build technological capabilities, critical factors matter: access to skills, adequate organisational and managerial structures, and exposure to external competitive pressures. It's important to highlight that, in this literature, technological progress encompasses radical, ground-breaking innovations as well as adaptation and incremental improvements, managing new functions, new kinds of know-how and operating procedures and the organisational arrangements needed to integrate these elements into existing processes (Bell and Albu, 1999).

Technological progress is the result of dynamic interactions between and beyond firms. At the firm-level, the capability to transmit and receive skills, information and technology from suppliers, sub-contractors and specialised firms and institutions contribute to the firms' competitiveness and the diffusion of technology throughout the industry (Lall, 1992). At the macro-level, technological progress is a function of complex linkages between firms, universities, research institutes and other stakeholders, which together define the National System of Innovation and its technological dynamism (OECD, 1997). This concept is important for developing countries, because an effective NSI fosters endogenous technological capabilities, which ensure sustained capacity to adopt, improve and diffuse new technologies, irrespective of whether the new technologies are produced domestically or abroad (Freeman, 1995). Reviewing five case-studies of knowledge-intensification in resource-rich sectors in developing countries, Lorentzen concluded that the combination of weak NSI, unavailable foreign technology and absent industrial policy, in the context of poor absorptive capacity, stunt technological progress (2008). Policy, therefore, has an important role to play with regard to technological innovation (Amsden and Hikino, 2000; Freeman, 1995; Lall, 1994; Lall 2000).

[1] In the literature on clusters, 'joint actions', or formal and informal cooperation, create positive externalities that, beyond the classical, Marshallian ones (pool of specialised labour, specialisation of suppliers, knowledge dissemination), assist the firms in responding to specific challenges such as new international standards and market liberalisation (Schmitz, 1997; Rabellotti, 1995 and 1998; Nadvi, 1999; Schmitz, 1995 and 1999).

In the context of this study, the GVC and NSI literatures suggest some critical analytical questions: which actors govern the value chain, how and with what consequences for the localisation of upstream linkages? Are there other factors driving such localisation process and how important are they? How are public and private institutions contributing to the development of domestic technological capabilities? What is the relationship between value chain governance, NSI and upgrading processes?

1.2 Focus of this research

The MMCP focuses on the opportunities for local upstream and downstream linkages as a basis for industrial development and knowledge intensification. The core hypothesis is that localisation of linkages is driven by ownership, sectoral policies, the National System of Innovation, skills' spillovers, regional capabilities and infrastructure.

This research focuses on development and knowledge intensification in industries upstream of Zambia's copper mining sector. The analytical discussion is framed by the MMCP hypotheses, with emphasis on the role of ownership. This research contributes to fill some important research gaps. At the policy level, the localisation of upstream linkages in Zambia has so far been at the margin of Zambia's domestic research and policy agendas. From an evidence-based position, this report suggests ways in which the copper mining sector could promote industrial development. Three issues are relevant for industrial development: firstly, expansion of the number of local firms participating in the mining supply chain; secondly, increasing the market size of individual firms, in terms of increased turnover. Finally, upgrading processes, that enhance dynamic firms' capability to do better what they are doing (process, product upgrading), to undertake new functions, and to move onto a more advanced value chain altogether.

At the theoretical level, this research provides new insights on the role of ownership in shaping value chain governance and in promoting localised industrialisation and knowledge-intensification. Zambia represents an interesting case-study, with the recent, sizeable entry of China and India in its mining supply chain. Finally it contributes to filling the gap in the empirical literature on minerals-based GVCs.

1.3 Outline of the report

Section 2 and 3 of the report provide a global and country overview of the copper industry. Zambia's copper industry is presented in terms of its history, its current profile, and an in-depth discussion on the ownership structure of the mining companies. Methodological issues are discussed in Section 4. Sections 5 to 7 present the research findings. The nature and extent of upstream linkages in Zambia are discussed in Section 5. Section 6 addresses the role of ownership in shaping value chain governance in Zambia's copper mining sector, and in determining firms' performance and upgrading processes. Other MMCP drivers are discussed in Section 7 - policy, NSI, skills' spillovers, regional capabilities and infrastructure. Last, concluding remarks and policy recommendations are presented in Sections 8 and 9.

2. The global copper industry

In 2009, global copper ore production totalled over 15.5 million tonnes. Latin America was the largest producing region (7.6 million tonnes), as output increased dramatically over the past decades. Chile alone accounted for over one-third of global output (almost 5.4 million tonnes). The US was the second largest producer (1.3 million tonnes). Asia produced 2.5 million tonnes: mostly in China (1 million tonnes), Indonesia (0.56 million tonnes) and Kazakhstan (0.42 million tonnes).

Refined production was located both in producing and importing countries (Table 1). Producing countries tended to vertically integrate smelting and refining, because proximity to the mining area conferred a competitive advantage for such operations. Importing countries had a large industrial base, which relied entirely (Japan) or in part on imports of unprocessed metal. They developed refining capacity thanks to falling transportation costs in the second half of the 20th century (UNCTAD, 1996). In 2009, world copper smelter and refinery output totalled 14.5 million tonnes and 18.5 million tonnes, respectively. Asia's was the leading and fastest-growing region in copper processing: 52% of global smelted production (24% in China alone) and 44% of refined production (22% in China alone). Japan, Chile, US and the Russian Federation followed.

Table 1: Global Production of Refined Copper (US$, '000)

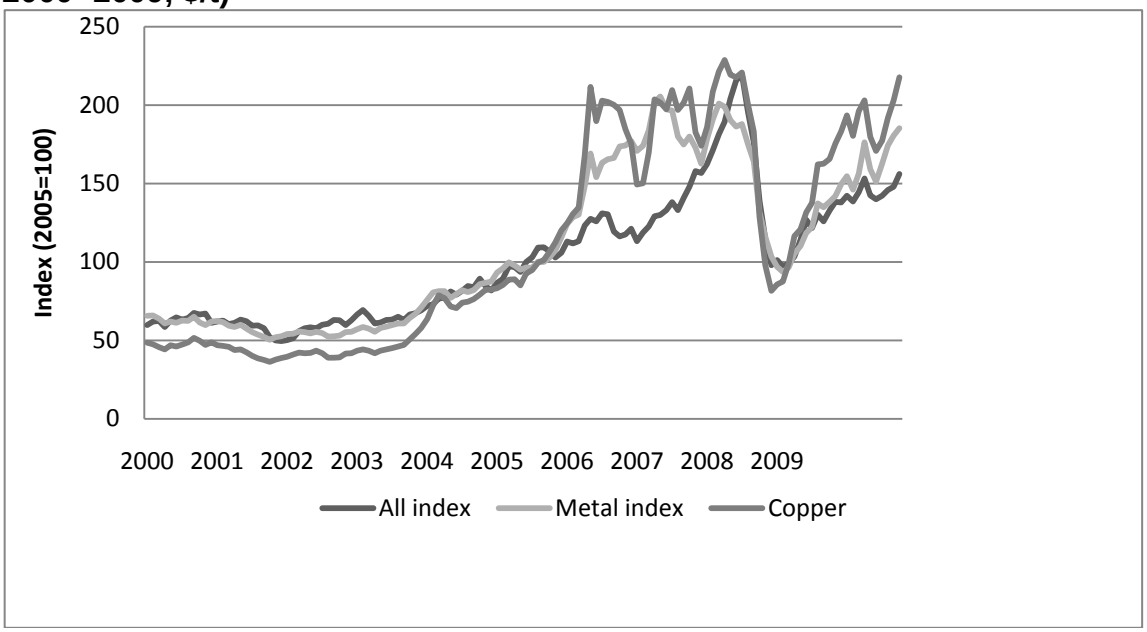
	2004	2005	2006	2007	2008	2009
Total	**16,096**	**16,832**	**17,378**	**17,957**	**18,199**	**18,506**
China	2,199	2,607	3,002	3,499	3,779	4,040
Chile	2,837	2,824	2,811	2,937	3,060	3,113
Japan	1,380	1,395	1,532	1,577	1,540	1,572
USA	1,306	1,255	1,250	1,311	1,267	1,270
Russia	919	935	943	949	862	846
Germany	653	639	662	666	690	701
Zambia	410	446	497	523	575	604
Poland	550	560	557	533	529	522
South Korea	496	527	562	566	514	512
Australia	498	469	429	442	503	511
Peru	505	510	508	414	464	454
Canada	527	515	501	454	442	426
Belgium	383	383	379	394	396	399
Kazakhstan	446	419	430	408	400	396

Source: Euromonitor International, 2011

2004 marked the beginning of an upward price surge for metals, especially for copper (Figure 1). Since 1974, copper prices suffered a long-term decline due to a combination of two global recessions, reduced intensity of metal use and excess supply. 30 years later, prices registered dramatic growth rates: a three-fold increase between 2003 and 2007, peaking to 8,714.2 US$/t in the first trimester of 2008 (Figure 2). From the last quarter of 2008, prices plummeted because of the global economic crisis, with bottom levels of 3,105 US$/t in December 2008, but recovering by the second half of 2009.

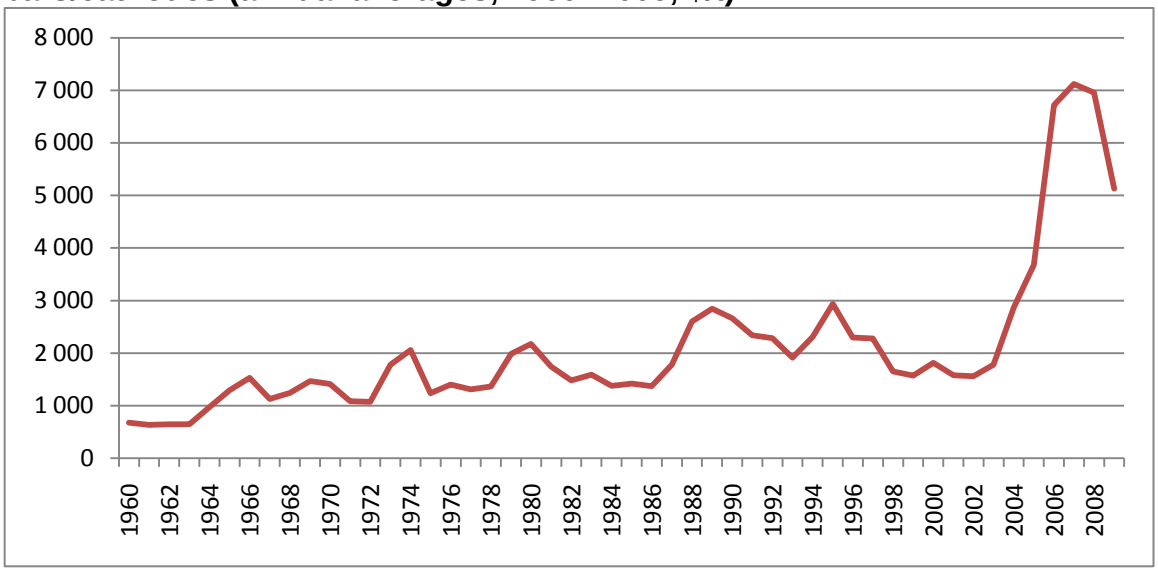
The main driver of the last decade's price boom was increased demand from China, coupled by a slow supply response. In 2005, China accounted for two thirds of the growth in copper demand (UNCTAD, 2007). Copper demand from China, India and other emerging economies was likely to be sustained as they embarked on a resource-intensive stage of economic development. A range of factors constrained the supply side: increasing costs of exploring and mining new areas, falling ore grades in developed areas (US, Chile), high capital costs, exchange rate risks and political instability (ICSG, 2010; UNCTAD, 2007). Recent research argued that the price boom represented a 'structural shift' in global copper prices (Cuddington and Jerrett, 2008; Kaplinsky & Morris, 2008; UNCTAD, 2007).

Figure 1: Metals Index and Refined Copper Price Index (monthly averages, 2000- 2009, $/t)



Source: IMF Commodity Price Statistics

Figure 2: Historical prices for refined copper, grade A, electrolytic wire bars/cathodes (annual averages, 1960- 2009, $/t)



Source: UNCTAD Stats

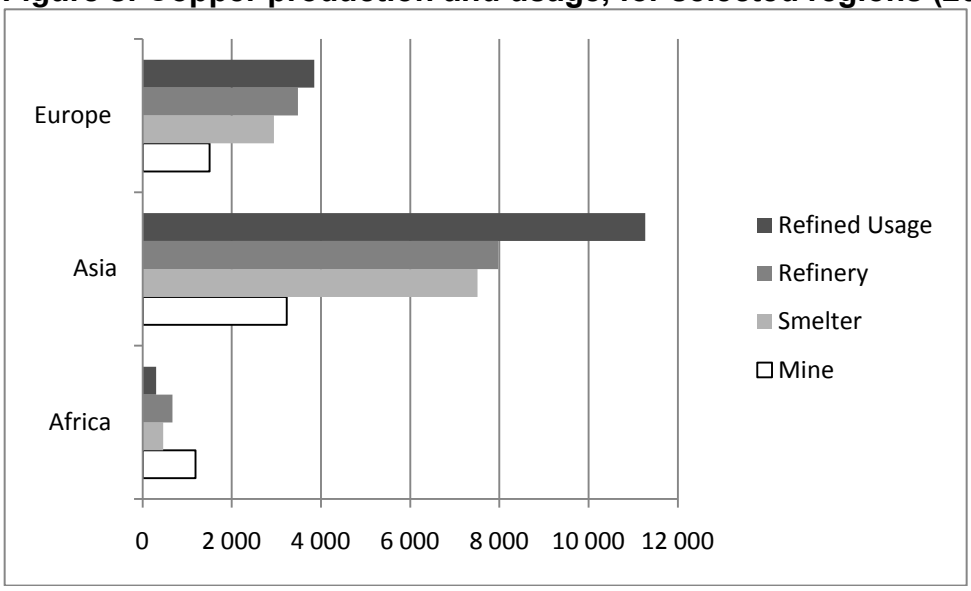
Copper has a high value per unit weight, which allows its tradability on the global market. With 77% of the value-added accruing at mining stage (UNCTAD, 2007), mining is a highly profitable business. This underlined the recent surge in world FDI into extractive industries. Metal mining was dominated by private TNCs with a high degree of internationalisation and, to a lesser extent, large SOEs (Chile, China). Since the mid-1990s, market consolidation intensified, with frenzied cross-border M&A activities. In 2005, 149 firms controlled 60% of the global metal mining output; the 10 largest firms controlled 30%. In the copper market, the 10 largest firms accounted for 58% of global output (Cuddington and Jerrett, 2008; ICSG, 2009; UNCTAD, 2007). The value of M&A activities in metal and oil sectors reached peak levels in 2008, US$ 87 billion, and slowed down in 2009 (UNCTAD, 2010).

Semifabricators are the 'first users' of refined copper. Wire, rods, plates, strips feed into the construction and manufacturing sectors. Competitiveness in semifabricates manufacturing is not typically determined by proximity to the mines, but by labour cost and access to infrastructure. In 2009, China was the first producer of semifabricates, more 12 million tonnes, three times US production levels, the second largest producer, followed by Germany and Japan (ICSG, 2010).

In term of final usage, equipment manufacturing absorbed the largest share of copper output (52%, or 11.6 million tonnes), followed by building construction (7.3 million tonnes) and infrastructure (3.2 million tonnes). Asia ranked first in refined copper usage, as demand expanded more than five fold in less than 30 years. China was the largest user (36%, 7.9 million tonnes), while India lagged significantly behind (0.92 million tonnes). North America and Western Europe, by 2009, absorbed, respectively, only 11% and 14% of global production. Their usage levels, at 2.5 million and 3.1 million respectively, did not change much from the 1980s, but were dwarfed in relative terms by the spectacular growth of Asian demand. The economic downturn in 2008 widened this diverging pattern (ICSG, 2009 and 2010).

The trade regime for copper is relatively free of barriers, and therefore does not impact on the distribution of roles in the global value chain (UNCTAD, 1996). Similarly to other commodities, downstream, higher value-added stages of the value chain are located in countries with large industrial bases, both in emerging and developed economies. This consideration begged the question of what happened to producing countries in Africa. Two striking features emerged when comparing Africa to Asia and Europe (Figure 3). Firstly, in Africa, a net exporter of copper ores, refined copper usage absorbed only 26% of total production (concentrated in South Africa). In Europe and Asia, refined copper usage represented 249% and 156% of ore production, respectively. Secondly, Africa was also a marginal player in copper ore production, with only one significant producer, Zambia. Africa was not only at the bottom of the copper value chain, with some refinery and insignificant industrial capabilities (except South Africa), but was also marginal in its mining exploration and development activities.

Figure 3: Copper production and usage, for selected regions (2009, '000 mt)



Source: ICSG accessed 2011, provisional 2009 data

3. Zambia copper industry

3.1 Historical background

Copper mining in Zambia dates back to the 1900s, under the control of two mining companies, Rhodesia Selection Trust and Anglo-American Corporation (AAC). In the post-colonial era, the wave of nationalisation that swept across Africa did not exclude Zambia. In 1969, Zambia nationalised the copper mines, which were later consolidated into the Zambia Consolidated Copper Mines (ZCCM), majority-owned by Government (60.3%), with a minority share owned by AAC (27.3%). Copper mining generated the bulk of government revenues, on average 45% between 1965 and 1975 (Shafer, 1990). These were mainly directed towards social sectors and subsidies to production and consumption. Copper mining also had extensive linkages to the rest of the economy: in terms of upstream linkages to local manufactures, mostly SOEs, and in terms of downstream processing by a cable and wire

semifabricator, ZAMEFA, a joint venture between Government and Phelps Dodge Ltd. (US).

From the mid-1970s, Zambia's copper mining sector came under mounting pressures: on the one hand from plummeting world prices and on the other, from scarce re-investment from the government for re-capitalisation and exploration activities (ICSG, 2007). This was coupled with increase transport costs due to disruption of the main transport routes through Zimbabwe and South Africa (UNDP, 2007). As a consequence, annual output fell from 750,000 tonnes in 1973 to 257,000 tonnes in 2000 (Chamber of Mines, 2005). Production costs rose by 100% in only 8 years, between 1969 and 1977 (Libby and Woakes, 1980: 37). The failure of the government to undertake major reforms to restructure the politically-sensitive mining sector (Shafer, 1980), forced Zambia to rely increasingly on foreign debt. Between 1975 and 2004 (HIPC completion point was achieved in 2005), debt service averaged 9% of GDP (UNDP, 2007).

The Structural Adjustment Programme (SAP) commenced in 1983, but was implemented consistently only from 1991, with the newly-elected Chiluba government. The core of the SAP was the privatisation of the mines. Between 1992 and 1997, ZCCM was dismantled and the first mine sold to foreign investors, in a process fraught with complications: the strategic importance of the mines, their dire financial situation at the time, pressures from donor agencies to complete the process and inconsistent positions from the main actors (Craig, 2001; Kaunda, 2002). By 2001, all the mines but KCM had been privatised. Transactions over the latter were concluded only in 2004. Phase II of the privatisation process, the offer of minority shares held by Government-owned ZCCM Investment Holdings to the Zambian public, has yet to be concluded.

The legal framework for the privatisation process was set by the 1995 Mines and Minerals Act (GRZ, 1995). The Act liberalised the investment regime and provided for fiscal incentives to be negotiated with each mining company and enshrined in Development Agreements (DAs). The DAs provided very favourable financial terms for the mining companies, because they were negotiated at a time of very low prices and the mines required significant re-capitalisation. The DAs also included provisions for the development of local businesses. When the copper price boom increased mining profits but not revenues for the Zambian government (Bova, 2009), the mining tax regime in the DAs rapidly became a major contentious issue in the political debate. Like other mineral and oil producers developing countries at the time, Zambia changed its mining sector fiscal regime. In 2008, the Zambian government repealed and replaced the 1995 Act - it unilaterally suspended the DAs, increased corporate tax and mineral royalties, introduced a windfall tax and a variable profit tax (GRZ, 2008a,d). Due to the copper price fall in 2008, the 2009 Budget scrapped the windfall tax and increased the capital allowance to 100% (GRZ, 2009a).

3.2 Profile of the copper sector in Zambia

In 2009, Zambia was the largest African copper producer and the 7th largest in world refined copper production (3.3% of global output) (see Table 1). Reserves of 19 million mt and a reserve base of 35 million mt of copper content ensured that, even without new discoveries, copper mining could continue at current rates for 60 years

(USGS 2006 data in ICSG, 2007). The value of copper exports grew dramatically in the past decade. It was estimated that Zambia's terms of trade improved significantly from 2000 onwards, thanks to the 'China effect', which accounted for almost half of the copper price growth between 2000 and 2005 (Zafar, 2007). In 2000, Zambia was exporting US$ 474 million worth of copper. By 2008, exports peaked almost US$ 4 billion, to decrease to US$ 3.17 billion in 2009 due to the copper price crisis, only partially offset by increased production volumes. In 2000-2005, copper exports contributed to around half of total foreign exchange earnings, but from 2006 onwards, this share increased to 73.5% - 83.2%. Copper also provided 10% of formal employment and its contribution to GDP in the last decade increased on a yearly basis, reaching 9.1% in 2009 (Table 2).

Zambia's exported copper is mostly in refined form (cathodes) (Figure 4). China imported around half of Zambia's exports[2]. Because expansion of refining capacity lagged behind production, from 2004, the share of exports of unrefined copper over total copper exports increased: 5% in 2004, 18% in 2006, 9% in 2009. Substantial investment took place in the past decade to expand refining capacity beyond the three existing smelters: a Chinese investment of US$ 310 million in a new smelter, which increased domestic refining capacity by 150,000 t/year; Indian investment in the Nchanga smelter; and a Swiss-Canadian US$190-million investment to expand the capacity of an existing smelter to 850 000 t/y (the latter was the largest copper smelter in Africa and the fifth-largest in the world) (CNMC, 2009; ICSG, 2007; Mining Weekly, 2006).

Output of copper plates, sheets and strips, as well as copper wires, increased consistently. Comtrade figures report increases from US$ 16 million in 2000 (4% of total copper exports) to over 1 billion in the period 2006 - 2008 (around 30%), declining to US$ 639 million in 2009 (20%)[3]. Domestic data, nevertheless, suggest that the actual figure may be significantly lower. Production was largely accounted for by ZAMEFA's wire rod plant, operated by Metal Fabricators of Zambia, which in 2009 suspended operations due to the crisis.

[2] Zambia's Central Statistics Office did not report export by final destination. It was more reliable to utilise COMTRADE import figures (ICSG, 2007).

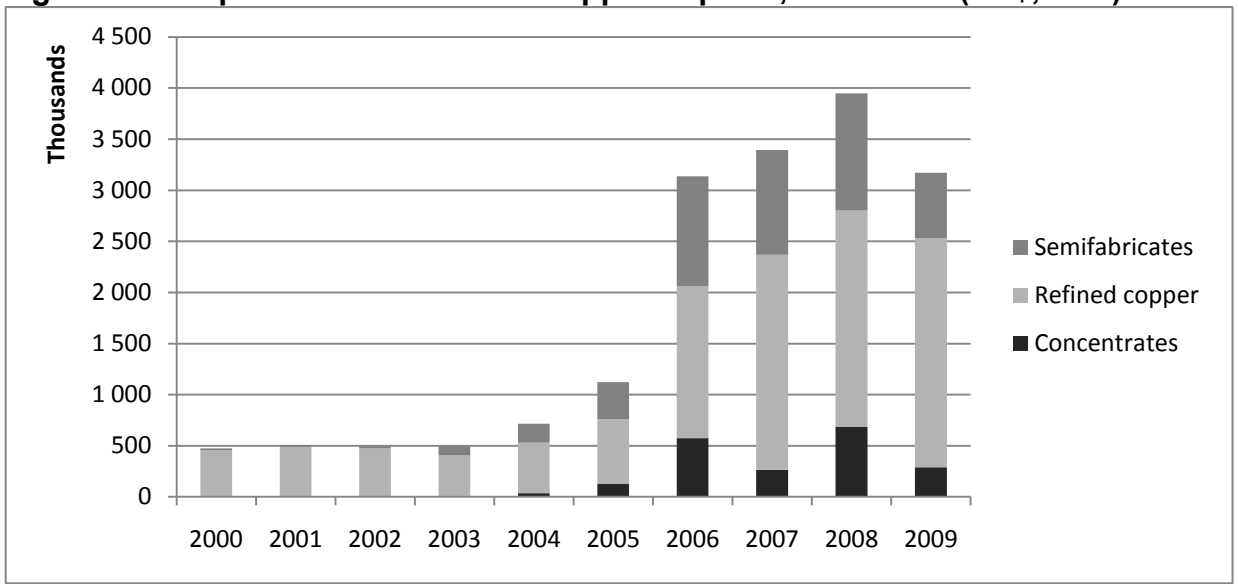
[3] This data nevertheless was inconsistent with the Zambia Development Agency data. The latter, which was more reliable, reported significantly lower levels of semis export.

Table 2: Zambia's copper exports, 2000-2009 (US$, '000)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Concentrates	1,736	1,623	2,080	11,034	34,450	126,832	574,854	264,395	688,741	288,232
Refined copper	455,370	487,855	470,928	394,241	497,777	633,275	1,485,602	2,104,451	2,111,791	2,243,224
Semifabricates	16,680	15,695	19,276	91,964	182,279	361,419	1,075,505	1,023,244	1,148,244	638,595
Tot copper exports	473,786	505,173	492,284	497,239	714,506	1,121,526	3,135,961	3,392,090	3,948,776	3,170,051
% ref copper	99.63%	99.68%	99.58%	97.78%	95.18%	88.69%	81.67%	92.21%	82.56%	90.91%
Total Exports	892,362	987,411	956,349	980,445	1,575,627	1,809,763	3,770,370	4,617,454	5,098,688	4,312,055
% Copper in Total Exports	53.1%	51.2%	51.5%	50.7%	45.3%	62.0%	83.2%	73.5%	77.4%	73.5%
% of GDP*	6.2	6.8	7.7	7.6	8.2	8.3	8.5	8.4	8.1	9.1

Notes: (*) constant 1994 GDP prices. Source: COMTRADE, Central Statistical Office

Figure 4: Composition of Zambia's Copper Exports, 2000-2009 (US$, '000)

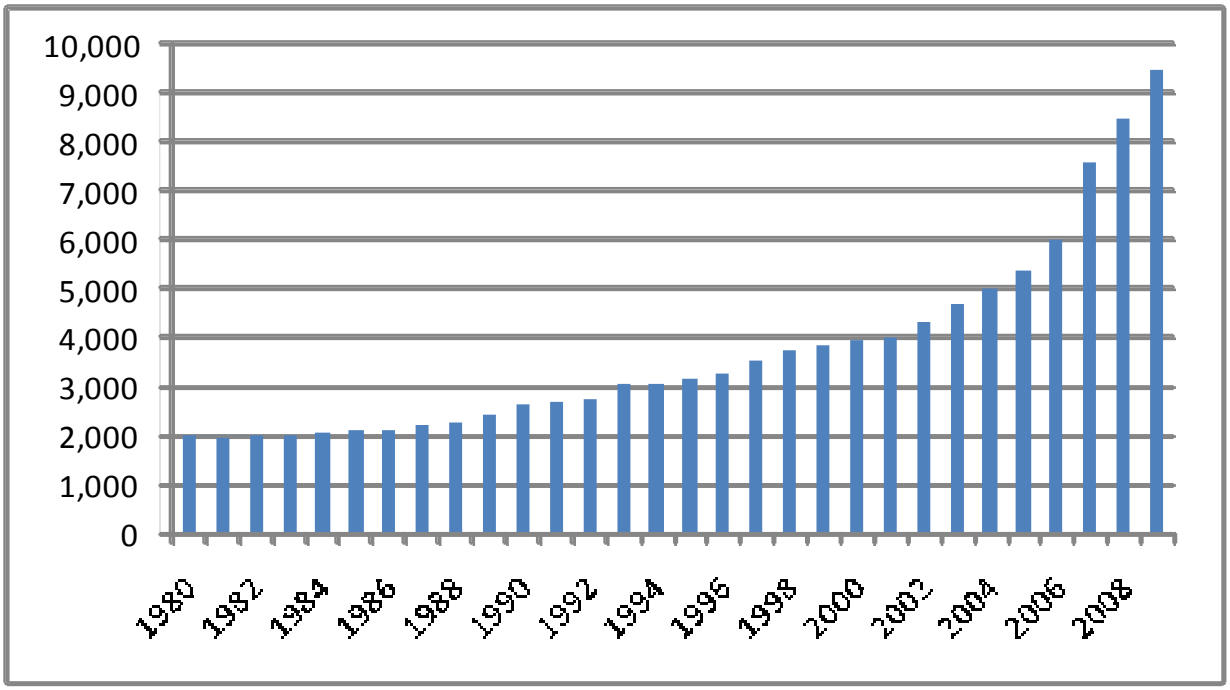


Notes: concentrates includes ores, concentrates, unrefined. Source: COMTRADE

3.3 The new kids on the block: Asian investment in the Copperbelt

The positive performance of the copper sector in Zambia was the result of exceptionally favourable world copper prices, as discussed in Section 2, as well as the injection of new investment capital after privatisation. Looking at inward FDI stocks in the past three decades, three phases could be identified: the 1980s, a period of relative stagnation; the 1990s, when investment increased by an annual average of 4% (1991-2001) due to privatisation of non-mining assets; and after 2001. After completion of the privatisation of mining assets, FDI stocks increased by an annual average of 11% (2002- 2009), totalling US$ 9.5 billion in 2009, almost exclusively in the mining sector (Figure 5). Investment by the new owners of the mines went into plant rehabilitation, expansions and new projects (Chamber of Mines, 2005). In the same period, small-scale mining became increasingly prominent, largely owned by Zambian investors.

Figure 5: Zambia's annual inward FDI stock, 1980-2009 (US$ current prices, millions)



Source: UNCTAD Stats, accessed in February 2011

In 2009, the largest sources of FDI in Zambia were Canada and India, which held 19.17% and 17.10%, respectively, of total FDI stock[4]. Australia and Switzerland followed at 3rd and 4th place, holding around 11% each of total FDI. China was the 5th largest investors, with a similar pattern to other SSA countries: small FDI levels, relative to developed countries, but fast-growing (UNCTAD, 2008 and 2010). South Africa[5] invested slightly more than 0.5 billion US$, not only into mining, but also into

[4] A Canadian-Australian company undertook the Lumwana mining project, the largest greenfield investment, located in a new mining area, the North-Western Province. It started production ten years after acquisition, in 2009.

[5] After protracted negotiations, in 2000 AAC concluded an agreement for the acquisition of Zambia's largest mining asset, Konkola Copper Mines. Few months later, as expectations on copper prices

agriculture and services. Investment from the European Union was fragmented across 12 countries and across different non-mining sectors. FDI from Netherlands and the UK accounted for the lion's share of it, standing at US$ 524 million and US$ 464 million, respectively (Table 3).

Table 3: Country of origin of Zambia's inward FDI stock, 2009 (US$, million)

			By component		
			Equity	Reinvested Earnings	Other capital
	US$ million	%	US$ million	US$ million	US$ million
Canada	1,433.00	19.17	98	1,335.00	0
India	1,277.90	17.10	564	172.2	541.7
Australia	810.4	10.84	751	58.1	1.3
Switzerland	805.4	10.78	37.9	46	721.5
China (incl. HK)	597.4	7.99	196.1	72.7	328.6
Netherlands	524.2	7.01	234.1	67.4	222.8
South Africa	510	6.82	61.1	137.3	311.6
UK	465.7	6.23	114.6	106.2	244.9
Africa (excl. ZA)	270.6	3.62	146.9	21.7	101.8
ROW	778.7	3.89	96.5	74.8	119.4
Total world	7,473.50	100.00	2,316.70	2,271.30	2,885.60

Source: Bank of Zambia, 2009

TNCs from developed countries dominated metal mining in Africa since colonial times and the early post-colonial decades, 1950s and 1960s (UNCTAD, 2007). In Zambia developed countries held 78% of total inward FDI stock, while India and China together accounted for only 4.6% in 2000 (UNCTAD, 2008). By 2009, their aggregated share rose to 25% (Table 3). Table 4 presents an overview of the post-privatisation ownership structure of the copper mining sector.

China's entry into Zambia's mining sector was gradual, with acquisition in 1998 of a relatively small mining operation, NFC Mining Co. In 2006, China invested in a US$ 310 million smelter. Luanshya, a mine with significant potential for expanded production, was acquired in 2009, after an Indian investor (1997-2000) sent it into receivership and a Swiss investor (2003-2009) pulled out due to the economic crisis. US$ 400 million had been committed to re-capitalise the mine, plus US$ 300 million for the construction of an acid plant. China was also in the process of financing and constructing the Chambishi Multi-facility Economic Zone, a US$ 800 million-worth investment. This included the Chambishi Copper Smelter and the acid plants, as well as a copper semi-fabricates manufacturing plant (CNFC, 2011; ZDA 2010 a)[6]. A pledge of US$ 3.6 billion was also received by a Chinese mining conglomerate involved in various stages of the mining value chain, from exploration to marketing (ZDA, 2010 a and c).

were increasingly negative, AAC pulled out, leaving the Zambian Government in desperate need of a buyer to preserve jobs and revenues.

[6] Luwmana Copper Project agreed with Government on the establishment of a MFEZ through issuance of a Statutory Instrument. It was not known, nevertheless, if Equinox Minerals Ltd. had taken responsibility for the required infrastructural investment.

India was the last country to enter Zambia's mining sector. In 2004, London-based Vedanta Resources acquired KCM assets, with a commitment to develop Konkola Deep Mining Project, of key strategic importance for the country's future in the industry, with the potential for a three-fold increase in Konkola mines' output (USGS, 2010).

Mining investors differed not only by country of origin, but also by corporate structure (Table 4). All but one of the firms from developed countries were listed on the major stock exchanges and 2 out of 3 were operating as JVs[7]. The South African and Indian firms were public-listed as well. The Chinese firm was owned by China Non-Ferrous Metals Corporation (CNMC), one of the largest SOEs, under direct supervision of the State-owned Assets Supervision and Administration Commission (SASAC). CNMC was not listed and was one of the 'national champions' selected by the Chinese Government for special support at domestic and international level.

The relationship between ownership and FDI attracted considerable research interest in the last decade. Ownership was found to matter in more than one way. The country of origin of the investing firm determined what drove internationalisation strategies (He, 2003; Zhao and Zu, 2000) and the extent of technology transfer (Ford *et al.*, 2008). The ownership structure determined risk preferences and decision-making horizons and, in turn, entry modes and location decisions (Filatotchev, 2007). Recent surveys of foreign investors in SSA highlighted that South African, Indian and Chinese investors differed by firm structure and factor use, as well as by risk aversion profiles (Broadman, 2007; Henley *et al.*, 2008). Particular interest focused on Chinese outward FDI, as China moved from being a major recipient of FDI to being a large source of FDI to developed and, especially from 1999, to developing countries (Broadman, 2007; Cheung and Qian, 2009; Sauvant, 2004; UNCTAD, 2008). Recent empirical work on Chinese FDI suggested few key distinctive features. Buckley *et al.* found such distinctiveness to derive from three factors: firstly, capital market imperfection, that is access to capital at concessionary terms. Secondly, ownership, which refers to a competitive advantage accrued from flexibility in adjusting to production methods of other developing countries. Finally, institutional factors (2007).

[7] One company was privately-owned, but minority-owned by one of the listed companies.

Table 4: Ownership profile of Zambia copper mining sector

Mines	Investor	Year of acquisition	Corporate structure	Assets	Production volumes
Konkola Copper Mines Plc (KCM)	Vedanta Resources, India (79,4%), ZCCM (20,6%)	2004	Listed on FTSE*	Mines, concentrators, smelter, leaching plants, SXEW plants	Refined copper MT 316,000 (2007)**
Kansanshi Copper-Gold Mines Plc Bwana Mkubwa	First Quantum Minerals Ltd, Canada (79,4%), ZCCM (20,6%)	2001 1997	Listed on FTSE, TSX*	Mines, concentrators, SXEW plants (capacity 140.000 mt/y of cathodes at Kansanshi, plus 30.000 mt/y at Bwana Mkubwa), leaching plants, SXEW plants , acid plants	Refined copper MT 245,000 (2009)
Mopani Copper Mines Plc	Glencore International AG, Switzerland (73,1%), First Quantum Minerals Ltd, Canada (16,9%), ZCCM (10%)	2000	Private equity	Mines, concentrators, smelter (870.000 mt of concentrate), leaching plants, SXEW plants	Refined copper MT 185,000 (2009)
Lumwana Copper Project	Equinox Minerals Ltd, Canada/Australia (95,6 %), ZCCM HI (4.4%)	1999	Listed on ASX, TSX*	Mines, concentrator	Copper Concentrates MT 109,413 (2009)
NFC Africa Mining Co Chambishi Smelter Luanshya Zambia China-Economic & Trade Cooperation Zone	CNMC Corp (90%), ZCCM IH (10%) CNMC (85%), ZCCM IH (15%) CNMC (85%), ZCCM IH (15%) Constructed and managed by CNMC	1998 Construct ed in 2006 2009	SOE	Mines, concentrator, smelter, acid plants, SXEW plants	Copper Concentrates MT 50,000 (2007) Projected MT 60,000***
Chibuluma	Metorex Limited, South Africa (85%), ZCCM IH (15%)	1997	Listed on the JSE*	Mines, concentrator, SXEW plants	Refined Copper MT 15, 905 (2009)

Note: (*) Australian Securities Exchange (ASX), FTSE (London), Toronto Stock Exchange (TSX), Johannesburg Stock Exchange (JSE).
(**)Estimate by ICSG (2007). (***) Estimate reported to Mining weekly. Additionally also Chambishi Cobalt Plant was sold to South African, and later Swiss investors, and the power plant to UK interests. Source: CNMC (2009); Equinox (2010); FQM (2010 a and b); Glencore (2011); KCM (2010); Metorex (2010 a, b); USGS (2010)

It is important to elaborate in more detail the institutional aspect. Not only because institutions are particularly important in determining firms' behaviour (North, 1990), but they also account for the Chinese capital market imperfections.

Institutional factors drive China's FDI at both formal (policy and regulations) and informal levels (ideological, cultural) (Ren *et al*., 2010). At a formal level, the encouragement of FDI kicked off with the 'open door' policy proclaimed by Deng Xiaoping in 1979. Outward FDI was seen as a means for integration into the global economy and for securing scarce natural resources. After slowing down in the 1980s and accelerating in the 1990s, this process culminated with the formalisation of the 'go global' policy in 2001. China, like other emerging economies, had to find a way to balance macroeconomic balance of payments considerations (need for inward FDI) with microeconomic considerations (internationalisation as an avenue to enhance firms' competitiveness) (Sauvant, 2004). With the 'go global' policy, China targeted 'inward-oriented outward investment', that is investment geared towards domestic development goals: securing scarce natural resources, acquiring R&D, technological capabilities and global competences, creating export opportunities, and strengthening economic ties with partner countries (Zhan, 1995). State support took the form of subsidies, tax incentives, market intelligence both at home and through investment promotion centres established in many African countries. Loans at concessional rates, export credits and international guarantees were channelled through the China Export-Import (ExIm Bank), which was instrumental in relaxing budget constraints on selected Chinese firms (Moss and Rose, 2006).

From the mid-1980s, the regulatory framework for outward FDI was progressively liberalised and decentralised. A plurality of bureaucratic actors, nevertheless, still influenced firms strategic decisions regarding sector/market of entry. Government ownership ensured the complete alignment of key firms to national priorities. SOEs were also required to develop core competences or be profit-oriented. Indeed, since the 1990s, some of them recurred to public listing to raise funds and had to meet international standards in terms of corporate governance, accounting, etc. (Hong and Sun, 2006). However, Chinese firms, SOEs in particular, had to fulfil broader political objectives and therefore were not driven exclusively by profit-maximisation (Gill and Reilly, 2007; Ren *et al*., 2010). In Africa, economic relationships were entangled with aid and political relationships defined by the 2006 Forum on China-Africa Cooperation (FOCAC) and China's Africa Policy (Haglund, 2008).

At the informal level, state ideology and national pride, centred on a collegial social organisation of economic activity, eased the enforcement of formal policies and processes (Hamilton, 1996; Ren *et al*., 2010).

The decisions of Chinese firms, it was argued, were driven by these specific institutional factors. It was observed that firms were less sensitive to high strategic and operating risks, and were markedly guided by natural resources- and market-seeking motives. Moreover, institutional factors lay behind countercyclical investment by Chinese firms. These observations called for a redefinition or expansion of traditional investment and comparative advantage theories. Indeed, institutional factors 'shaped' the comparative advantage of firms (Aggarwal and Agmon, 1990; Buckley *et al.*, 2007; Cheung and Qian, 2009; Davies, 2009; Yao *et al.*, 2010; Ren *et al.,* 2010). Chinese FDI also privileged wholly-owned entry. In the early stages of

internationalisation, Chinese FDI was located in the Asian region, where cultural ties were strong and lowered transaction costs, and operated mainly through JVs (Zhan, 1995). The move to whole-ownership reflected increasing confidence by the Government on its firms' international competitiveness, its readiness to bear risks and costs associated to whole ownership, and its desire to control strategic assets (Buckley *et al.*, 2008). By the end of the decade, Chinese FDI was increasingly driven by commercial interests and, since 2003, by the private sector (Hong and Sun, 2006). This was the reason for the increased heterogeneity of Chinese presence abroad, in size, motivations, behaviour (Gill and Reilly, 2007; Li, 2010). As the rapid accumulation of international reserves will create incentives for China to increase its outward investment activities (Cheung and Qian, 2009; Davies, 2009; Yao *et al.*, 2010), the distinctive features of China's FDI will become even more relevant.

Indian FDI was privately-owned. From the 1990s, the Indian regulatory framework for outward FDI was increasingly liberalised, but there was no extensive and articulated support comparable to China (Sauvant, 2004). Therefore, it was reasonable to analyse Chinese and Indian investors with different expectations.

The heterogeneity of ownership in Zambia's mining sector provided a fertile ground for an investigation of the relationship between ownership and localisation of upstream linkages. The key research question was whether the entry of China, and, to a less extent, India, had different implications for the localisation of upstream industries compared to 'traditional' investors.

China had a long-standing political and economic, relationship with Zambia (Taylor, 1998). China's largest mining investor was an SOE, with direct access to political and financial support from Beijing, and with corporate objectives expressly in line with national policies (CNMC, 2009). In light of the literature reviewed and of the important relationship between China, Zambia and CNMC, we could expect that the distinctiveness of Chinese FDI would impact on the localisation of upstream linkages in three respects: Beijing's objective of promoting Chinese exports through outward FDI; China's NFCA different response to the 2008/2009 economic crisis; and its the lack of corporate policy towards local supply chain development.

One of the explicit objectives of the 'go global' policy and of EXIM Bank guidelines was the promotion of Chinese exports. CNMC, the owner of NFCA in Zambia, included between its corporate objectives its expansion upstream and downstream of the metal mining value chain (CNMC, 2009). Empirical studies found that Chinese firms tend to operate as an *enclave*, being more vertically integrated than domestic or other foreign investors and sourcing more from the home country (Broadman, 2007; for Sudan, see Suliman and Badawi, 2010). The same, it was argued, took place in Zambia, with the Chinese mine reportedly adopting short-term, cost-cutting operating strategies and outsourcing from the parent company, CNMC (Carmody and Hampaye, 2010; Haglund, 2008; 2009a). The evidence to support this argument, nevertheless, was scant and anecdotal. On the contrary, there were reports of considerable discrepancy between policies set in Beijing and the practice of Chinese corporations on the ground (Gill and Reilly, 2007; Li, 2010). Moreover, Chinese firms were subject to pressures to be profitable. Whether the Chinese mine was mainly driven by Beijing-defined objectives or by profit-maximising ones would impact

significantly on the opportunity for local suppliers to enter in the Chinese supply chain. This was one of the key issues addressed in this research.

Chinese firms were characterised by soft budget constraints, which meant that their response to the global economic crisis differed from other firms. In 2008, total FDI flows declined by 16%. In 2009, FDI outflows declined by a further 43%. China's outward FDI into the non-financial sector (mainly extractive industries) grew unabatedly (UNCTAD, 2010). In Zambia, the Chinese mine showed a counter-cyclical expansion, with acquisition and re-capitalisation of a new mine and continuing investment in the MFEZ. The Chinese mine did not cut production, investment, development projects and was also the only one, with the South African mine, not to retrench workers (Haglund, 2009b; Li, 2010; SARW, 2010). This implied that the crisis affected the local supply chain to the Chinese mine differently from the supply chain to other mines.

Facing falling copper prices and a credit crunch, the mining industry generally resorted to production cuts, cost cutting measures and halting of new investment projects (ICSG, 2008). Table 5 illustrates very different responses adopted by non-Chinese mining companies in Zambia. Information was available for 4 listed companies. 2009 was a difficult year, not only for the price crisis, but also for higher oil-related costs (as much as 50%), higher steel costs, and higher wages (16% increase), only partially offset by a depreciation of the Zambian kwacha. For some mines, refining costs also went up. All the mines but one, Lumwana, the mine which started production in 2009, focused on cutting production costs, in one case by a sharp 52% (KCM, 2010; FQM, 2010; Equinox Minerals, 2010; Metorex, 2010 a). Moreover, some mines were put on care and maintenance (ICSG, 2009). Small-scale miners, both formal and informal ones, went mostly out of business. Local suppliers were negatively affected with reductions in turnover and profits, and for some, exit from the mining supply chain.

Table 5: Corporate strategies adopted by selected mining companies (2009)

Company	Response to the crisis	Production costs
Chibuluma	• Cash flow improvement • Increased production volumes • Lower capital expenditures (largest capital investment were undertaken in previous years)	Cash costs increased from US$ 2663/t in 2008 to US$ 2793/t in 2009
Kansanshi, Bwana Mkubwa	• Cost saving programme, lower input costs • Increased production volumes	Production costs in 2009 at US$ 0.99/pound, 15% lower than in 2008
Konkola Copper Mines Plc (KCM)	• Cost curtailment; Renegotiate all contracts for supplies, commodities and logistics • Increase recoveries • Shut down of high-cost Nkana smelter • Reduced manpower by 2000 workers • Continuation of construction of new smelter and Konkola Deep Mining Project	Production costs decreased from 292.8 centr/lb in 2008 to 140 cents/lb in March 2009
Lumwana Copper Project	• Improving suppliers' after-sale services for capital equipment	US$ 1.49/pound (1st year of production)

Source: Metorex (2010 a and b); KCM (2010); FQM (2010 a and b); Equinox (2010)

Chinese mines relied heavily on Government to Government intermediation (Haglund, 2009a; Kragelund, 2009). Zambia and China concluded 5 cooperation agreements spanning from the MFEZs to cooperation in the mining sector, to infrastructural projects and cultural exchanges (ZDA, 2010 b). The Chinese mine did not see local supply development as part of its corporate strategy. Chinese mines were not members of the Chamber of Mines, Kitwe Chamber of Commerce or the IFC Suppliers Development Programme. Localisation of upstream linkages, therefore, was perceived as the responsibility of the Zambian government. Differently, mining firms from developed countries and from South Africa foresaw local supply chain development as part of their Corporate Social Responsibility (CSR) Policy, including the need for their suppliers to meet health, safety and environmental standards (Company websites). They were also subject to pressures by the international project finance market to meet social and environmental standards. Chinese firms only recently began to receive pressures from Beijing in this direction (Haglund, 2008). The Indian company completed a suppliers' development programme initiated by the previous owners, but neither followed up nor included supplier development in its CSR Policy.

China and India were key players in Zambia's copper mining industry. In the last decade, researchers focused on the distinctiveness of Chinese FDI. Such distinctiveness was defined by institutional factors that shaped the competitive advantage of Chinese firms vis a vis other firms. With soft budget constraints, thanks to comprehensive State support, Chinese SOEs were pursuing strategic goals defined by Beijing. In Zambia, this justified at least three hypotheses on how China's entry in the mining value chain could have a distinctive impact on the localisation of upstream linkages. The extent to which local suppliers would be allowed to enter the supply chain was likely to be determined by two competing objectives: the policy-driven objective of promoting Chinese exports and upstream suppliers, and the profit-driven objective of securing an efficient supply chain, with local and regional participation. Existing data on this aspect was scant and anecdotal. Additionally, the counter cyclical expansion of the Chinese mine, during the global economic crisis, implied that suppliers would not be squeezed in order to allow for cost-cutting measures. Lastly, as the Chinese mine privileged State to State interaction, and minimised its interaction with local industrial bodies, there was an indication that local suppliers' development was perceived as a responsibility of the Zambian authorities.

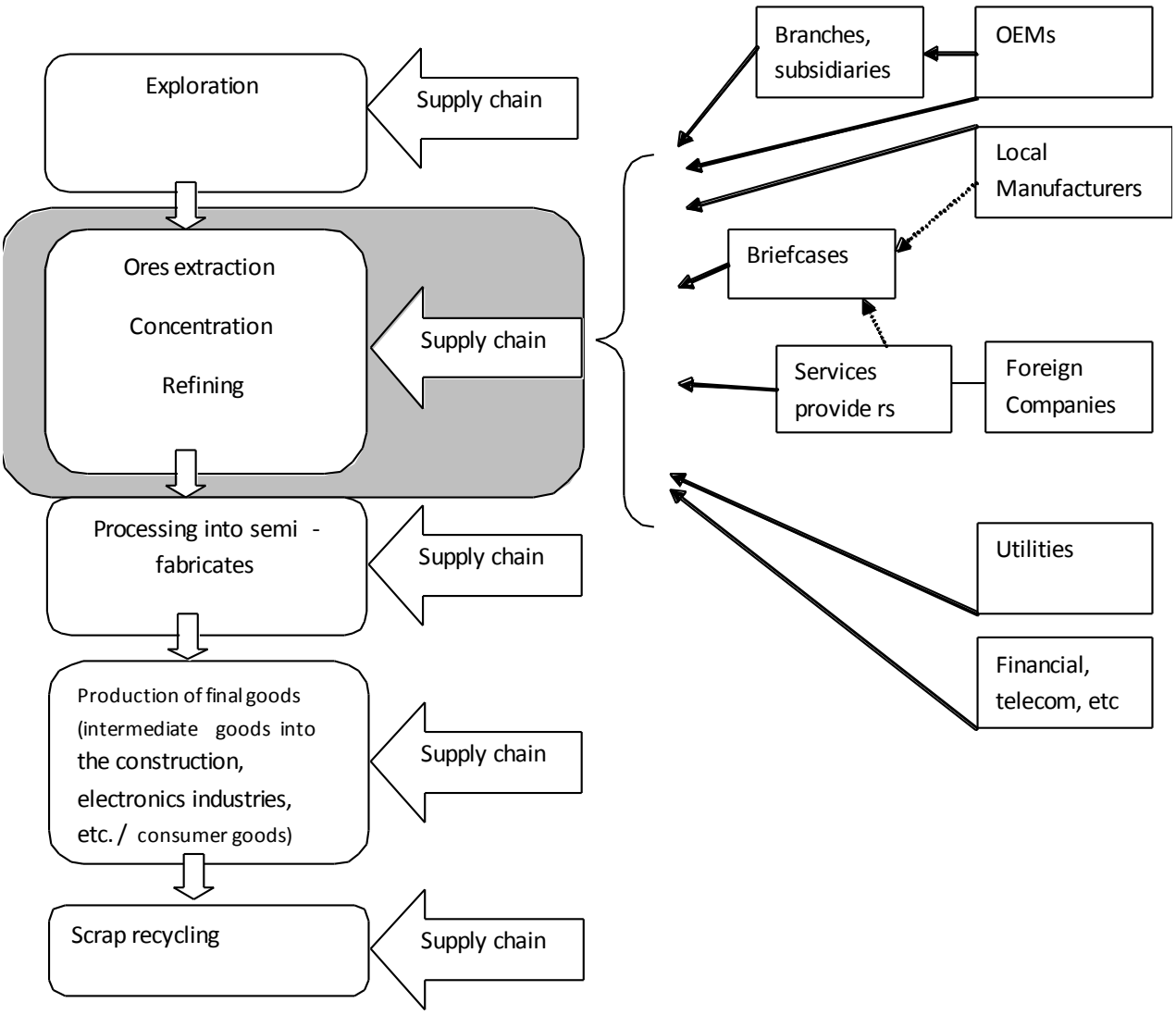
4. Research questions and methodology

4.1 Research questions

This research focuses on the localisation of upstream linkages to the copper mining sector in Zambia, within the framework of the MMCP hypotheses. It evaluates the nature of, and extent to which Zambia developed localised upstream linkages. Drawing policy implications, it analyses how local linkages are driven by:

1. Ownership
2. NSI
3. Skills
4. Policy related to the mining sector
5. Regional capabilities
6. Infrastructure

Figure 6: Copper mining value chain



The survey included only mines in the copper ores extraction stage, some of which were also involved in processing (smelting/refining). Exploration and development stages were not included[8] (Figure 6).

4.2 Data collection

The report is based on primary data, mainly of a qualitative nature. Fieldwork took place between August and December 2009, in the Copperbelt, North-Western

[8] Value chain governance varies with the life of the mine. In the exploration and construction phase, foreign engineering companies dominate the supply chain. This was the case in Zambia (USGS, 2010). Through turn-key arrangements, these engineering companies manage suppliers' selection and coordination. They tend to prefer suppliers they have had experience with, often foreign companies (UNCTAD, 2007). At the stages of extraction, concentration and refinery, the mines assume direct control over the supply chain. Extraction operations rely on a ticker supply chain, with a wide range of goods and services involved. As the life of a mine spans over decades, it was deemed appropriate to restrict our investigations to such stage of the copper mining value chain.

Province and Lusaka. Data was collected through a cross-sectional survey. Interviews were conducted on the basis of a questionnaire which included both open-ended and closed-ended questions.

The interviews targeted three groups of respondents. Two parallel samples comprising buyers (the mining companies) and suppliers were instrumental in exploring their relationships along the value chain. Moreover, key respondents from public and private sector institutions provided qualitative data to shed light onto the policy dimension.

4.2.1 Buyers

The buyers' population, amounting to 14 mining companies, was defined as mining companies currently operating through a mining licence. 9 mines were selected on the basis of geographical accessibility, of which 8 responded. The mines were based in the Copperbelt and, the small ones, in the Central Province (Annex A).

The sample is representative of different size and ownership patterns (Table 6). According to the 2009 data, our sample covered 70% of total copper production volume. It included mining companies from developed countries and South Africa, which for practical use will be from now onwards be called 'traditional buyers'. The Chinese mining company is included, but not the Indian company. Most of small-scale mining operations were owned by Zambians. However, due to the economic crisis most of the small mines closed operations, leaving only a handful to be interviewed. These companies were located in Mwaamba and in Lusaka.

Table 6: Buyers' sample

	Size		
	Large >50.000 mt/yr	**Small <2.000 mt/yr**	**Total**
Total Population	6	8	14
Sample	4	4	8
	Ownership of large-scale mines		
	Traditional buyers	Asian buyers	
Total Population	4	2	6
Sample	3	1	4
	Ownership of small-scale mines		
	Zambian	Non-Zambian	
Total Population	7	1	8
Sample	3	1	4

Interviews were conducted with supply managers. Repeated visits were carried out with the two largest mining companies, where both management and operations departments were interviewed. In the small mines, the owners were also in charge of supply management.

4.2.2 Suppliers

Data from the Chambers of Commerce and the mining companies estimated the total population of suppliers to be around 200 units. As the research also looked at possible agglomeration effects, the geographical location of the firms mattered. The survey population was composed of 95 firms based in the main supplying clusters,

Kitwe and Ndola, and in the capital, Lusaka. Out of the 95 firms which received the questionnaire and were contacted for interviews, 52.6% responded, which led to a sample size of 50 firms (Annex A).

The sample is satisfactorily representative of the population. All the ownership/sectoral patterns have been adequately represented. The only sub-group that has been under-represented were Zambian-owned, trading companies. Responses received from the sampled sub-group, nevertheless, showed a remarkable level of consistency. In-depth, qualitative interviews with their representative bodies validated the view that they were indeed a fairly homogenous group.

Interviews were conducted with managing directors/CEOs. For some of the largest companies, directors operations and/or the sales managers were interviewed. [9]

Table 7: Suppliers' sample

	Zambian-owned	Foreign-owned	Joint Ventures	Sub-Total
Manufacturers	8	14	1	23
Services	10	11	6	27
Sub-Total	18	25	7	50

4.3.3 Institutions

A wide range of respondents from different Zambian institutions were interviewed. Interviews were arranged through snowball sampling, on the basis of open-ended questions (Annex B).

The researcher had good access to key respondents thanks to her work as long-term consultant in the Ministry of Commerce, Trade and Industry. The Ministry is in charge of industrial and business development, and supported this research project.

5. Nature and extent of linkages

5.1 The extent of linkages

The level and composition of outsourced costs varies with the size of the mine, the type of operations (underground, open cast, refining) and the quality of the copper deposit, among others[10].

Data on the level of outsourcing to local firms was not comprehensive. Local sourcing referred to Zambian-registered companies under the Patent and Companies Registration Act. This criterion did not distinguish between Zambian, foreign or joint ownership. A mine owned by a traditional investor reported an expenditure of US$86 million in 2007 on the local supply chain (including fuel and electricity). A Chinese

[9] 'Briefcase businessmen' were one-man, trading businesses that supplied the mines until 2008, and have often been accused of being responsible for corruption practices in the supply chain. They played an important role in shaping the public debate on linkages and on the management of the supply chain, but most of them exited the supply chain following the economic crisis and were therefore not in operation. Their lobby association was interviewed.

[10] A medium-sized, open-cast mine, with a high-grade copper ore, reported that outsourced production costs accounted for 60% to 70% of the value of the refined copper.

mine reported spending US$30 million in 2008 on consumables, equipment and spare parts (excluding services, fuel and electricity). Hence they are not comparable.

In relative terms, the local supply chain was sizeable, across mines' ownership and size. Large-scale mines outsourced between 60% and 86% of expenditures to the local supply chain. Small mines outsourced between 35% and 80%[11] (Interviews, 2009). This dispells the long-held view that Chinese mines did not outsource locally.

In general, traditional buyers outsourced activities outside their core competences (Chamber of Commerce, 2005). In some circumstances, this strategy had to be adapted to local capabilities. For example, a mine had outsourced loaders maintenance and operation. Weak local capabilities and the criticality of these operations led to the vertical re-integration of this activity.

Chinese and Indian buyers vertically integrated some non-core functions, as local firms did not meet their expectations in terms of volume, price and quality. The Chinese mining houses invested in in-house engineering services (electrical, mechanical) and a foundry. The Indian mining house vertically integrated equipment maintenance services. When one of the largest OEMs downsized its workforce due to the economic crisis, the mine employed the skilled workforce and built in-house capabilities.

Path dependency is also important: if one mine acquired machining shop facilities as part of the privatisation package, it maintained such services in-house.

In absolute terms the value of purchases by small-scale mines was low, as they did not require high-level capital investment such as hydraulic equipment, pumps and valves used in underground mining. Nevertheless, in relative terms, they relied as heavily on the local supply chain as large-scale mines. This was partly explained by the fact that, rather than importing equipment and spares, small-scale mines would hire equipment from local firms. Equipment hire, rather than purchase, became more prominent following the global economic crisis[12].

5.2 The nature of linkages

The range of goods and services demanded by the mines was very broad. Buyers categorised goods and services according to the concept of 'critical supply'. In the value chain literature the concept indicates vertical integration by the producer. In this context, nevertheless, it was defined as 'supplies which, if not available, could cause production to stop'. The financial implications of a failure in a supply link, therefore, defined how 'critical' it was. Some of the respondents also defined critical supplies as those required to meet environmental and safety standards (Table 8).

Criticality was affected by scarcity – i.e. the degree of competition along a specific supply link and the level of competences of local suppliers. This concept of critical supply was key in explaining governance patterns along the value chain. In order to

[11] 7 out of 8 mines surveyed responded. Data refer to the share of local content in their annual expenditures, both capital and operational, with limited disaggregation by type of expenditure.

[12] The crisis forced 3 out of 4 buyers to re-organise their supply chain with regard to OEMs, by relying on new Asian suppliers or by leasing rather than purchasing equipment.

control critical supplies, buyers adopted a number of strategies, ranging from vertical integration to developing tight relationships. This finding confirmed the view of Humphrey and Schmitz (2001)[13] that the determinants of governance are not the intrinsic characteristics of the product, such as its closeness to the technological frontier, but rather the risks faced by the buyers. This risk is defined by uncertainties on the suppliers' competences and by losses incurred if the suppliers fail to perform.

Table 8: Categories of goods and services purchased by the mines

Critical	• Equipment • Valves, pumps, hydraulics • Crusher spares, mill liners spares, conveyor belts, mill balls • Spare parts for smelters and concentrators • Consumables: explosives, lime, cement, fuel, reagents, etc. • Maintenance services for equipment • Specialised transport (copper concentrates, acids) • Accommodation, health care • Insurance
Non-critical	• Civil engineering • Office consumables (stationery) • Welding, Laboratory consumables • PPE • Fasteners • General transport • Cleaning, gardening

Source: Interviews, 2009

Equipment was generally purchased through local OEM subsidiaries or imported directly, when local subsidiaries or agents were not available, or when the manufacturers would grant higher discounts. Spares for crushers, liners and conveyor belts were directly imported and stocked by the mines, as they were critical and suppliers were generally considered unreliable. Given the high technology content involved, the supply link related to smelting operations (smelter, maintenance and spares) was outsourced to foreign, specialised firms. Other critical supplies, such as explosives, lime, cement, and all non-critical supplies were generally purchased from local firms. For maintenance and repair services, different solutions were devised by different buyers, depending on degrees of complexity of the services - some vertically integrated; others sent the equipment to South Africa.

5.3 Changes in the population of the copper mining supply chain

Zambia's local supply chain was populated by a heterogeneous group of firms.

First-tier suppliers, which were mostly based in the Copperbelt, could be broadly described as follows:

- Small-scale services providers: these include agents and distributors with different depth of relationship to the OEMs or manufacturers and different levels of capabilities (stockholding, back-up services); traders, of which one

[13] For example, general transport was not a critical supply for most of the mines. For a mine located in a remote area, with few local suppliers, general transport was a critical supply, which required tight cooperation in the form of long-term contractual relationships with the supplier.

large sub-group, known as ‘briefcase businessmen’; specialised, skills-intensive firms (such as engineering firms);

- Medium and large-scale services providers: OEMs subsidiaries; large distributors; specialised, capital-intensive firms (such as drilling companies, specialised transport);

- Manufacturers: firms producing a wide range of inputs, such as metallurgical, plastic and rubber products, engineering products, paints, foundries. With the exception of one large steel foundry, they were relatively small-sized.

Clusters are generally characterised by high degrees of heterogeneity because they are the result, at a specific point in time, of a complex process of evolution (being growth or decline) and, often, of increasing internal differentiation (Schmitz, 1995; Nadvi, 1999; Cawthorne, 1995).

Privatisation process

Two key events deeply affected Zambia’s local supply chain to the mining sector: the privatisation process, in the second half of the 1990s, and the copper price crisis in 2008-2009. Before the privatisation era, local manufacturers dominated the supply chain. These were supported by the import substitution policy and by intense cooperation with ZCCM. There were three groups of suppliers: SOEs under the Industrial Development Corporation (INDECO), a number of family-run businesses established by European migrants, and Zambian-owned firms. Most OEMs had a local presence through Zambian agents and distributors, while few had a direct presence, with some manufacturing operations. Local suppliers faced two key problems - ZCCM poor payment records and the scarcity of foreign exchange which curtailed their possibility to import inputs (National Economic Advisory Council, 2007). Nevertheless, suppliers were rarely excluded from the supply chain if they failed to meet agreed specifications, quality or lead time. They could plan ahead, within a medium-long term horizon of low business risk.

With the privatisation process, the new mining houses imposed higher performance requirements on the local suppliers. Policy incentives, such as tax exemption on capital equipment imports and investment liberalisation, increased competition in the supply chain in the form of new foreign-owned firms and import of goods and services. Local suppliers underwent a deep learning process from their buyers on the requirements of a highly modernised mining supply chain, but the process was highly selective, as many firms exited the value chain. Empirical work on clusters found that similar dynamics occurred when domestic firms were exposed to external markets, which imposed stringent imperatives in terms of quality and design (Schmitz, 1995; Cawthorne, 1995; McCormick, 1999; Nadvi, 1999; Rabellotti, 1995).

The population of the local supply chain changed dramatically. Firstly, many OEMs established a direct presence in the Copperbelt, with a two-fold objective: first, to tighten control over the quality of the goods and services provided to the mines, and second, to increase revenues streams from highly-profitable after-sale services. OEMs enforced stringent warranty systems, which tied the buyers to such after-sale services (spares, maintenance, repair). Manufacturing, on the contrary, was largely

re-located to more competitive industrial countries. OEMs without a direct presence tightened requirements on distributors and agents.

As far as the manufacturers were concerned, they were affected by the decline suffered by the sector at national-level. Having to compete with an increasing flow of imports, especially from South Africa, only few firms remained in the supply chain. Trading activities became prevalent. Some agents and distributors, able to meet the requirements of the OEMs and manufacturers moved into after-sale services and held large stocks. Another, growing, group of suppliers were positioned in low-value added links, characterised by low barriers to entry and exit, high-profit and low-risk activities. They would secure on-the spot orders and import mostly from South Africa. In order to be successful, these businesses invested in networking and lobbying to secure access to the supply chain. Other capabilities were not critical to succeed, and indeed only few upgraded into established businesses. They became known as 'briefcase businessmen' because they operated 'out of a briefcase'. With no overheads, they sometimes became price-competitive, pushing more established suppliers out of the value chain. More often, though, lower operating costs were not passed onto the buyers in the form of price reductions, as they would collude with mine personnel to maintain high profits. As they failed to meet lead times, provided no technical advice and engaged in various forms of frauds, 'briefcase businessmen' came to be seen by buyers as inefficient economic actors in the supply chain. Nevertheless, buyers were caught up between pressure from the DAs to develop local suppliers and successful lobbying from briefcases businessmen to the Government, and hence did not address the issue. High profit margins during the copper price boom made this possible. This changed in the last quarter of 2008.

2008/2009 copper price decline
With the economic crisis, the mining houses had to face a price squeeze that called for the re-organisation of their supply chains. They had to cut costs and look for value added services. The strategies adopted in order to achieve these objectives differed between mines, as described in Section 3.3. Lower demand level from the mines as well as an increasingly price-driven supply chain caused many 'briefcases businessmen' as well as many manufacturers operating on very low profit margins to exit the value chain.

Overall, the past two decades were witness to the loss of manufacturing capabilities, and a local supply chain increasingly dominated by services providers. Only some of the latter provided high value services, which allowed them to compete and upgrade, while most were involved in import activities. Therefore, while the relative value of local expenditures reported in the previous section was high, the depth of the local supply chain remained low. This was consistently highlighted by all buyers as the key challenge for the development of the local supply chain.

6. Ownership and localisation of linkages

In Section 3.3., we identified four different value chain drivers: traditional investors, Chinese, Indian, and small scale mines. This section addresses two key questions: How does ownership affect the specific governance type of each value chain? How do ownership and governance affect the localisation of upstream linkages?

6.1 Ownership and governance

Zambia's copper mining value chain was a producer-driven value chain - high capital and technological intensity, strong internal governance by the producers. All buyers surveyed held decision-making power over their supply chain, except for two foreign-owned mines which shared decision-making power over capital expenditures with head quarters abroad. One mining house also reported that, due to the economic crisis, purchasing functions for all African operations were being centralised, in order to increase the group's leverage in negotiations with suppliers[14].

Whilst all the mining houses exerted strong governance over their supply chains, the content of such governance varied with respect to 1) the selection of participants; 2) the rules - Critical Success Factors; and 3) relationship with suppliers in terms of cooperation. We turn to each of them separately.

6.1.1 Selection of participants

Both traditional and Chinese buyers had well-established procurement procedures that aimed at increasing transparency and restricting entry to the supply chain to capable suppliers[15]. They operated through selective tenders, therefore firms had to be registered in order to enter the supply chain.

Table 9: Selection of new entrants in the supply chain

Supply chain	Main selection criteria	Secondary selection criteria	Entry barriers for suppliers
Traditional buyers	Historical relationships	Increasing reliance on auditing to cut briefcase businessmen. Selective auditing.	High entry barriers for new entrants
Chinese buyers	Extensive auditing	Trust built with considerable effort	Low entry barriers for new entrants
Indian buyers	Ensure a large suppliers' base	Increase competition between new and regular suppliers	Low entry barriers for new entrants
Small buyers (both foreign and small)	Shopping around for suppliers	Trial and error	Low entry barriers for new entrants

Source: Interviews, 2009

Traditional buyers relied heavily on past relationships to select their suppliers, and brand loyalty was high. This was reinforced by the fact that mining companies tended to employ their procurement staff from the same, small pool of people, which was embedded in a business community, where 'everything is based on a word of mouth'. One buyer reported that the IFC suppliers' development programme had an unexpected outcome for the mines, as they 'discovered' many capable suppliers they

[14] The impact of the centralisation of procurement on local suppliers was difficult to predict. The mine will most likely achieve better contractual terms from the OEMs, with local subsidiaries still supplying after-sale services and spares. For suppliers for which physical proximity is a key competitive advantage, situation may change little. The suppliers most likely to be affected are likely to be distributors and manufacturers.

[15] This had mixed results. Suppliers argued that some buyers were very 'straightforward to do business with', others were riddled with corruption. There was no distinction across ownership.

were not aware of. Many suppliers argued that entering this supply chain was extremely difficult[16].

The traditional buyers' non-critical supply links, nevertheless, were populated by many briefcase businessmen. As the global economic downturn hit the mines, traditional buyers had to increase efficiency in their supply chain. They tightened the screening process, by increasing collaboration with the local Chamber of Commerce and undertaking direct auditing of all the registered and potential suppliers[17]. Because it was costly given the existing staff levels, the auditing process became selective and entry barriers remained high for many new entrants[18]. Agglomeration effects also played a role. Mining companies based near the local clusters audited more suppliers.

Entry barriers to the supply chain to Chinese buyers were low. Chinese buyers were more open than traditional buyers to try new products/new suppliers. They conducted many auditing visits to assess potential suppliers' capabilities, products' quality, reputation and experience. Competition was limited to price and lead times. Trust remained very important, but was built after suppliers entered the supply chain, often with considerable investment by both sides (Box 1). Strict auditing processes were less a result of the crisis and more of past negative experience with the local suppliers. When the mines were established, poor knowledge of local suppliers and cultural and language barriers opened the supply chain to a large number of briefcase businessmen. With time, the buyers re-organised the supply chain, to exercise stronger governance over the selection of participants.

Indian buyers relied on a large basis of suppliers, with low entry barriers for new entrants. This was particularly true for non-critical suppliers. As the Indian supply chain became increasingly price-driven, in 2008/2009, Indian buyers were delaying payments to suppliers by several months. At the same time, they had to avoid disruptions to the flows of goods and services supplied to the mines. Non-critical suppliers were relatively easy to switch. They held low bargaining power, especially as they failed to coordinate, and they depended on the large market represented by KCM (the largest copper mines). By maintaining low entry barriers for new entrants, including briefcase businessmen, Indian buyers were able to negotiate prices down with firms eager to enter the market. Regular suppliers were forced to choose between exiting and remaining in the supply chain, with minimal profit margins.

Small mines, both foreign and Zambian-owned, had no formal procurement system: buying functions were held by the owner/manager. Entry barriers to their supply chains were low, as buyers were pro-active in searching suppliers, 'shop around' for the best quality/price in Zambia and South Africa, and would select through a process of trial and error. One buyer reported testing up to ten suppliers before selecting one. This eased entry for new entrants and new products.

[16] One buyer adopted an electronic procurement system. Suppliers argued that this gave them an opportunity to compete with historical suppliers. By replacing the 'word of mouth' with objectively verifiable criteria, the system levelled the playing field for all suppliers.

[17] One buyer was planning extending auditing to suppliers based in South Africa and other countries.

[18] One buyer found that only 4 out of 34 audited firms met the basic requirements. Therefore, it audited only firms which had workshop facilities or were in a joint venture with a foreign entity.

Box 1: Building trust-based relationships with the Chinese buyers

Two critical, high-performing suppliers reported the long process required to build relationships in the Chinese supply chain. One supplier was promptly audited by the Chinese buyer, but the small physical premises did not convince the buyer of the firms' capabilities. Only after more than one year, the firm was given an opportunity to enter its supply chain. When the buyers requested the firm to assist with a technical problem with the equipment, the firm went underground, several times, with no compensation. The firm worked closely with Chinese operations personnel, provided advice, solved technical problems and explained its products' characteristics. Low trust levels and language barriers proved to be the main challenges. The firm gained the trust of procurement, technical and production departments. Building trust enabled the firm to establish a solid business relationship with the buyer. He reported 'It's difficult to get them to trust you, but once they do, the business relationship is good'.

A large, well-known supplier incurred significant sunk costs to enter the Chinese supply chain. The Chinese buyer gave the wrong specifications for a large construction project, ignoring the supplier's advice. Consequently the project failed. The supplier was paid, but decided to re-do the job at its own expenses. The Chinese buyer then re-contracted the supplier for subsequent long-term jobs.

Low levels of trust caused inefficient outcomes, as the Chinese buyer failed to receive advice and jointly devise solutions to technical and operational problems with specialised suppliers. By sharing the costs of failed transactions, suppliers invested in their reputational factor and entered the Chinese supply chain for the long-term. Trust was built around technical and financial capabilities (competence to 'move in, move out' without assistance from the Chinese, no need for advance payment, rather extend the payment terms than do a quick job).

Source: Interviews, 2009

6.1.2 Rules: Critical Success Factors (CSFs)

The conditions for participation in the value chain are referred to as critical success factors (CSFs). CSFs are '*order qualifying'* (that is, firms need to achieve these in order to participate in these markets), or '*order winning'* (that is, the critical factors which lead particular firms to succeed, perhaps by selling at a price premium). In the past, these CSFs largely consisted of price and reliability, but they are increasingly determined by other factors (quality, lead times, standards) and differentiated by value chain, market, sector (Kaplinsky and Morris, 2001) .

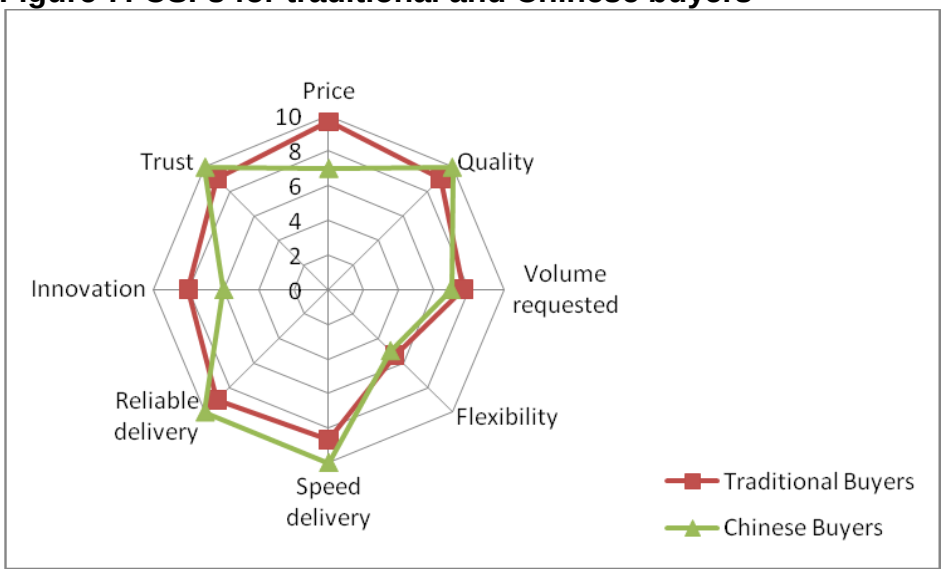
In Zambia's copper mining value chain, buyers identified quality, lead times and trust (contractual and competence) as order-qualifying CSFs. Disaggregating the data by ownership and size, we identified similarities and differences between buyers (see Figure 7). Lead times were very important in the supply chain to both buyers, especially the Chinese ones. Most suppliers noted that Chinese buyers expected the goods to be delivered 'on-the-spot'. This implied that local suppliers had to hold large stock in order to meet the Chinese CSFs. Trust, including in terms of contractual trust (reliable delivery) was very important for both buyers, especially for the Chinese ones. The suppliers' flexibility in adjusting production lines and in producing the volumes requested were comparatively less important CSFs in both supply chains. This could be explained by the decline of local manufacturers, which meant that CSFs related to manufacturing were less relevant.

The weight attached to price differed. Traditional buyers were increasingly price-driven, as a response to the global economic crisis. For Chinese buyers, price was markedly less important than quality in driving the supply chain. This however varied with how critical the supply link was: non-critical supply link were markedly more price-driven and buyers were willing to compromise on quality.

The firms' learning and innovative capabilities were more important to traditional buyers. This implied that the demand that suppliers develop such dynamic capabilities originated from traditional buyers only, an issue further explored later.

Two out of three large traditional buyers indicated that, whilst the supply chain was driven by efficiency and profit-maximisation, there was an element of corporate social responsibility behind the decision to favour local suppliers in some non-critical areas, such as civil construction of local schools, etc. No such element was raised by the Chinese buyers.

Figure 7: CSFs for traditional and Chinese buyers

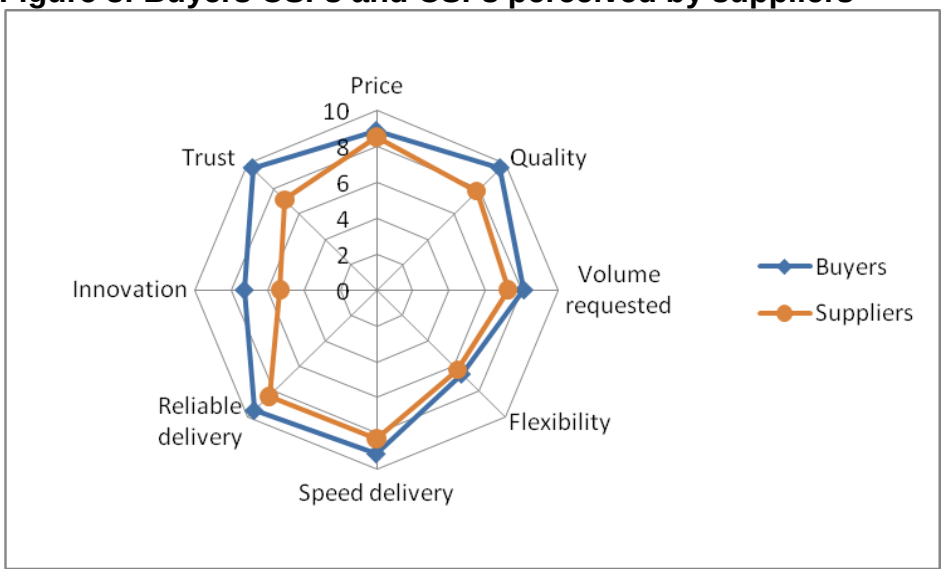


Source: Interviews, 2009

In order to validate these results, data was triangulated with the suppliers' view on the CSFs. Overall, important misalignments emerged (see Figure 8). Suppliers argued that the supply chains were mainly price-driven. On average, they underestimated the weight attached by buyers to two order-qualifying CSFs (trust, product quality) and one order-winning CSF (firms' learning and innovation capabilities). In particular, suppliers underestimated the weight attached by traditional buyers on innovation capabilities (Figure 9). Qualitative data complement this point. In the suppliers' view, traditional buyers demanded high quality, for which they were willing to pay higher prices. Quality and integrity - 'they respect the contract in place' as one supplier put it – were considered order-winning CSFs. Suppliers failed to understand that the supply chain to traditional buyers was increasingly price-driven, and that they expected suppliers to develop dynamic capabilities, key for upgrading. Traditional buyers confirmed that their efforts were increasingly devoted to search for suppliers that could provide value-added services, for which, nevertheless, they were willing to pay only marginally higher prices and not the very high mark ups negotiated by local suppliers.

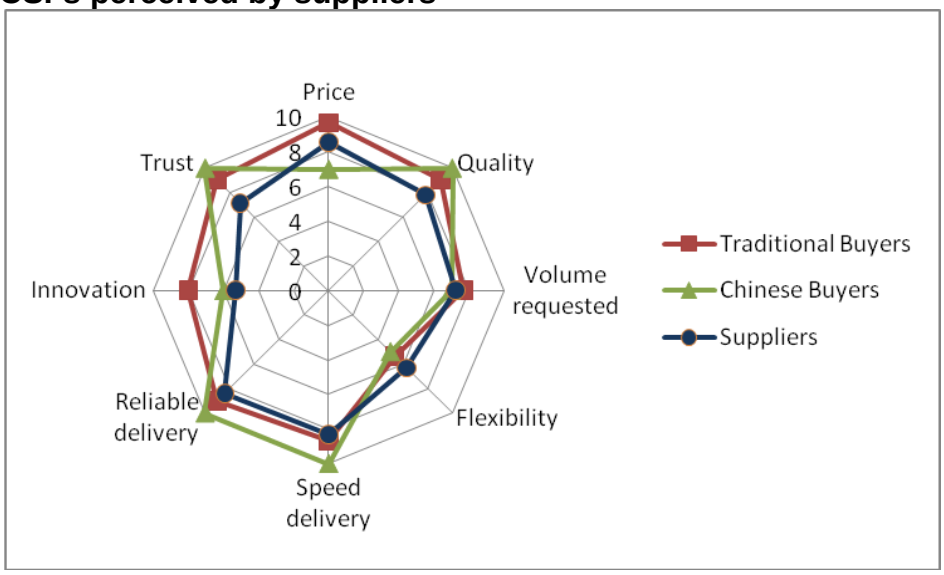
Suppliers overestimated the relevance of price as an order-winning CSF in the Chinese supply chain (Figure 9). Qualitative data shed more light in this respect. Only some suppliers understood that quality was increasingly important for critical supply links. On lead times, suppliers' view on CSFs was aligned to the Chinese expectations. A successful supplier explained that 'the Chinese like things to move, and, as a supplier, you don't do delays, and you don't argue over changes they require. You do as they wish, and then maybe fix the problems later'.

Figure 8: Buyers CSFs and CSFs perceived by suppliers



Source: Interviews, 2009

Figure 9: Traditional and Chinese buyers CSFs, and CSFs perceived by suppliers



Source: Interviews, 2009

Whilst data on the Indian supply chain CSFs were not available, it should be noted that suppliers consistently argued that it was exclusively price-driven. Quality, trust and innovation were indicated as irrelevant. One manufacturer and one service provider offered a comparison between CSFs for traditional and Indian buyers

(Figures 10 and 11). Their views were consistently supported by other suppliers. Some respondents argued that Indian buyers lacked the solid technical experience of other mining houses. They pursued a short-term, profit-maximising perspective which left no room for investment in an efficient and quality-driven supply chain.

Figure 10: Manufacturer Suppliers' view of buyers CSFs - Indian vs. Other

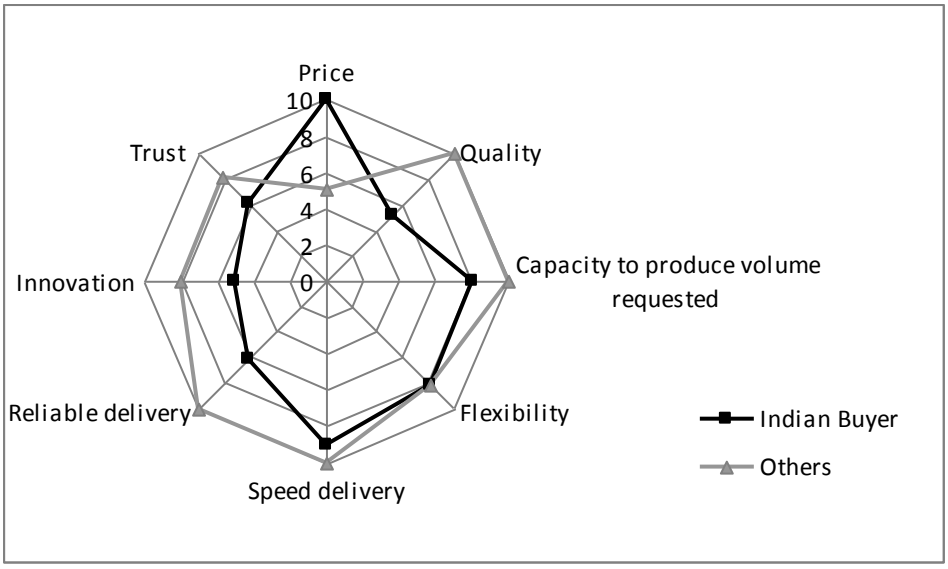
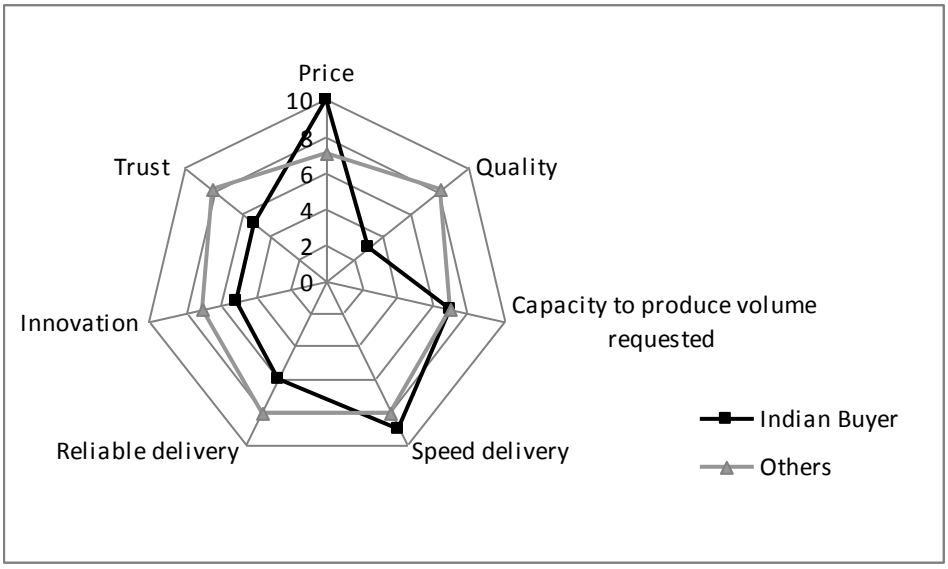


Figure 11: Service provider suppliers' view of buyers CSFs - Indian vs. Other



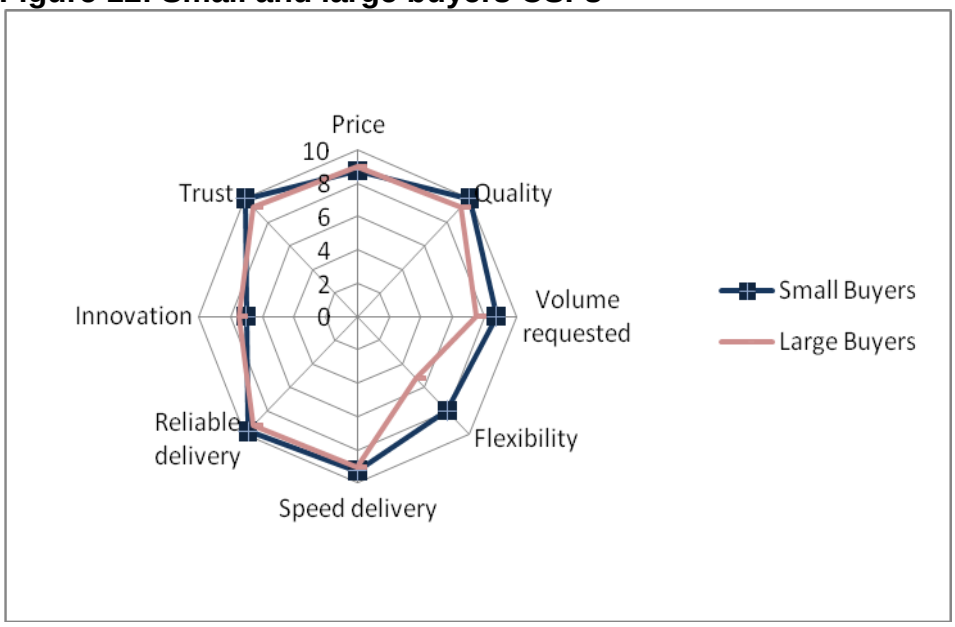
Source: Interviews, 2009

CSFs also varied with the buyers' size (Figure 12). Small buyers paid more attention than large buyers to CSFs based on flexibility and capacity to produce volumes requested. This could be explained by higher levels of engagement with local manufacturers, though joint product development. Manufacturers indicated that small buyers were very demanding in terms of quality and forced them to produce small orders, within short lead times, and at high quality levels.

International standards (both mandatory and voluntary) have been found to be critical in other value chain studies. Product-related international standards were order-

qualifying CSFs for all buyers positioned on some critical supply links, such as equipment, spares and reagents. Process-related international standards (quality and safety management) were required by traditional buyers only. They would not require ISO or South Africa Bureau of Standards' certification, but they expected quality assurance systems in place. Social and environmental standards were included in their CSR and in contracts, but were not enforced.

Figure 12: Small and large buyers CSFs



Source: Interviews, 2009

To summarise, quality, lead times and trust were order-qualifying CSFs. Price was a order-winning CSF in the supply chain to traditional buyers, and, for non-critical supply links, also to Chinese buyers. Traditional buyers expected their suppliers to develop dynamic capabilities in terms of learning and innovation. International standards were order-qualifying CSF for all critical equipment, spares and reagents. Small-scale mines engaged more with local manufacturer, therefore considered their ability to produce small batches to their specifications a key performance requirement. Suppliers, overall, failed to understand the buyers' CSFs.

6.1.3 Suppliers' relationship: cooperation and enforcement

Very different types of relationship existed between buyers and suppliers (Table 10). Traditional buyers, on average, had longer-term relationships with their suppliers[19]. As a response to the economic crisis, traditional buyers aimed at reducing in-house stock levels, by selecting capable suppliers with which to develop forward purchasing agreements (FPAs). Such agreements tied buyers to purchase an agreed amount of goods or services from the supplier, for a relatively long-term. This relationship was based on trust. Buyers had to trust that suppliers would meet short lead times, while suppliers had to trust that buyers would place orders as per agreed quantities. As one buyer put it, the contract had to be respected, to ensure that 'you don't kill your

[19] One buyer further elaborated on its strategy. In supply links with limited suppliers' competition, he would prefer long-term relationships to ensure suppliers tied their resources to the supply chain. In supply links with more contestants, the buyer would switch suppliers often, with the objective of diversifying risks and preserve high levels of competition.

suppliers'. Whist this process was highly selective (Box 2), it was also more conducive to foster upgrading processes as suppliers used FPAs as a basis for investment. This was critical for suppliers that could not benefit from credit facilities with the manufacturers (such as sole distributors) or with the banks. For the same reason, the good payment records of traditional buyers were considered by suppliers an advantage of doing business with them.

Most of the traditional mines participated in both formal and informal vertical cooperation with the suppliers. Informal cooperation took the form of intense information exchange and negotiations, organisation of transport, both domestically and from South Africa, to reduce lead times and transport costs, and advance payment. Less frequently, they would engage in development of specific product packages with the supplier, running joint tests, providing quality feedbacks. One mine, in particular, consistently assisted suppliers to develop internal quality assurance systems. The same mine, when it switched to a new procurement system, engaged suppliers through the local Chamber of Commerce in intensive consultations. Large traditional buyers also cooperated formally, through the International Finance Corporation (IFC) suppliers' development programme. The buyers co-funded the programme, in order to pursue two main activities: information sharing with suppliers on their procurement procedures and CSFs, and assistance to selected manufacturers. The latter would receive a contract for one year, and then be assisted with product development, formulation of a business plan and development of quality assurance systems.

Box 2: FPAs: selection and upgrading

Long-term contracts enable suppliers to plan in advance and invest for upgrading. Building long-term relationships with one supplier, nevertheless, implied that other suppliers exited that particular supply link. One large traditional mine in 2001/02 re-organised its supply chain for personal protective equipment (PPE) by outsourcing procurement functions for all equipment to an intermediary firm. The latter would coordinate purchase from PPE manufacturers in Zambia and overseas and hold stocks. One of the suppliers interviewed was sub-contracted by the intermediary firm. The supplier was able to increase its profit margins by charging the standard price with no discounts, and was able to plan production and investment in advance. In 2004, the intermediary was replaced by another company, which sub-contracted another supplier, included as well in our sample. The latter was able to expand its market and undertake process and product upgrading. The first supplier, on the other hand, found it very difficult to re-enter the supply link. The respondent preferred a direct procurement system, based on requests for quotation, which allowed many different players in the supply chain. The current, concentrated structure, in his views was undermining competition in the supply chain. The re-organisation of the supply chain, based on FPAs had been selective, but also enabled the selected supplier to upgrade.

Source: Interviews, 2009

Chinese buyers were consistently reported by suppliers as 'very good customers' and 'result-oriented''. They engaged in tough price negotiations, but paid on-time and reduced red tape to the minimum. In critical supply links, Chinese were willing to move beyond market-based relationships. Trust was very important, 'it's really about the *soft issues'* as a successful supplier summarised. Once the trust relationship was built, price negotiations ceased to be the only determinant of the relationship, with tacit agreements that good performance be rewarded with more orders. However more orders did not mean that any additional assistance was forthcoming.

Indian buyers relied on arm's length market transactions: low trust, no brand or suppliers' loyalty, high propensity to switch suppliers and no cooperation[20]. Suppliers identified price negotiations as the main content of their relationship, which was unbalanced, with buyers taking unfair advantage of their market power[21]. Trust was low also due to poor information flows and corruption. The cost-cutting measures undertaken following the economic crisis squeezed suppliers even further. Payment was delayed by as much as 6 months[22]. Low profit margins meant that many suppliers 'work for survival not for expansion'. 'We were like beggars' summarised another supplier[23]. As one supplier stated: '(the buyers) have really spoilt the Copperbelt'. Many suppliers pointed to the stark contrast between the supply chain management strategy adopted by the Indian buyers and the one by the previous owner, AAC. Under the latter, a trust-based relationship with the suppliers included practices such as cooperation on quality management, open books accounting, an 'open door policy', a suppliers' development programme, joint product development and promotion of linkages between South African manufacturers and local firms.

Small buyers operated through personal interaction, but they worked through on-the-spot transactions. They could buy bulk for low-value consumables, but not high-value items such as capital equipment. Suppliers required advance payment because small-scale mining was risky. Following increased competition in the supply chain, though, suppliers, including OEMs, had to engage in negotiations and improve customer care. Small buyers engaged in joint product development with local manufacturers, but did not provide resources for upgrading their capabilities.

Table 10: Buyers-suppliers relationships

Long-term relationship	Arms' length relationship
Traditional buyers • formal agreements • formal and informal cooperation for upgrading **Chinese buyers** • for critical supply links: trust-based, informal agreements • for non-critical supply links: arms' length relationships • no cooperation	**Indian buyers** • market-based relationships • no cooperation • late payments, low trust **Small buyers** • personal, but market-based relationship • some cooperation with manufacturers, but no resources for upgrading

Source: Author's analysis

[20] Only one firm reported cooperating with the buyer in sourcing raw materials.

[21] Indian buyers engaged in multiple negotiations during one transaction: during the tendering process, when signing the contract, when paying. Suppliers that desperately needed payments would agree on 'abnormal discounts', in the range of 20%. Some suppliers reduced profits margins so low, that they were not able to recover costs.

[22] Only critical suppliers (OEMs, fuel) managed to receive payment, by coordinating efforts and threatening to suspend supplies.

[23] One firm reported that lead times and delayed payments amounted to a total of 20 months, in which its capital was tied up in one transaction. The firm had to pay taxes on invoices which had not been paid. Another supplier reported that the buyer unilaterally set the exchange rate, and by paying with 5 months delay, caused the firm to lose 50% on the value of the order.

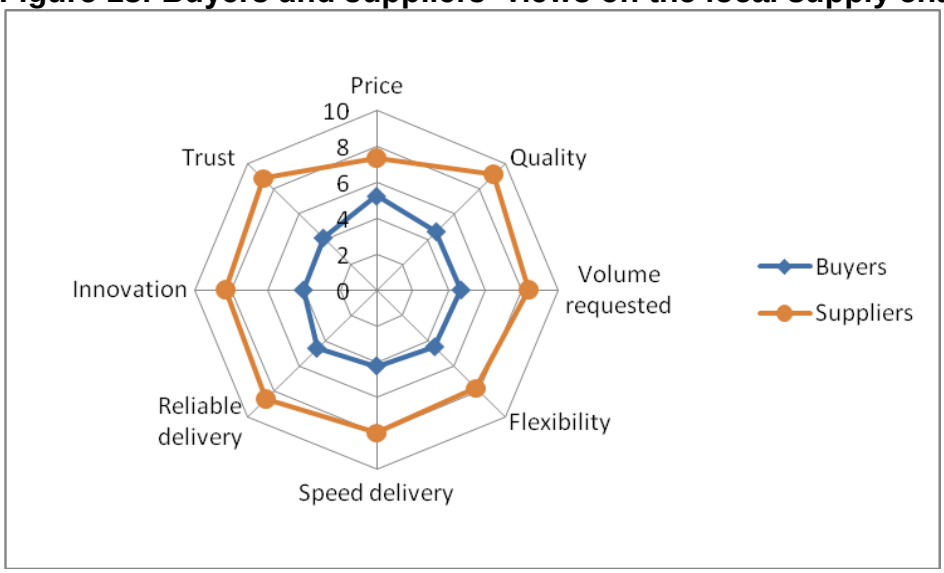
6.2 Ownership and trajectory of the local supply chain

This section discusses how ownership, through different governance types, impacted on the local supply chain in terms of performance and upgrading.

6.2.1 Views on the performance local supply chain

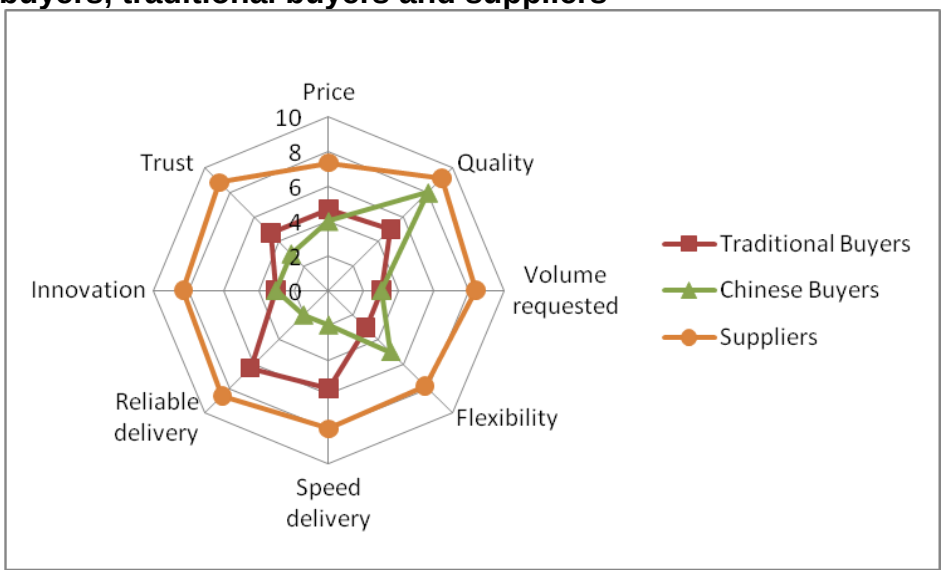
Buyers were not satisfied with the performance of the local supply chain, though they all pointed to the existence of a small number of very capable suppliers (mostly OEMs and some engineering firms) (Figure 13). In particular, Chinese buyers were dissatisfied with performance on trust, price and lead times, while traditional buyers, pointed to quality and price competitiveness (Figure 14). Suppliers consistently overestimated their performance in all the CSFs.

Figure 13: Buyers and suppliers' views on the local supply chain performance



Source: Interviews, 2009

Figure 14: Performance of the local supply chain in the views of Chinese buyers, traditional buyers and suppliers



Source: Interviews, 2009

Building on firm-level data, we turn to the performance of individual firms (Annex B). Firms fell into three categories: firms positioned in either dynamic, static or declining trajectories. In particular, we searched for patterns underlying these trajectories. The findings are summarised below:

Table 11: Summary table of suppliers' trajectories

	Underlying patterns	No. firms
Dynamic trajectory	Intense cooperation with traditional buyers • Through formal cooperation • Through informal cooperation Tight insertion into foreign GVCs Monopolistic market power	26
Static trajectory	Small-sized/non-critical suppliers Participation only to Indian supply chain	8
Declining trajectory	Weak insertion in foreign GVCs, of which: • some suppliers have medium/high potential for upgrading through tight, formal cooperation with traditional buyers • some have low potential to reverse exit Warranty system, technological change	16
TOTAL		50

Source: Author's analysis

6.2.2 Suppliers positioned on a dynamic trajectory

In terms of output, sales and profit growth as well as upgrading, 26 firms performed positively. 18 firms supplied all the buyers, while 8 only supplied traditional buyers. The reason for the latter's decision to specialise on supply to traditional buyers were two-fold. For some of them it was a deliberate decision not to enter the Chinese and Indian supply chains; for others, cooperation with traditional buyers was the only opportunity to enter the mining supply chain.

Firms positioned in the positive trajectory were characterised by cooperation with traditional buyers or tight insertion into foreign GVCs.

Cooperation with traditional buyers
Suppliers upgraded through tight vertical cooperation with traditional buyers, both of an informal and formal nature

A group of highly-specialised, critical suppliers were placed in supply links characterised by high capital and knowledge related entry barriers. Because locational proximity was required for their services, all buyers outsourced to this group of firms. These firms, indeed, registered good profit margins in all the supply chains.

Traditional buyers engaged in vertical cooperation with these suppliers: intense knowledge flows, forward purchasing agreements, supporting linkages with foreign OEMs, joint development of modular solutions, constant feedback on product quality, advance payments. As a result of the economic crisis, they increased cooperation to ensure that the local supply chain 'survived the crisis'. This form of cooperation, good profit margins and, in few cases, support from South African partners, allowed the firms to undertake continuous product and process upgrading. One specialised firm, which had a trust-based, long-term relationship with both traditional and Chinese buyers, undertook functional and chain upgrading, moving into copper mining and taking new functions such as exploration, extraction and testing.

For one important sub-group, engineering firms, expansion opportunities were curtailed by two factors. Firstly, they were locked out of some of the most valuable supply chains, since the Chinese buyer was vertically integrating engineering services, whilst the Indian buyer was also internalising some maintenance services. Secondly, their competitive advantage was progressively eroded by an ageing workforce which was difficult to replace.

Another group of suppliers was positioned in high-rent supply links, where competition was non-existent (Box 3). Traditional buyers needed to develop suppliers' capabilities because they could not vertically integrate peripheral activities. In order to do so, traditional buyers developed trust-based, long-term relationships and provided resources for upgrading. Such resources included capital as well as commitments to purchase. This encouraged functional and chain upgrading in very short time periods.

Box 3: Informal cooperation and firms' upgrading

One of the mining companies located in a remote geographical area found it difficult to organise its supply chain because suppliers had been mostly unwilling to relocate. This gave an incentive to the mine to develop tight forms of cooperation with the few local suppliers. In one particular case, the mine entered into a long-term relationship, assisting with the capital investment, by purchasing the equipment required and renting it out to the supplier. The supplier specialised in products which required geographical proximity, such as low value, large volumes transactions, where transport costs, even low, made a difference. The combination of high rents and intense cooperation allowed this firm to expand its market size and move into different value chains – moving from low skilled services (cleaning) into higher-skilled ones (civil engineering). Within the new value chain, the firm also upgraded into new functions to control both upstream and downstream stages of the value chain (manufacturing of construction material, real estate sector).

In another case, a Zambian-owned supplier played a valuable intermediary role between mining companies and commodity producers. Zambian producers were small-scale and scattered, and the mines relied on imports from South Africa, which were reliable but not price competitive due to transportation costs. By linking producers (sometimes with exclusive distributorship rights) and mining companies, the supplier created a profitable, niche market, not contested by other firms. The supplier reduced search and monitoring costs for the mines, as well as their transportation costs. Cooperation with one traditional buyer took the form of an FPA, which allowed the firm to expand the range of products supplied, and reduce delivery times, thereby meeting the JIT requirements of the buyer. The firm expanded into other mining supply chains, upgraded into after-sale services, by partnering with an engineering firm, and moved into the small-scale mining value chain.

Source: Interviews, 2009

Formal cooperation, through the IFC programme, targeted manufacturers of non-critical consumables. These were subject to fierce competition from imported goods and supplied a diversified market (non-mining sectors, regional markets). Though not ISO certified, they undertook forms of product and process upgrading. Formal cooperation allowed them to enter the mining supply chain: it granted access to information flows, an opportunity to quote and to discuss product specifications and delivery times with the mines.

Tight insertion into foreign GVCs

Suppliers tightly linked to foreign GVCs included OEMs subsidiaries, manufacturers owned by foreign conglomerates, and sole distributors.

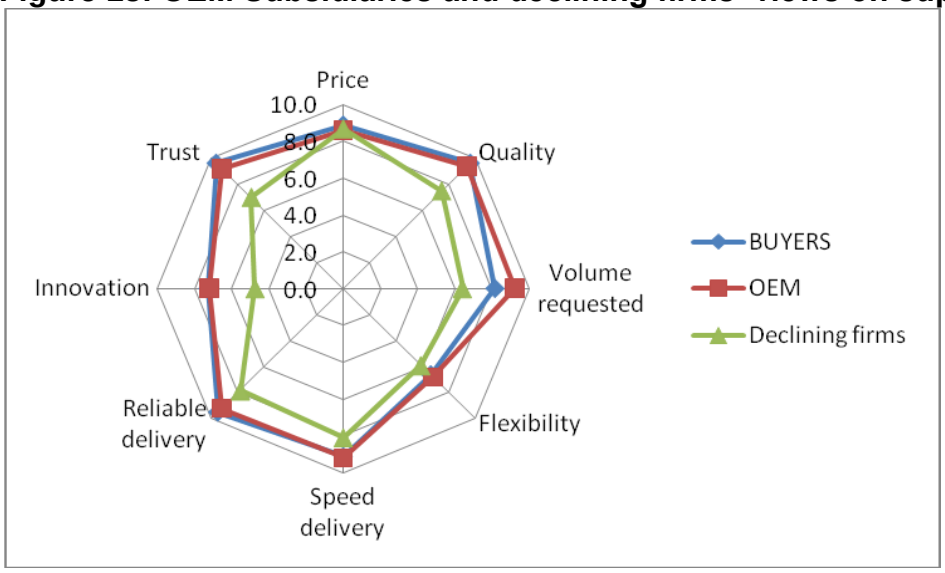
OEMs subsidiaries operated in critical supply links – i.e. the distribution of specialised equipment and spares, and after-sale services. Only one subsidiary undertook local assembly and re-conditioning operations. Manufacturers that were part of foreign conglomerates produced a range of non-critical consumables and relied heavily on parent companies. Sole distributors had agreements with parent companies based in South Africa, Europe, and Australia. They engaged in higher-value added activities, such as assembly, maintenance, repairs, stock-holding. All these firms operated on global standards: manufacturers and OEMs subsidiaries were ISO certified, sole distributors met high standards imposed and were monitored by the second-tier OEM suppliers.

Whilst all the firms invested in varying degrees of product and process upgrading, OEMs subsidiaries had the largest investment in process upgrading: intense training programmes (two training centres), new equipment, quality management and management systems. Their contribution to job and skills creation was significant, with 3 subsidiaries employing 100, 400, and 500 semi to highly skilled Zambian employees. Process upgrading was very important for OEMs, as it reduced lead times and price - two order-winning CSFs in a supply link in which quality was an order-qualifying CSF. OEMs had distinctive characteristics - they had a more equal relationship[24] and longer, contractual relationships with all buyers.

Insertion in the foreign GVCs granted local suppliers access to capital, knowledge and reputation. Knowledge-sharing, in particular, ensured a better understanding of the order-winning CSFs. This is confirmed by a comparison of the view on CSFs by OEMs subsidiaries with the view held by firms on a declining trajectory (Figure 15). Moreover, OEMs subsidiaries were protected from competition by high entry barriers: intellectual property rights and warranty systems. The latter, in particular, excluded other manufacturers of spares and components and maintenance firms from the after-sale supply link. This link was so profitable that OEMs would agree on large discounts on capital equipment in order to tie large buyers to their after-sale services. Warranty, though, was not always effective, as one OEM estimated that 50% of transactions on spares were not done through OEMs.

[24] Sometimes OEMs would decide not to renew a contract to a buyer as the terms were not profitable enough, they would get paid by the Indian buyers.

Figure 15: OEM Subsidiaries and declining firms' views on supply chain CSFs



Source: Interviews, 2009

Direct ownership was not the only way in which foreign parent companies facilitated upgrading. Sole distributors invested heavily in equipment, skills (such as operation of specialised mechanical equipment, welding, maintenance of equipment with computerised components), and in fewer cases, management and quality control (see Box 4). Irrespective of whether suppliers were Zambian or foreign-owned, sole distributorship agreements encouraged upgrading. OEMs exerted pressure in this direction, for example by requiring them to move into assembly to meet customised designs or into after-sale services[25]. OEMs also granted them access to external resources and expertise, credit facilities, exclusive access to the OEM products. Upgrading spurred a deep learning process. For example, one sole distributor had to develop customised solutions and undertake maintenance services. This firm developed in-house technical competences as well as coordinated second-tier specialised engineering companies based in Zambia and South Africa. The outcome was two-fold: firstly, the firm entered new sectors (fuel distribution, agro-processing, cement); secondly, it moved into maintenance services independently from goods distribution. For this group of suppliers, cooperation with the mines was limited: exchange of information, negotiations, in some cases transport arrangements[26].

The potential for functional upgrading of this group of suppliers, nevertheless, was limited, as firms were part of tightly organised global or regional value chains. The highest value added links, such as R&D, product development and marketing, took place outside Zambia. OEMs, in particular, cooperated intensely with mining houses on joint product development, with limited participation from local subsidiaries. The potential for expansion rested on market size, as the DRC mining supply chain became increasingly developed and profitable. The OEMs Zambian subsidiaries, indeed, were already participating in the DRC supply chain, directly or indirectly through branches based in the Katanga Province.

[25] Some dealership agreements were so tight that the mines cannot buy from dealers based in other countries, as the latter would have to pay an infringement fee to the local distributor.
[26] Only one manufacturer reported being engaged in deeper forms of cooperation such as joint design of a plant, receiving regular feedbacks on quality and coordination with the buyers in order to improve delivery reliability.

A case on its own was Ndola Lime Company, a Public-Owned Enterprise. A critical supplier of lime, which was used to neutralise acids in the leaching process, this firm had a monopolistic position. Given such a high-volume, low-value commodity, high transportation costs made South African producers uncompetitive, therefore ensuring sustained high profits margins in all the supply chains.

Box 4: The value of distributorship agreements

A supplier established in the 1990s used to have a sole distributorship agreement with an OEM and performed well on this basis. When the OEM sold its division to another company, which had its own distribution network, the local firm lost its sole distributorship agreement. Having lost its tight relationship with the OEM, the firms moved into loose agreements with other manufacturers. The latter, nevertheless, did not encourage and support any upgrading process. The firm slowly lost markets as it was unable to compete with briefcase businessmen.

Source: Interviews, 2009

6.2.3 Suppliers positioned on a static trajectory

Firms positioned in a static trajectory were characterised by small size and/or supply of non-critical products (8 firms). Small-sized firms relied on skilled managers, but failed to grow into more complex managerial and organisational structures that could accommodate upgrading processes. Non-critical suppliers increased their competitiveness by forming sole distributorship agreements, but were exposed to high competition from local and foreign companies, and were disadvantaged by the fact that buyers did not have an interest in cooperation.

Two suppliers served only the supply chain to the Indian mines - it's noteworthy that only such a small number of firms could 'afford' to do so. They were agents, facing high search costs to find 2-tier suppliers overseas. Their profits margins were squeezed, as they competed with local and foreign suppliers. With no internal resources for upgrading, these firms were trapped in weak relationships with foreign OEMs and with the buyers.

6.2.4 Suppliers positioned on a declining trajectory

Of the 16 firms on a declining trajectory, a striking 10 were manufacturers (43.5% of the total population of manufacturers). 9 out of 10 were Zambian-owned, and 8 out of 10 had been established between 1961 and 1980, mostly by European and Indian migrants. They were positioned in non-critical supply links, governed by arms' length market relationships and subject to intense competition from briefcase businessmen. As they operated in price-driven, non-critical supply links, their profit margins were very low, often further squeezed by operating through briefcase businessmen[27]. Some firms lost market shares because they had being cut out from the supply chain for spares and components, controlled by the OEMs, or technological change reduced the demand for their products (rubber, batteries, ropes). By not being inserted into foreign GVCs, they were not pressured and guided into an upgrading

[27] OEMs would charge briefcase businessmen the same price they would charge the mine, sometimes more. As they were the only distributors, briefcase businessmen had no choice but to accept the price. Manufacturers, on the other hand, were competing with each other to receive orders from well-connected briefcase businessmen.

process – for example, none of them was ISO certified. They were effectively caught in a trap of low profits, no access to finance or to external resources.

Some firms were exiting the supply chain altogether. Three manufacturers upgraded in order to move out of the mining value chain, into different value chains (distribution, generic consumer goods, components for transport industry). In these cases, upgrading was more an exit strategy than a strategic shift into more profitable and technologically complex value chains. Four firms had the potential to arrest their exit from the value chain, though their participation in the IFC programme with traditional buyers[28].

Also worth of note was the exit of the largest steel foundry in the country, employing over 1500 workers at full capacity. The firm was a POE established in the 1960s, and was a key supplier to ZCCM. It was later privatised and recapitalised, with the recent investment in a multi-million dollars plant. Notwithstanding the level of investment, the firm had been progressively squeezed out of the supply chain. From interviews with different actors in the value chain, misalignment over what the CSFs were and how the firm was performing emerged as key challenges[29].

7 Other linkages drivers

7.1 Policy

Historically, policy in Zambia played a key role in determining the extent and nature of local linkages. The nationalisation of the mines in the 1970s aimed at maximising linkages to the Zambian economy (Kaunda, 2002). The localisation of upstream and downstream linkages was instrumental in promoting industrialisation, together with import substitution policies and subsidies. In the 1990s, privatisation, together with investment and trade liberalisation, changed the profile of the local supply chain (see Section 5.3).

Policy affected the supply chain also through the mining legislation. Two relevant aspects of the mining legislation are investigated in this section: the tax regime on imported goods and the Development Agreements (DAs).

The 1995 Mines and Mineral Development Act, and later the 2008 Act, granted the mines VAT exemption and elimination of custom and excise duties on all machinery and equipment. According to Zambia's tariff book, MFN duties generally amounted to 0-5% for capital goods and 15% for spare parts. In 2009, one third of mining-related goods entered at 0 and 5%; slightly less than two thirds at 15% and a small number of lines were set at 25%, mostly to protect domestic producers of protective clothes, plastic and wooden goods (Table 12).

[28] Only one firm in this group undertook cooperation outside the IFC programme. It cooperated with KCM on raw materials supply and joint quality testing processes. This firm supplied critical products which were only required by underground mining, and, increasingly, only the Indian buyer necessitated.

[29] Poor value chain coordination also played a role with a smaller-scale foundry. The firm supplied through briefcase businessmen, which squeezed its profit margins. This firm undertook product and process upgrading, with one of the few reverse engineering and in-house design efforts.

The tax regime only applied to the firms holding mining rights, which included mostly the mines but not their suppliers. Suppliers of capital goods, therefore, paid a customs duty ranging from 15 to 25% for some goods –unless these goods qualified for SADC FTA treatment and were imported from South Africa - plus VAT on all imports. This measure conferred a cost penalty on local suppliers.

Table 12: MFN duty levels on mining-related goods

MFN duty	0%	5%	15%	25%	Tot
No. tariff lines	42	25	129	7	203

Source: 2009 Zambia tariff book

All the DAs included provisions on local procurement. The mining companies were to grant local firms an adequate opportunity to bid for tenders and ensure no unfair discrimination. They also had to submit a local business development programme. This was to be monitored by an inter-ministerial committee comprising the Ministry of Mines and Mineral Development and Ministry of Commerce, Trade and Industry.

The provisions of the DAs on local suppliers were set in a policy environment that was, at least in theory, favourable to the development of local enterprises. The economic policy of the years following privatisation was geared towards private sector development. The 2006 Fifth National Development Plan (FNDP), which guided the policies of the Government in the period under analysis, acknowledged that the economic growth spurred by the mining and construction sectors failed to reduce poverty. More particularly, limited integration of the copper sector into the rest of the economy made Zambia doubtful over its broader developmental potential. The underlying response of the FNDP was the promotion of an export-oriented, private sector (GRZ, 2006). Since 2005, Government also designed horizontal policies aimed at cutting the cost of doing business, through the Private Sector Development Reform Programme. In 2006, the Zambia Development Agency Act set a framework to promote investment, through a range of regulatory simplifications and fiscal incentives. Multi-Facilities Economic Zones were to be established, with infrastructural and fiscal benefits to large-scale investors in priority sectors. In 2009, Government decided on a sectoral approach to industrial policy, through the establishment of cabinet committees, and priorities sector were identified under the 2009 Commercial, Trade and Industrial Policy (2009)[30].

The provisions of the DAs on local suppliers were largely disregarded by both the mines and Government, with the exception of a limited IFC-led suppliers' development programme. The explanation was three-fold: firstly, the years after privatisation were focused on recapitalising the mines and some large-scale development projects required the sub-contracting of large foreign engineering companies. Later, policy makers and the public at large focused on revenue and miners' wages issues. Local suppliers caught the attention of the public mainly in two circumstances: when one large mine tried to change the procurement system without consulting local firms, and briefcases businessmen managed to successfully elicit

[30] The 2006 Citizens Economic Empowerment Act provided for measures to support Zambian-owned enterprises. One of the most significant measures was preferential government procurement policies.

intervention from Government at the highest political level; and when Vedanta-owned KCM suspended payment to its suppliers following the 2008/2009 price crisis. Overall, however, local supply chain issues remained marginal to the national debate on the copper mining sector.

Secondly, policy-makers failed to see the potential for private sector development in the localisation of upstream linkages. These were not included in any industrial and private sector development policy or programme. In 2007, the World Bank, through the IFC, undertook a suppliers' development programme in the Copperbelt Province. This was and remained a donor and private sector-funded programme, with little ownership from Government. Staff from the relevant ministries attended only a few initial meetings. The mines' supply managers, with guidance from the CEOs, and the IFC staff solely implemented the project.

Thirdly, the lack of implementation of the DAs reflected poor institutional capacity of the Ministries involved. No comprehensive assessment of the supply chain was conducted, nor were monitoring mechanisms established or support programmes designed. This was due to, among other reasons, high staff turnover in the Ministries, lack of clear implementation and monitoring mechanisms and a highly personalised style of management, which built on individual rather than institutional, capabilities. Also, neither strong political guidance nor resources were invested in this area.

Policy, therefore, failed to play a role in encouraging mining companies to increase local content and in upgrading local suppliers' capabilities'. The unilateral cancellation of the DAs under the 2008 Act removed the only legal obligation of the mines to develop local supply chains. At a horizontal level, the implementation of private sector development programmes was slow. Also, Government did not address two key challenges for suppliers. In the interviews, most respondents highlighted scarce access to working or investment capital and fluctuating exchange rates as key constraints to production and expansion. Only firms tightly inserted into foreign GVC as subsidiaries or part of a conglomerate were unaffected, because they could rely on the parent companies. Poor public policy-driven governance made internal value chain dynamics the key driver for the localisation of linkages.

7.2 National System of Innovation

Zambia's total budget allocated for innovation and skills creation was dismally low (Table 13). Activity-based budgets were available only from 2004, and revealed that on average less than 1% of total budget was devoted to innovation and skills. Moreover, most of the allocation was spent on recurrent expenses. Table 14 shows that the actual share devoted to research institutes and programmes ranged between 10 and 15% of the overall budget on innovation and skills, or, on average, 0.17% of GDP, a low proportion compared to an already low average for Africa of 0.3% in 2008 (UNESCO, 2010). This was compounded by very low private R&D.

Table 13: Zambia public investment in R&D and skills development (2004-2009, US$)

	Budget for Research and Skills		% Total Budget	% GDP
	In Kwacha ('million)	In US$		
2004	84,845	17,758,986	1.02%	0.15%
2005	76,426	17,115,938	0.78%	0.13%
2006	94,312	26,195,955	0.93%	0.18%
2007	130,859	32,703,451	1.09%	0.20%
2008	135,600	36,189,263	0.99%	0.21%
2009	120,000	23,786,232	0.79%	0.13%

Source: National Budgets, 2004-2009. Rolling Average Exchange rates provided by the Bank of Zambia. GDP estimates from the WDI, accessed on 15 January 2011

Linkages between public institutions and the private sector were almost non-existent. This meant that the research conducted in public institutions was rarely transferred to commercial exploitation (GRZ, 1996a). The 1997 Science and Technology Act established a number of institutions, which from 2009 were endowed with a Strategic Research Fund. The latter, however, did not target specific industries. Respondents from the National Technology Business Centre (NTBC), the body responsible for working jointly with the private sector on innovation technology, reported undertaking no project with the suppliers in the Copperbelt.

Table 14: Zambia public investment in R&D (2004-2009, US$)

	Total Budget	NISIR	NTBC	Research - Investment Programmes	% Total Research & Skills Allocation	% GDP
2004	17,758,986	1,208,159	173,331	397,693	10%	0.01%
2005	17,115,938	1,292,667	185,457	2,799,435	25%	0.03%
2006	26,195,955	1,680,445	257,761	743,284	10%	0.02%
2007	32,703,451	2,136,763	324,888	2,124,268	14%	0.03%
2008	36,189,263	2,756,209	346,947	2,441,975	15%	0.03%
2009	23,786,232	2,874,170	832,518	722,507	19%	0.02%

Source: National Budgets, 2004-2009. Rolling Average Exchange rates provided by the Bank of Zambia. GDP estimates from the WDI, accessed on 15 January 2011

While it supported competitiveness and upgrading, tight insertion into foreign GVCs did not imply that suppliers were involved in technological innovation in Zambia. TNCs tend to retain the most knowledge-intensive activities, such as R&D, in their home countries. Their contribution to developing technological capabilities in the host countries crucially depends on how new technologies are imported. Importing

technologies as a ‘package’, transferring only the results of the innovation, but not the process itself, may *truncate* the technology transfer (Lall, 1992: 179). Bell and Albu (1999) highlighted the difference between knowledge-using versus knowledge-changing elements. R&D and product development, the highest value added stages for mining equipment, took place outside Zambia. Subsidiaries required know-how to assemble, sell, maintain and repair equipment. Parent companies for OEMs cooperated intensely with the mines in joint product development, but the local subsidiaries would not be part of this process. Equally, manufacturers explained that plastics or paints technology were nonexistent in Zambia, and they relied exclusively on their parent companies. Also, local suppliers would channel information on product performance from the mines to the parent companies, without being involved in the following technical work. Only one supplier reported working with the South African parent company in adapting technologies to Zambian mines.

Manufacturers and services providers not linked to foreign GVCs faced higher barriers to technological innovation and know-how. They used internet, sectoral publications and some professional associations to access information on the latest technologies. This activity was undertaken directly by the managing directors, and not through specialised staff. Trade fairs were not useful, and international trade fairs were excessively expensive. Only the largest steel foundry could afford external consultants.

Equipment was adopted with no technological adaptation. Investment in technologically advanced equipment was curtailed by different factors: capital constraints, reluctance to invest due to high competition from low-cost imports and flat or erratic demand from the mines. Consequently, many firms operated old machineries from the 1960s.

The Copperbelt was a shallow cluster, with low levels of knowledge sharing and weak linkages between first- and second-tier suppliers. First tier suppliers in Zambia would import equipment from suppliers based in South Africa and other countries. Respondents preferred to vertically integrate maintenance and repair functions. They would internalise also other non-core functions. Three suppliers, for example, invested in in-house testing facilities, in order not to rely on university or private laboratories. The lack of local suppliers specialised in computerised equipment meant that first-tier suppliers would not invest in such equipment, as costs for maintenance and repair were very high.

Weak NSI, low levels of public and private R&D and a ‘technologically shallow’ cluster hampered the development of technological capabilities. Some firms in the supply chain also failed to understand the importance of innovation capabilities as an order-winning CSF in the supply chain, especially for traditional buyers (Section 6.1.2). Tight cooperation with foreign-owned GVCs granted access to technologies and know-how, but not to a level which could promote functional or chain upgrading. The combination of weak NSI and limited value chain governance in upgrading technological capabilities of firms did not allow the development of a technological dynamic cluster able to promote knowledge-intensive firms and to support upgrading processes.

7.3 Skills spillovers

The mining companies provided training, partially to meet their obligations under the DAs. Slightly more than one third of the mining companies relied on on-the-job training, while the other two thirds relied also on external institutions. Retention rate was high, but the average length of stay after training for 46.2% of trainees was 2 years or less (National Economic Advisory Council, 2007).

Undersupply of technical skills, in terms of level and quality, emerged as an important constraint to suppliers' expansion. Small-scale, skills-intensive businesses found it difficult to replace an ageing, skilled workforce. Some large firms, like OEMs subsidiaries, had a very aggressive training policy, tapping into parent companies' resources. In order to address low retention, they adopted bond systems, with limited success, and were in process of moving towards closer partnerships with local training institutes. Most of the suppliers, however, undertook little or no training, and then mostly in the form of on-the-job training.

Budget allocations for skills creation were very low in Zambia. Zambia's key institution was the Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA), managing 21 Training Institutes. Budget allocated to training institutions absorbed, on average, half of total allocation to research and skills (2004-2009) (Table 15). The Technical Education, Vocational and Entrepreneurship Training Policy (1996b) highlighted the importance of skills creation for poverty reduction. Nevertheless, it failed to prioritise training of skills in high demand in the Copperbelt.

Table 15: Zambia public investment in skills development (2004-2009, US$)

	Total Budget	Allocation to Training Institutes	Training - Investment Programmes	% Total Research & Skills Budget	% GDP
2004	17,758,986	2,528,377	12,140,089	83%	0.12%
2005	17,115,938	2,331,121	3,852,022	36%	0.05%
2006	26,195,955	2,982,998	9,977,122	49%	0.09%
2007	32,703,451	3,633,747	6,513,255	31%	0.06%
2008	36,189,263	4,144,685	6,338,459	29%	0.06%
2009	23,786,232	2,624,414	9,256,809	50%	0.06%

Source: National Budgets, 2004-2009. Rolling Average Exchange rates provided by the Bank of Zambia. GDP estimates from the WDI, accessed on 15 January 2011

Poor quality training impacted negatively the skills levels. Training was largely theoretical, rather than practical, and schools were endowed with old equipment. Certifications had a weak informational value in terms of actual competencies. This translated into high selection costs for the firms (Interviews, 2009). Skills scarcity was especially problematic for mechanical (turning and milling machines operators) and electrical engineers, welding, metallurgy, metal fabrication (boiler-making), IT-related

skills, hydraulics (Interviews, 2009; National Economic Advisory Council, 2007). On the other hand, tertiary-level skills were largely available.

From the end of the 1990s, the skills' spillover from the mines to the supply chain intensified. Immediately after privatisation, ex-employees from the mines' operations departments entered the supply chain. They had acquired technical skills from the operations department and marketing skills and knowledge of the procurement process at the sales departments (Interview, 2009[31]). The latter, 'soft skills', were particularly important for suppliers.

Table 16: Suppliers employing ex-staff from the mines

	Positive performance	Static trajectory	Negative performance	Total
Employed staff from the mines	14	2	8	24
Not employed staff from the mines	9	5	7	21
Not responded	3	-	2	5
Total	26	7	17	50

Source: Interviews, 2009

In the survey, 24 suppliers employed staff which trained and worked in the mines. There was no clear evidence that this improved firm competitiveness, as only 14 performed well. Indeed, looking at the 26 firms that performed well, only 14, or 54%, employed ex-workers from the mines. These 14 firms were tightly inserted in foreign GVCs (8) and closely cooperating with traditional buyers (6) (Table 16).

The lack of technical and vocational skills represented a cost penalty for local suppliers, and suppliers with access to foreign GVC were better able to do in-house training. A market failure nevertheless persisted in the form of low retention levels. Skills spillovers between the mines and the supply chain emerged as a significant factor, which eased the skills constraints, at both technical and managerial levels. Skills spillovers, nevertheless, were not a determinant factor of the performance of local suppliers. In order to have a positive effect, these had to take place together with tight forms of value chain governance.

7.4 Regional capabilities

The construction, recapitalisation and operation of the copper mines required significant import of goods and services, in light of the weakness of local manufacturing and services companies. We undertook an analysis of import flows of mining-related capital equipment, from the year in which recapitalisation commenced, 1998, until 2009. In this 12-year period, over US$ 4 billion worth of equipment were imported. Imports increased drastically from 2004 onwards, peaking to US$ 890 million in 2007 and US$ 779 million in 2008. South Africa remained the core source of supply, but China was also emerging as an important supplier (Figure 16 and Table 17).

[31] Interview with Lesa P. Kanyanta, President, Association for the Welfare of Former Miners in Zambia, Kitwe, 12/11/2009

In 1998-2009, over US$ 2 billion of mining-related equipment was sourced from South Africa. In relative terms, this accounted for 54% on average of total imports, although this share declined over the years. Europe was the second most important source of imports (22% of total imports), in particular UK, Finland, Sweden and Germany. China was almost insignificant until 2005, but slowly catching up with imports totalling US$ 306 million, or 9% of total imports, in the 2005-2009 period. This amount was larger than imports from Australia and North America over the same period (US$ 180 million, 6% of total imports). India remained a relatively less important source of imports, on average 3% of total imports were sourced from India over the 12-years period under analysis. Japan and Switzerland were important sources.

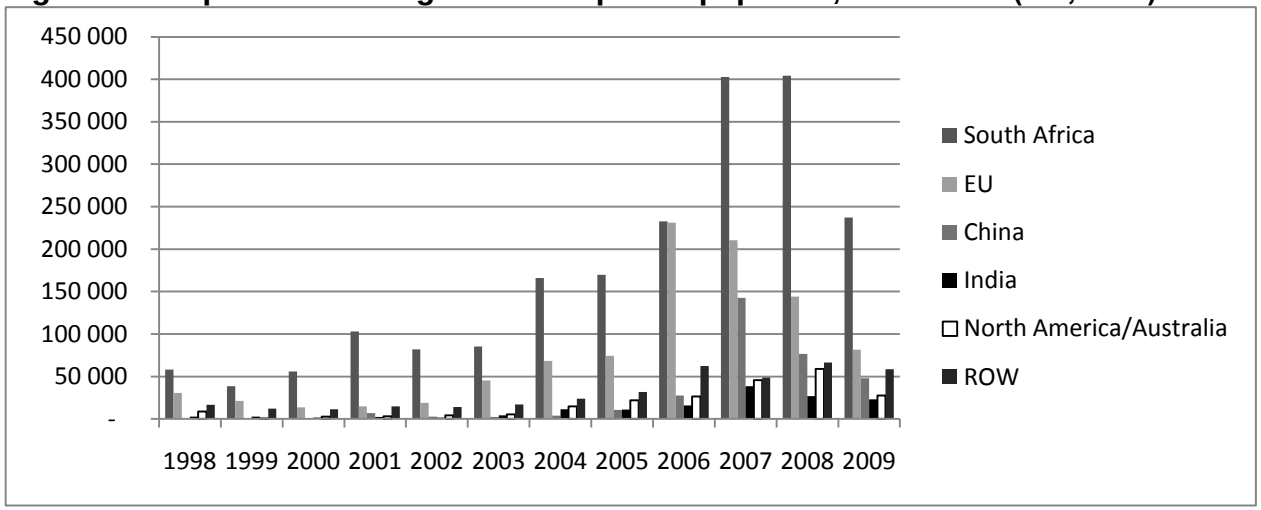
South Africa was a key regional hub in the supply chain. For some suppliers, South Africa was part of an integrated value chain, where goods, as well as expertise and training, were sourced from. South Africa, being so close geographically and culturally, increased their competitive advantage. For other suppliers, particularly manufacturers, South Africa was a fierce competitor; it had significant, sometime insurmountable, cost advantages. The vast opportunities opening up in the mining supply chain in the DRC will present interest opportunities for the region. Zambian firms could find the economies of scale they lacked until now to move up the regional value chain South Africa is party to, by moving into assembly and higher-value maintenance and repair services, for example.

Table 17: Imports of mining-related capital equipment, 1998-2000 (US, '000)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
South Africa	58,147	38,536	56,044	103,033	81,910	85,322	165,906	169,578	232,809	402,531	404,279	237,071
EU	30,521	21,037	13,678	14,636	19,089	45,238	68,389	74,193	230,989	210,348	144,184	81,617
China	212	287	785	6,798	2,867	2,152	3,794	10,745	27,668	142,552	76,758	47,942
India	2,653	2,545	1,556	2,352	1,699	4,347	11,442	10,815	16,005	38,686	26,664	23,111
North America/Australia	8,712	399	2,781	2,974	4,339	5,519	14,593	21,857	26,509	45,539	58,981	27,474
ROW	16,741	12,304	11,548	14,640	14,087	17,091	23,815	31,684	62,368	48,629	66,449	58,542

Source: COMTRADE

Figure 16: Imports of mining-related capital equipment, 1998-2000 (US, '000)



Source: COMTRADE

7.5 Infrastructure

Infrastructure developed around extractive industries has different levels of positive externalities, depending on its asset-specificity and location. Pipelines and helicopters services have lower externalities than roads and railways (UNCTAD, 2007). In Zambia, copper mining spurred the development of a rail line from South Africa through Zimbabwe to the Copperbelt and through to the Congo and to Lobito Bay in Angola. Further, to meet the demand of the mining industry for low-cost electrical power and energy, Kariba Dam and the hydroelectric power stations on the Zambezi and Kafue Rivers were developed as well (Chamber of Commerce, 2005).

Currently, four main trade corridors link Zambia and the southeast DRC to the subregion and overseas markets. These are Dar-es-Salaam, Walvis Bay, Beira, and the north-south corridor through Durban. Though not the closest port, Durban was the most convenient and utilised port for Zambian firms. Although not the highest in SSA, transport prices for Lusaka-Durban were US$6 per tonne/km, against US$5 in China and US$3.5 in Brazil. Three factors lay behind high transport costs in the North-South Corridor: firstly, high border crossing times, especially on the Chirundu Border with Zimbabwe. It was estimated that a 20% reduction in border crossing time would reduce transport prices to the importers by 10-15%. Secondly, high fuel prices - almost 80% of the fuel prices in Zambia were constituted by taxes and levies, which meant that 40% of total transport costs were linked to taxation (World Bank, 2009). Third, quality of physical infrastructure was poor due to lack of investment from Government or private mines.

Development of the North-South Corridor presents the opportunity for the broader industrial and agricultural development of the Copperbelt and the rest of Zambia. This was recognised by the Government, which together with other neighbouring countries, launched the North-South Corridor Programme in April 2009. The ambitious Programme aimed at reducing transport costs for two main routes: Copperbelt - Dar es Salaam, and Copperbelt - Durban. This would be done by rehabilitating the physical infrastructure and improving the regulatory regime (reducing cross-border clearing procedures, harmonising transit and transport regulations, and simplifying administrative requirements). The programme aims to involve the expanding extractive industries in Zambia and DRC as key drivers of the programme (North-South Corridor International Financing Conference, 2009). The first concrete step to implement the programme took place in 2009, when Zambia adopted the One-Stop Border Post Act, the legal foundation for the joint administration of the Zambia-Zimbabwe border post (GRZ, 2009).

Poor infrastructure represented a cost penalty on both buyers and suppliers. Reducing transport costs would cut lead times for agents and distributors that currently need capital and large stocks to be able to supply just in time. Manufacturers would have lower production costs and less inputs stock costs. The North South Corridor would also link the mineral-rich part of DRC, creating additional opportunities for Zambia to increase its role in the regional supply chain.

8. Conclusions

The past two decades have brought major changes to the depth and composition of the local supply chain to Zambia's copper industry. Privatisation and liberalisation led to a higher presence of foreign suppliers, both through imports and through establishment of subsidiaries and partnerships with Zambian firms. As the progressive demise of the manufacturing sector unfolded, the local supply chain was increasingly dominated by services providers. While some services providers were able to move into value-added services, the majority were involved in trading. A category of trading companies, known as 'briefcase suppliers', were one-man businesses, with no overheads, positioned in low-value added links, characterised by low barriers to entry and exit, high-profit and low-risk. They impacted negatively on supply chain efficiency, but this was tolerated by the mines to appease Government and on the back of high profit margins. This changed with the 2008/2009 crisis, when buyers had to cut costs and exclude inefficient suppliers.

Mining companies directed a significant share of their expenditures to the local supply chain. The depth of local linkages, nevertheless, was low. While the local supply chain was populated by a heterogeneous group of firms, most firms engaged in low value-added activities, and were highly uncompetitive. This was consistently highlighted by all buyers as the key challenge for development of the local supply chain.

The ownership structure of Zambia's copper mining sector was diversified: it included companies from developed countries and South Africa – 'traditional buyers' - as well as from emerging economies, India and China. Small-scale mining was also relevant in terms of number of companies involved. The impact of Chinese FDI in Africa is attracting substantial interest in the academic and policy arena. Recent research argued that the institutional framework of Chinese FDI led to distinctive behaviour of Chinese firms. Strong State support created soft budget constraints and determined policy-driven, rather than, or rather than only, profit-driven corporate objectives. This enabled Chinese firms to pursue higher-risk investment, of a counter-cyclical nature. Such FDI was natural resources and market seeking and privileged wholly-owned entry. While private sector-led investment was growing, increasing the heterogeneity of China FDI actors, institutions remained a major force in shaping outward FDI, especially for SOEs.

China's entry into Zambia copper value chain had a distinctive impact on the localisation of upstream linkages. Firstly, this report challenged the expectation that the Chinese mine would operate as an enclave. Whilst the objective of CNMC and ExIm Bank was to promote Chinese exports through outward FDI, the Chinese mine supply chain was driven by economic efficiency considerations. Mine development was undertaken by Chinese firms, but the bulk of extractive operations relied on a diversified basis of local, regional and foreign suppliers. If suppliers met their requirements, Chinese buyers were open to do business with new entrants. Secondly, counter cyclical investment to expand mining and refining capacity meant that pressure to cut costs, experienced by other mining companies, did not play a major role in the Chinese supply chain. This had implications for the modality of engagement with local suppliers. Moreover, for critical supply links, buyers were on a learning process path, in which quality became an order-winning CSF. Lastly, the

Chinese mine relied on Government to Government interaction, as suggested by previous studies. They minimised their interaction with local industry associations and did not participate in the IFC suppliers' development programme. They indeed failed to internalise such issues in their corporate strategy. No formal or informal cooperation was taking place with their suppliers.

As prices plummeted in 2008, traditional buyers came under pressure to cut operations and capital costs. Selection of participants in the value chain was tightened and the supply chain was increasingly price-driven. They engaged in different forms of cooperation with their suppliers. Informal cooperation took place to improve their supply chain management. Cooperation with highly-skilled, specialised and critical suppliers was motivated by the need to support a basis of local reliable suppliers. More particularly, buyers wanted to ensure such a base would not be disrupted by the economic crisis and would be there when full production resumed. Cooperation also targeted a few firms positioned in supply links where there was no competition, but in non-core activities that buyers wanted to outsource. Cooperation involved the provision of capital and a commitment to purchase goods. Buyers invested more resources because of very low suppliers' capabilities. Lastly, formal cooperation through the IFC Suppliers Development Programme was undertaken in fulfilment of CSR policies and of the DAs.

Indian and small buyers dealt with their suppliers through arms' length market-based relationships. Indian buyers specifically leveraged on unequal bargaining power to squeeze suppliers' profit margins. Moreover, low levels of trust and delayed payments reduced the quality of buyer-supplier relationships, and curtailed upgrading opportunities. Small mines' supply chains had higher engagement with the local manufacturers, such as joint product development, which nevertheless could not tap into resources for upgrading.

Quality, lead times and trust were order-qualifying CSFs for all buyers. As mentioned, traditional buyers' supply chains were increasingly price-driven, while Chinese buyers paid more attention to quality for critical supply links. Traditional buyers considered learning and innovative capabilities an order-winning CSF. This was important because it implied that suppliers' investment in this area would be rewarded. Suppliers, by and large, failed to understand these dynamics.

International standards were order-qualifying CSFs for some supplies only (equipment, reagents). Traditional buyers, nevertheless, required their suppliers to have internal quality management systems, but not necessarily ISO certified.

Different governance types co-existed within the same sector, and governance types varied with ownership, and changed over time, most recently in light of the economic crisis. Suppliers were left with the challenge of meeting different expectations, in terms of CSFs and types of engagement. Buyers reported that, despite a few exceptions, local suppliers failed to meet their performance requirements. Traditional buyers were dissatisfied with their price and quality competitiveness, while Chinese buyers with suppliers' lead time, trust and price competitiveness. There was a value chain misalignment, as suppliers consistently overestimated their performance. Tthis issue needed to be addressed.

The relationship between governance and ownership affected the trajectory of the local supply chain, in terms of growth and upgrading. By focusing on the *trajectories* of clusters, incorporating dimensions of time and change, researchers are in a better position to separate elements crucial to the success of the cluster from elements that are purely incidental to it (Humphrey, 1995). We have reviewed the firm-level data, on performance and upgrading, to identify and explain patterns. Three trajectories were identified: dynamic, static and declining trajectory. Suppliers positioned on a positive growth and upgrading path fell into two categories - those tightly inserted into foreign GVCs and those engaged in formal and informal cooperation with traditional buyers. In the first case, foreign GVCs required subsidiaries, branches and sole distributors to upgrade, and also provided the resources for such upgrading, in terms of capital, technologies and knowledge. Reputation, ISO certification and better understanding of the CSFs were transferred on local suppliers, increasing their competitiveness. Subsidiaries, in particular, invested heavily in training, establishing training centres, and creating significant levels of skilled jobs. Sole distributors not only supplied ISO-certified products, but had to upgrade into after-sale services and invest in skills development.

A positive trajectory was also determined by cooperation with traditional buyers. Firms engaged in cooperation in a variety of forms, both formal and informal. Our research found that the intensity and efficiency of such cooperation was positively correlated to how critical such outsourcing was for the buyer, and negatively correlated to suppliers' capabilities. In other words, when traditional buyers really required a reliable supplier, they would invest resources in building its capability. More resources would be invested if capabilities were low.

Our findings suggest that a minimum size and some level of specialisation on critical supply links were required in order to accommodate upgrading processes. Micro-enterprises that registered good profits and turnover, failed to grow into more complex managerial and organisational structures that could accommodate investment in product and process upgrading. The lack of specialisation on critical supply links also meant that buyers had no interest in cooperation. This was confirmed by the experience of 'briefcase businessmen', who enjoyed years of bonanza in terms of high, quick, risk-free profits, but almost never upgraded. With the global economic crisis, they quickly exited the supply chain.

A significant number of firms were on a declining trajectory, with poor performance and no capability to upgrade. A striking share of them were manufacturers, established during the Import Substitution industrialisation Policy and nationalisation era. New private mines imposed high standards, which the firms were not accustomed to, because the domestic market did not require the same. Some firms had been squeezed out of the supply chain for spares and components, controlled by the OEMs through the warranty system, or by technological change. In absence of effective public policies or strong cooperation with buyers or foreign GVCs, they lacked both the incentive and the resources for upgrading. Their low profit margins meant few resources were available for investment in quality management systems, new technologies, and so forth. Only a few firms had the potential for product and process upgrading through the IFC suppliers' development programme, but it was too early to evaluate whether this would reverse their decline.

Humphrey and Schmitz (2000) suggested that for suppliers locked into relationships with existing buyers, the opportunities for functional upgrading may come from exploring different value chains. Our findings confirmed that, in order to undertake functional upgrading, suppliers moved into other value chains. Three high-performance suppliers moved into a value chain which required more complex managerial and technological capabilities, as well as capital investment. Another three manufacturers moved into different value chains with less stringent requirements as an exit strategy. Moving into new value chains, therefore, not always coincided with a chain upgrading. Interestingly, these firms were all Zambian-owned. Suppliers tightly inserted in foreign GVCs had no interest in functional or chain upgrading, as they were part of a global distribution of roles controlled by the lead firms in their GVCs.

With regard to the other MMCP drivers, weak policy and NSI were found to have a negative impact on the localisation of upstream linkages. The formulation of the tax regime for capital equipment imports disadvantaged local suppliers. The poor implementation of the local suppliers' development provisions in the DAs, coupled with weak government support to the private sector in general, implied that upgrading processes were left to internal value chain governance.

The weakness of the NSI also contributed negatively to the deepening of local linkages. With low public investment in building technological capabilities, firms were caught in a trap of no access to investment capital, low technological capabilities to start with, low incentives to adopt new technologies and risk that the market would not reward such investment. Firms tightly inserted into foreign GVCs accessed the knowledge and technologies required to supply the mines, but R&D activities were localised abroad. The technology transfer was, in Lall words, 'truncated'. Traditional buyers considered innovation and technological capabilities as an order-winning CSF, but their forms of cooperation did not build such capabilities. There was a limit to the resources they were willing to invest in such cooperation. A weak and undynamic NSI curtailed firms' capabilities to upgrade into more technology and knowledge intensive stages of the value chain and limited the possibility of technological spillovers from foreign GVCs.

Skills availability was poor due to low public investment and low propensity from firms to invest in in-house training, with the exception of OEMs subsidiaries. This constrained the possibility for suppliers to expand their markets and to upgrade into highly-skilled activities. The problem was particularly acute for engineering firms that found it difficult to replace their ageing workforce. All the mines had on-the–job and external training. Skills spillovers from the mines to the supply chain provided firms with technical skills and knowledge about the internal process to the mines. This, however, was not found to be critical for growth and upgrading processes. They were effective when taking place in conjunction to tight cooperation with foreign GVCs or traditional buyers.

South Africa was a regional hub for supply of mining-related equipment to Zambia. Many suppliers were inserted into South Africa-based value chains, from which they tapped capital, skills and knowledge. The expansion of the DRC mining sector opened an opportunity for the Zambian suppliers to achieve the economies of scale they earlier lacked to undertake higher value-added activities within this regional

supply chain. This would be supported by infrastructural development within the framework of the North-South Corridor. By reducing transaction costs for Zambian suppliers, and linking them to mines in DRC and second-tier suppliers in South Africa and overseas, this infrastructural project had the potential to expand and deepen local linkages.

9. Policy recommendations

The policy implications of the research findings take into consideration two factors. Firstly, within the copper mining sector, there was not one, but many value chains. Secondly, there are different possible industrial growth paths, namely: expanding the number of local firms that enter the mining supply chain; increasing the market size of individual firms; and fostering upgrading processes (see discussion in Section 1.2).

Table 18 summarises the findings according to three dimensions: buyers' ownership, type of suppliers, and industrial developmental paths. We focused on the large buyers because they constitute the largest part of the demand for goods and services. A series of policy recommendation for Government and for the private-sector are presented below.

Policy recommendation 1: Easing access to the supply chain
Zambia should engage mining corporations in a policy dialogue to address the transparency of the procurement process. Indeed, it would be necessary when many suppliers complained about some traditional buyers and the Indian buyer. Transparency was critical to facilitate the entry of capable, local suppliers in the value chain and to improve supply chain efficiency. An electronic procurement system could be a step in this direction. In the past, misunderstanding between the mines, the suppliers and the Government over the establishment of such system caused the project to be aborted. This experience highlighted the importance of adequate consultations before and during implementation of such reforms.

Policy recommendation 2: Building on the IFC suppliers development programme
The IFC suppliers' development programme targeted a group of peripheral suppliers to the mining supply chain. They received support on product and process upgrading, and, some, an opportunity to enter the supply chain for the first time. While the programme was still in the implementation phase, and it was too early for a definitive assessment, a few policy suggestions can be made:

- Firstly, targeting critical suppliers could have increased the commitment and resources availed from the traditional buyers. We have shown that low levels of capabilities did not discourage cooperation when suppliers were critical.

- Secondly, manufacturers that performed well were part of foreign conglomerates. For some local manufacturers, competition with imports or the foreign conglomerates was not sustainable and they had been excluded from OEMs global value chains on parts and components. In these cases, accompanying measures could assist local manufacturers to move into other

value chains, such as agricultural equipment for the domestic market; a process some of them had already undertaken.

- Thirdly, services suppliers with high potential for upgrading, skills and job creation, were not targeted by the programme. However these firms could be integral to a process of knowledge intensification of the local supply chain.

- Lastly, while in an early stage the IFC programme was supposed to provide capital, this objective fell through when the programme commenced. For many beneficiaries, this constituted a major pitfall of the programme. Future initiatives should build on the IFC programme, taking into considerations these four issues.

Policy recommendation 3: Encouraging Chinese and Indian mines to deepen cooperation with local suppliers

The mining value chain was characterised by high levels of transactional dependence of the suppliers on the mines, and unequal relationship between them. In order to facilitate the entry of local suppliers in the mining value chain, and cooperation to develop their capabilities, Zambia included such issues in the DAs. However, these were largely ignored. More specifically, the Chinese and Indian buyers failed to adopt any support programme. Furthermore with the revocation of the DAs, there was no legal obligation on the mining companies in this respect. There was a gap created by weak Government regulatory capacity and the failure to internalise supply chain development by the Chinese and Indian buyers. Zambia should engage the mines at a political level, with the objective of securing their commitment in this area. Chinese buyers should also be encouraged to participate in the life of local industry associations.

Policy recommendation 4: Skills creation

The technical and vocational education policy should target the skills shortages in the Copperbelt: mechanical (turning and milling machines operators) and electrical engineers, welding, metallurgy, metal fabrication (boiler-making), IT-related skills, hydraulics. This would allow skills-intensive firms to expand, and, in general, to move into higher value-added activities and new technologies.

Policy recommendation 5: promotion of FDI

Policies to promote FDI, JV and other forms of partnership would encourage this category of suppliers. Zambia adopted an open investment regime, and through the Zambia Development Agency Act (GRZ, 2007), envisaged important fiscal incentives for large investors. Improving the business climate, nevertheless, require addressing other factors: cost and ease of dealing with construction permits, enforcing contracts and trading across borders (World Bank, 2011).

Policy recommendation 6: State to State dialogue with the DRC

In order to enter the DRC mining supply chain, Zambia needs to address important issues on a bilateral basis with the DRC. Such dialogue should include, among others, the conclusion of the bilateral FTA by DRC or its implementation of the SADC Trade Protocol, improvement of border management and transparency of practices of border agencies on both sides, facilitating banking transactions between the two countries.

Policy recommendation 7: building the NSI

Lall and Teubal (1998: 1378-1379) argued that, given the right context, prioritising policy around a 'nuclei of development' can be instrumental in promoting technological growth. 'Nuclei of development' were defined as specific regions, clusters or industries, with higher than average potential for technological growth, learning spillovers and vertical linkages with other activities. This would maximise social returns on the investment of limited resources. The mining sector in Zambia, especially the traditional buyers, created an opportunity to build firms' technological capabilities, as it potentially provided the returns on such investment. Public investment to improve local firms' access and absorption of technologies would facilitate development of knowledge- intensive activities and firms.

Policy recommendation 8: Horizontal and sector-specific measures

Business development initiatives should target industries in the Copperbelt. The current Micro, Small and Medium Enterprise Development Policy did not include such suppliers in its target group. According to the official government classification[32], 46 firms in the sample would qualify as large, while only 4 would be recognised as small. Most of the firms had higher turnover and capital investment than levels set by the Policy to be classified as medium-sized firms[33]. However, 34 firms met the employment level criteria of 'medium' and 'small' firms - they employed less than 100 people[34]. None of these suppliers would qualify for support under the Micro, Small and Medium Enterprises Development Policy. The Commercial, Trade and Industrial Policy (2008) did not include upstream industries either.

- Government should consider expanding the reach of the current policies or creating a separate policy instrument to target this group of firms.

- Support should prioritise capital, quality management systems and business management. Access to capital would allow suppliers to expand operation to the new mining areas in Zambia, and possibly the DRC.

- Traditional buyers required their suppliers to have internal quality management systems in place. In the future, they would require such systems to be internationally certified. Government should assist selected local firms to comply with these requirements.

- ISO certification was costly and required sophisticated internal firms capabilities. Some dynamic firms were investing in ISO certification expecting this to be a future requirement by traditional buyers. For these firms, Government should support the certification process, as costs were high due to lack of international accreditation of the national certification system.

- Nevertheless, for other firms, support should focus on establishing internal quality control systems. This could work as a stepping stone for international

[32] Micro, Small and Medium Enterprises Development Policy, 2009.
[33] Medium firms have less than Kwacha 800 million turnover per year (US$ 160.000).
[34] Another policy implication of the above data is that the labour elasticity of firm's growth appeared to be low.

certification. Such support should be offered to the entire cluster, in order to include second-tier suppliers.

- Trade facilitation and infrastructure development would assist in cutting operation costs for local suppliers, as well facilitating their insertion in regional value chains.

- At the sectoral level, Zambia should re-assess the enforcement mechanisms of the tax exemption regime. This should remove the cost disadvantage for suppliers.

Policy recommendation 9: Strengthening private sector horizontal and vertical cooperation

Agglomeration effects in the Copperbelt were weak. Positive externalities mainly affected market access to the mining supply chains, to some extent, creation of a labour pool and skills' spillovers. Knowledge and technology sharing, and specialisation, nevertheless, were low, both between buyers and suppliers, and between first- and second- tier suppliers. Suppliers' horizontal cooperation was almost non-existent. In the past, briefcase businessmen lobbied through their association, with some success, for market access to the supply chain. Recently, suppliers cooperated through the Chamber of Commerce to address the issues of delayed payment by Indian buyers. Nevertheless, the content of such cooperation did not deal with skills, technology and infrastructure, critical factors to increase the clusters competitiveness. Suppliers should strengthen and strategise their joint actions towards such issues.

Buyers' horizontal cooperation started recently, with some knowledge sharing over fraudulent suppliers. The aim was to extend this over bad performers and, through the newly-established Procurement Institute, improve skills of procurement professionals. Such forms of horizontal cooperation should be encouraged, as they benefit buyers, including small-scale mines, and suppliers. Increased vertical cooperation would also be important to address the key issue of value chain misalignment. Suppliers and buyers failed to 'hear' each others. Improved information exchange would ensure that stakeholders acquire a better understanding of the critical factors affecting dynamics in the value chain.

Relating the various policy recommendations to different supplier needs:

In conclusion, having proposed a number of policy recommendations that could be taken up by government and the private sector, we now turn to how these relate to the different categories of suppliers identified in the report. The policy interventions suggested above are likely to impact diferentially on the suppliers according to the type of category they belong to and, in some cases, to the buyers they are supplying.

Non-critical suppliers: These suppliers included traders, agents and manufacturers of consumables. Entry barriers to the Chinese supply chain were low (except for foundries). The Chinese supply chain represented a potential entry point to the mining value chain. Post-entry, however, arms' length market relationships prevailed, and it was more difficult for suppliers to expand and upgrade. The supply chain to

traditional buyers presented high entry barriers, but granted the opportunity to few suppliers to expand and upgrade. Some manufacturers of consumables performed well as they were part of foreign conglomerates, while others had the potential for upgrading through the IFC programme.

- *Policy recommendations 1, 2 and 3* in this context are critical as they aim at easing access to traditional buyers' supply chains, by creating a level playing field; encouraging Chinese and Indian buyers to enhance the quality of their engagement with the suppliers; and last, building on and improving the IFC programme.

Skills-intensive suppliers: These suppliers (engineering firms, hydraulics) were mostly positioned in the supply chain to traditional buyers, where they expanded and undertook process upgrading. Their key constraint was the skills shortages.

- *Policy recommendation 4* suggests that increased investment was required to enhance the level and the quality of training.

Critical, capital intensive suppliers: These suppliers included OEMs subsidiaries, sole distributors of mining equipment, specialised transport. These firms expanded and upgraded independently from the buyers' ownership patterns. They specialised on value-added activities, employed and developed skilled labour, and adopted high product and process standards. Potential for development mainly rested on product and process upgrading, and tapping into foreign GVCs. The potential for increasing the market size was considerable, especially by entering the DRC supply chain, as regional suppliers.

- *Policy recommendations 5 and 6* are critical for this group of suppliers in terms of FDI promotion and facilitating market access to the DRC.

Zambian-owned firms: One key research finding was that Zambian-owned firms were more likely to pursue higher forms of upgrading, both functional and chain. So far, public institutions have been weak, therefore value chain governance in the form of tight cooperation became the privileged mechanism for upgrading. Nevertheless, this internal governance was not sufficient to support the entire cluster of suppliers.

- *Policy recommendations 4, 7 and 8* will enable Government to prioritise skills creation, the NSI and horizontal and sector-specific business support measures in order to promote simultaneousdeepening and localisation of upstream linkages.

Finally, *Policy recommendation 9*, concerning the deepening of private sector-led value chain cooperation, cuts across all categories of suppliers and buyers.

Table 18: Summary of findings on ownership and industrial development path

			Industrial developmental path		
		Suppliers type	Expanding the basis of the supply chain	Increasing market size for individual firms	Upgrading
Buyers' ownership	Traditional buyers	Non-critical suppliers	high entry barriers	selective opportunities	selective opportunities – process functional/chain upgrading
		Skills-intensive firms	low entry barriers	yes	yes - process upgrading
		K-intensive, critical suppliers	low entry barriers	yes	yes – process/functional/chain upgrading
	Chinese buyers	Non-critical suppliers	low entry barriers	limited	No
		Skills-intensive firms	no entry	no	no
		K-intensive, critical suppliers	low entry barriers	yes	yes - process upgrading
	Indian buyers	Non-critical suppliers	low entry barriers	no	no
		Skills-intensive firms	low entry barriers	no	no
		K-intensive, critical suppliers	low entry barriers	no	no

Appendix A Respondents' List

Mining Companies	Respondents	Place/Date of Interview
Bwana Mkubwa First Quantum Minerals Ltd	Paul Weston Contracts Manager	Ndola, 18 November 2009
Chibuluma Mines Plc	Willie Roux Supply Manager	Kalulushi, 9 November 2009
Chilibwe Mining	Madalisu Zulu Manager	Lusaka, 1 December 2009
Copperhead	Tandi Kamanga Manager	Lusaka, 5 December 2009
Kansanshi Mining Plc First Quantum Minerals Ltd	Franques Lee Contract Officer – Services	Solwezy, 5 November 2009
Kansanshi Mining Plc First Quantum Minerals Ltd	Kellie Stockenström Contracts & Logistics Officer	Solwezy, 5 November 2009
Mopani	Passmore Hamukoma Chief Service Officer	Kitwe, 20 November 2009
Mopani	Hermann J. Siegling Supply Manager	Kitwe, 11 November 2009
NFC Africa Mining Plc	Pan Jincheng Vice General Manager	Kitwe, 20 November 2009
Scirocco Enterprises Ltd	Moustafa S.Y. Saadi Managing Director	Lusaka, 16 December 2009
Sokotela Mines	David Sokotela Chilopa	Lusaka, 11 December 2009
ZCCZ Zambia-China Economic & Trade Cooperation Zone	Zao Baosen Vice General Manager	Kitwe, 20 November 2009

Supplier Firms	Respondents	Place/Date of Interview
Action Auto Ltd	Brian Bentley General Manager	Kitwe, 2 November 2009
Active Agents	Mr Yawawa Director	Ndola, 16 November 2009
Afrope	J B Lungu General Manger	Kitwe, 6 November 2009
Afrox	Kuda Ngoma Sales and marketing manager	Kitwe, 19 November 2009
Amalgamated Dress Ltd	J.N.Vaghela Managing Director	Ndola, 19 November 2009
Andrea Machinist	Dario Sesia Director / Workshop Manager	Kitwe, 2 November 2009
Art Engineering Ltd	Narendra Thakkar Managing Director	Ndola, 17 November 2009
Athol Plastics Ltd	Spyros Enotiades Managing Director	Kitwe, 2 November 2009
Atlas Copco Zambia Ltd	George Kapeso Product Manager GDE/RCE	Kitwe, 20 November 2009
Austral Equipment Ltd	Brian Chisanga Managing Director	Kitwe, 30 October 2009
Avilkram Industrial Supplies Ltd	John Liva CEO	Lusaka, 1 December 2009
Barloworld Equipment Zambia Ltd	Gilbert Sinjani, Regional Sales Manager	Kitwe, 4 November 2009
Bell Equipment Company Zambia Ltd	Patricia K Kalota Finance & Admin Manager	Kitwe, 4 November 2009
BPT Engineering Ltd	Adam Hughes General Manager	Kitwe, 4 November 2009

Bresmar Investment Ltd.	Brenda Kunda Managing Director	Solwezy, 18 December 2009
C P Engineering Ltd	Chandrakant Mistry Manager	Kitwe, 6 November 2009
C&B Engineering Ltd	Simon Chilongoshi Sales and Marketing Manager	Kitwe, 12 November 2009
Chloride Zambia Ltd	John Musonda General Manager	Kitwe, 3 November 2009
Dukon Paints	Jeremiah Manda Operations Manager Dukon Paints Ltd	Kitwe, 20 November 2009
Engilex Ltd	John Kombe, Bobi K. Nebwe Directors	Lusaka, 10 December 2009
Fire Prevention	Mr. Parmar Managing Director	Ndola, 16 November 2009
Fox Foundry Ltd	C. Chiti Executive Chairman	Kitwe, 12 November 2009
Frabec Engineering Enterprises Ltd	Alfred Lungu Managing Director	Kitwe, 11 November 2009
Gomes Haulage Ltd	Reginald H. Gomes Executive Chairman	Ndola, 17 November 2009
Hanekom innovations Ltd	Steven Muzipo Business Development Manager	Kitwe, 1 November 2009
Kasembo Transport	Kevin Shone HR Director	Ndola, 17 November 2009
Klassic Kreations	Anthony Kabaghe Managing Director	Kitwe, 14 November 2009
Lamasat/ Start Investment Ltd	Mohamad A Ahmad Managing Director	Lusaka, 2 December 2009
MacSteel Zambia Ltd	Johan Van Deventer Director	Kitwe, 11 November 2009
Meltcast Engineering Ltd	Maybin Kombe Director	Kitwe, 4 November 2009
Morganite Zambia Ltd	Steny Kampo General Manager	Ndola, 18 November 2009
Ndola Engineering Company Ltd	S. Bettega Managing Director	Ndola, 19 November 2009
Ndola Lime Company Ltd	Abraham Witika Acting General Manager	Kalulushi, 16 November 2009
Non-Ferrous Metal Works Ltd	Wayne R. Bouverie Commercial Manager	Ndola, 19 November 2009
Pex Zambia Ltd	Raj Karamchand Managing Director	Kitwe, 10 November 2009
Pigott Maskew Ltd	M.C. Storti Director	Kitwe, 3 November 2009
Plascon Zambia Ltd	PV Mohan Business Development and Depot Manager	Kitwe, 9 November 2009
Powerflex Zambia Ltd	C Chipili Managing Director	Kitwe, 20 November 2009
S D Mining Equipment Ltd	Jack A. Chakonta CEO	Ndola, 16 November 2009
Sandvik (Zambia) Ltd	George Mutali Ltd Director – Admin and Services	Kitwe, 12 November 2009
Scaw Ltd	R D Gupta Managing Director	Kitwe, 14 November 2009
Sky Pharma Ltd	Mr. John Kerry Managing Director	Lusaka, 2 December 2009

Stanley Mining Services Ltd	Trevor Connell Country Manager – Zambia / Operations Manager – Southern Africa Region	Ndola, 17 November 2009
Sterelin Medical & Diagnostics Ltd	Harish J.N. de Silva Managing Director	Lusaka, 3 December 2009
Tri-Pump&Engineering	Larry Mapani Director	11 November 2009, Kitwe
Unity Garments Ltd.	Kam Shah Operations Manager	Ndola, 16 November 2009
Valves and Actuators	Fidelis Chisompola Managing Director	Kitwe, 3 November 2009
Weir Warman Africa	Mweemba Mulunda Finance Director	Kitwe, 12 November 2009
Zamleather	Richard Franklin General Manager	Lusaka, 18 December 2009
Zamchin Steel and Foundry Ltd	John Chikisanda Manager/ Accounts and HR	Kitwe, 14 November 2009

Appendix B. Respondents from private and public institutions

Sector	**Institution name**	**Number of respondents**
Government	Official from the Ministry of Commerce, Trade and Industry Official from the Ministry of Mines and Mineral Development Officers of the National Business Technology Centre	3
Private sector	Chairman of the Kitwe Chamber of Commerce and Industry Chairman of the Ndola Chamber of Commerce and Industry Chairman of the Solwezy Chamber of Commerce and Industry President of the Mines' Contractors and Suppliers Association President of the Small-Scale Miners Association of Zambia GM of the Chamber of Mines Project Officer from the Zambia Association of Manufacturers Vice GM – Zambia China Economic and Trade Cooperation Zone	8
Other Non State Actors	Professors from the University of Zambia (Dept. Economics) and Copperbelt University (Business School) Chairman of the Copperbelt office of the Zambia Institute of Purchase and Supply President of the Association for the Welfare of Former Miners in Zambia Programme manager, IFC Suppliers Development Programme Ex manager of BP Kitwe	6
TOTAL		17

Appendix C. Firms' performance and trajectories: methodology

Performance at the firm-level was assessed along 5 indicators: output, sales, price, profit, employment. The period of reference was 2003-2008 period. Upgrading was assessed against 4 dimensions: product, process, functional and value chain upgrading. For each firm, these data were complemented by in-depth, qualitative data (see Table below).

In some cases, firms registered positive, but decreasing sales and profits, and undertook minimal levels of upgrading. This was responsive rather than pro-active upgrading, and failed to re-position the firms in the supply chain. In these cases, notwithstanding positive indicators for sales and upgrading, these firms were placed on a declining trajectory.

Criteria for assessment

Dynamic trajectory	Firms registered overall positive performance in sales and profits. Some firms experienced a decline in employment levels or price, due to successful process upgrading and increased productivity. Firms undertook one or more forms of upgrading.
Static trajectory	Firms registered a moderately positive or no sales and profit growth. They undertook little or no upgrading, and were not in a position to compete with imports or new entrants.
Declining trajectory	Firms were exiting the value chain. Mostly, they showed negative performance and no or insufficient upgrading. Few firms performed moderately well, but their market share was being eroded and they had no capability to upgrade. Another group of firms was moving into other value chains, which required less complex technological and organisational capabilities.

10. References

Aggarwal, R. & T. Agmon. 1990. The International Success of Developing Country Firms: Role of Government-Directed Comparative Advantage. *Management International Review* 30 (2), 163-180

Amsden, A. H. & T. Hikino. 2000. The Bark is Worse than the Bite: New WTO Law and Late Industrialisation. *Annals of American Academy of Political and Social Science* 570, 104-114

Bair, J. & G. Gereffi. 2001. Local Clusters in Global Chains: The Causes and Consequences of Export Dynamism n Torreon's Blue Jeans Industry. *World Development* 29 (11), 1885-1903

Bell, M. & M. Albu. 1999. Knowledge Systems and Technological Dynamism in Industrial Clusters in Developing Countries. *World Development* 27(9), 1715-1734

Blomström, M. & A. Kokko. 2007. From Natural Resources to High-Tech Production: The Evolution of Industrial Competitiveness in Sweden and Finland. In Lederman, D. & W.F. Maloney (eds), *Natural Resources: Neither Curse nor Destiny*. Washington, DC: Stanford University Press and The World Bank, 213-256

Bova, E. 2009. The Implications of Mine Ownership for the Management of the Boom: A Comparative Analysis of Zambia and Chile. *NCCR Working Paper 2009/13*. Bern: Swiss National Centre of Competence in Research

Broadman, H. 2007. Africa's Silk Road: China and India's New Economic Frontier. Washington, DC: The World Bank

Buckley, P., L. Clegg, A. Cross, X. Liu, H. Voss & P. Zheng. 2008. Historic and Emergent Trends in Chinese Outward Direct Investment. *Management International Review 48 (6),* 715–748

Buckley, P., A. Cross, H. Tan, X. Liu & H. Voss. 2007. The Determinants of Chinese Outward Foreign Direct Investment. *Journal of International Business Studies* 38, 499–518

Carmody, P. & G. Hampwaye. 2010. Inclusive or Exclusive Globalization? Zambia's Economy and Asian Investment. *Africa Today* 56 (3) Special Issue: Africa's Spaces of Exclusion, 84-102

Cawthorne, P. 1995. Of Networks and Markets: The Rise and Rise of a South Indian Town. The Example of Tiruppur's Cotton Knitwear Industry. *World Development* 23 (1), 43-56

Chamber of Mines of Zambia. 2005. Survey of the Zambian Mining Industry 1995 to 2004, Zambia: Mission Press.

Cheung, Y-W & X. Qian. 2009. Empirics of China's Outward Direct Investment. *Pacific Economic Review* 14, 312–41.

China Non-Ferrous Metals Corporation (2009), Businesses and Products. http://www.cnmc.com.cn

Craig, J. 2000. Putting Privatisation into Practice: The Case of Zambia Consolidated Copper Mines Limited. *Journal of Modern African Studies* 39 (3), 389-410

Cuddington, J. & D. Jerrett. 2008. Super Cycles in real metal prices. *IMF Staff Papers* 55 (4), Washington: International Monetary Fund

Davies, K. 2009. While Global FDI Falls, China's Outward FDI Doubles. *Columbia FDI Perspectives 5.* New York: Vale Columbia Centre

Equinox Minerals Ltd. 2010. 2009 Annual Report. http://www.equinoxminerals.com/

-----. 2010. LMC Supply. http://www.equinoxminerals.com/LMC-Supply

Filatotchev, I, R. Strange, J. Piesse & Y. Lien. 1997. Source FDI by Firms from Newly Industrialised Economies in Emerging Markets: Corporate Governance, Entry Mode and Location. *Journal of International Business Studies* 38:4, 556-572

First Quantum Minerals Ltd. 2010a. 2009 Annual Report http://www.first-quantum.com

-----. 2010 b. Annual Information Form http://www.first-quantum.com

-----. 2010c. FQM Corporate Sustainability Strategy http://www.first-quantum.com

Ford, T., J. Rork & B. Elmslie. 2008. Considering the source: Does the country of origin of FDI matter to economic growth? *Journal of regional science* 48 (2) 329-57

Freeman, C. 1995. *The National System of Innovation in historical perspective. Cambridge Journal of Economics* 19, 5-24

Glencore. 2011. Mopani profile. http://www.glencore.com/mopani.html

Gereffi, G. 1999. International Trade and Industrial Upgrading in the Apparel Commodity Chain. *Journal of International Economics* 48 (1), 37-70

-----. 1994. The organization of buyer-driven global commodity chains: how United States retailers shape overseas production networks. In G. Gereffi & M. Korzeniewicz (eds), *Commodity Chains and Global Capitalism.* Westport, CT: Praeger, 95-122.

Gereffi, G., J. Humphrey & T. Sturgeon. 2005. The Governance of Global Value Chains. *Review of International Political Economy* 12 (1), 78-104

Gill, B. & J. Reilly. 2007. The Tenuous Hold of China Inc. in Africa. *Washington Quarterly* 30 (3), 37-52

Government of the Republic of Zambia (GRZ). 2009a. Budget Speech. Lusaka

-----. 2009c. One-Stop Border Post Act. Lusaka

-----. 2008a. Budget Speech. Lusaka

-----. 2008b. Commercial, Trade and Industrial Policy, Lusaka

-----. 2008c. Micro, Small and Medium Enterprise Development Policy

-----. 2008d. Mines and Minerals Development Act. Act

-----. 2007. Zambia Development Agency Act. Lusaka

-----. 2006. Fifth National Development Plan, 2006-2010. Lusaka

-----. 2004-2009. Zambia Yellow Books. Lusaka

-----. 1997. Science and Technology Act. Lusaka

-----. 1996a. National Policy on Science and Technology

-----. 1996b. Technical Education, Vocational and Entrepreneurship Training (TEVET) Policy. Lusaka

-----. 1995. Mines and Minerals Development Act. Lusaka

Government of the Republic of Zambia, NFC Africa Mining and China Nonferrous Metal Industry's Foreign Engineering and Construction Corporation. 1998. Chambishi Mine Development Agreement

Government of the Republic of Zambia and Chibuluma Mines Plc. 1997. Development Agreement

Government of the Republic of Zambia and Konkola Copper Mines Plc. 1997. Amended and Restated Development Agreement

Government of the Republic of Zambia and Mopani Copper Mines Plc. 2000. Mufulira Mine, Smelter and Refinery and Nkana Mines, Concentrator and Cobalt Plant Development Agreement

Government of the Republic of Zambia and Cyprus Amax Kansanshi Plc. 1997. Development Agreement

Giuliani, E., C. Pietrobelli & R. Rabellotti .2005. Upgrading in global value chains: Lessons from Latin American clusters. *World Development* 33:4, 549-573

Gylfason, T. 2001. Natural Resources, Education, and Economic Development. *European Economic Review* 45 (4/6), 847-859

Haglund, D. 2009a. In It for the Long Term? Governance and Learning among Chinese Investors in Zambia's Copper Sector. *The China Quarterly* 199, 627-646

-----. 2009b. Regulating diversity: China and the changing composition of Zambia's mining sector. *The China Monitor Issue 44. Contemporary Sino-Zambian Relations*, Stellenbosch: Centre for Chinese Studies

-----. 2008. Regulating FDI in Weak African States: A Case Study of Chinese Copper Mining in Zambia. *Journal of Modern African Studies* 46, 547-575

Hamilton, G. 1996. The Organizational Foundations of Western and Chinese Commerce: A Historical and Comparative Analysis. In G. Hamilton (ed.) *Asian Business Networks*, New York: Walter de Gruyter, 43-57

He, C. 2003. Location of Foreign Manufacturers in China: Agglomeration Economies and Country of Origin Effects. *Papers in Regional Science 82,* 351-372

Henley, J., S. Kratzsch, M. Kulur & T. Tandogan. 2008. Foreign direct investment from China, India and South Africa in Sub-Saharan Africa: A new or old phenomenon? *UNU-WIDER Research Paper 2008/24*. Helsinki: UNU

Hong, E. & L. Sung. 2006. Dynamics of Internationalisation and Outward Investment: Chinese Corporations' Strategies. *The China Quarterly* 187, 610-634

Humphrey, J. 1995. Industrial Reorganization in Developing Countries: From Models to Trajectories. *World Development* 23:1, 149-162

Humphrey, J. & H. Schmitz. 2001. Governance in Global Value Chains. *IDS Bulletin* 32 (3), Brighton: Institute of Development Studies

-----. 2000. Governance and Upgrading: Linking Industrial Cluster and Global Value Chain Research. *IDS Working Paper 120*. Brighton: Institute of Development Studies

-----.1996. The triple C approach to local industrial policy', *World Development* 24 (12), 1859-1877

International Copper Study Group. 2010. World Copper Factbook 2010, Lisbon: ICSG

-----.2009. Impact of lower copper prices and world economic downturn on copper supply and demand, *ICSG Insight 5.* Lisbon: ICSG

-----.2008. Impact of the financial crisis on the copper industry, *ICSG Insight 4.* Lisbon: ICSG

-----.2007. Zambia Country Profile, *ICSG Insight 2.* Lisbon: ICSG

Isham, J., L. Pritchett, M. Woolcock & G. Busby. 2003. The Varieties of the Resource Experience: How Natural Resource Export Structures Affect the Political Economy of Economic Growth. Washington D.C.: World Bank

Kaplan, D. & R. Kaplinsky. 1999. Trade and industrial policy on an uneven playing field: The case of the deciduous fruit canning industry in South Africa', *World Development* 27 (10), 1787-1801

Kaplinsky, R. 2008. China and the Terms of Trade: The Challenge to Development Strategy in SSA. Paper prepared for *2nd Mount Holyoke Conference on Global Challenges*, The Rise of China: Global Challenges and Opportunities, Holyoke, MA

-----. 1993. Export Processing Zones in the Dominican Republic: Transforming manufactures into commodities. *World Development* 21 (11), 1851-1865

Kaplinsky, R. & M. Morris. 2008. Do the Asian Drivers Undermine Export-Oriented Industrialisation in SSA. *World Development Special Issue on Asian Drivers and their Impact on Developing Countries* 36 (2), 254-273.

-----. 2006. The Structure of Supply Chains and Their Implications for Export Supply paper prepared for the *African Economic Research Consortium,* Nairobi

-----.2001. A Handbook for Value Chain Research', Institute of Development Studies, University of Sussex, www.globalvaluechains.org

Kaunda, F. 2002. Selling the Family Silver: the Zambian Copper Mines Story, KwaZulu Natal: Printpak Books

Konkola Copper Mines Plc. 2010. Annual report 2009, http://www.kcm.co.zm/

-----.2010. Corporate Social Responsibility Policy, http://www.kcm.co.zm/

Kragelund, P. 2009. Part of the Disease Or Part of the Cure? Chinese Investments in the Zambian Mining and Construction Sectors. *European Journal of Development Research* 21, 644–661

Lall, S. 2000. Selective Industrial and Trade Policies in Developing Countries: Theoretical and Empirical Issues. *Working Paper n. 48* QEH Working paper series

-----. 1994. The East Asian Miracle: does the bell toll for industrial strategy? *World Development* 22 (4), 645 – 654

-----. 1992. Technological Capabilities and Industrialisation. *World Development* 20 (2), 165-186

Lall, S. and M. Teubal. 1998. Market Stimulating Technology Policies in Developing Countries: A Framework with Examples from East Asia. *World Development* 26 (8), 1369-1385

Li, Pengtao. 2010. The Myth and Reality of Chinese Investors: A Case Study of Chinese Investment in Zambia's Copper Industry. *SAIIA Occasional Paper 62.* Johannesburg: SAIIA

Libby, R.T. & M.E. Woakes. 1980. Nationalisation and the displacement of development policy in Zambia. *African Studies Review* 23 (1), 33-50

Lorentzen, J. 2008. Knowledge intensification in resource-based economies. In Lorentzen, J. (ed.) *Resource Intensity, Knowledge and Development: Insights from Africa and South America*. Cape Town: HSRC Press

Lungu, J. 2008. Copper mining agreements in Zambia: Renegotiation or law reform? *Review of African Political Economy* 117, 403-415

Maloney, W.F. 2007. Missed Opportunities: Innovation and Resource-Based Growth in Latin America. In Lederman, D. & W.F. Maloney (eds), *Natural Resources: Neither Curse nor Destiny*. Washington, DC: Stanford University Press and The World Bank, 141-182

Mc Cormick, D. 1999. African Enterprise Clusters and Industrialisation: Theory and Reality. *World Development* 27 (9), 1531-1551

Metorex Ltd. 2010a. 2009 Annual Report http://www.metorexgroup.com

-----. 2010b. Competent Persons Report and Valuation of Chibuluma Mines Plc. http://www.metorexgroup.com

-----. 2010. Corporate Governance Policies. http://www.metorexgroup.com

Mining Weekly. 2006. *New Mopani smelter is largest in Africa*. 6/10/2006 http://www.miningweekly.com

Moss, T. & S. Rose. 2006. China ExIm Bank and Africa: New Lending, New Challenges. *CGD Notes.* Washington: Centre for Global Development

Morris, M. 2001. Creating value-chain cooperation. In G. Gereffi & R. Kaplinsky (eds.) The Value of Value Chains. *IDS Bulletin 32(3*), Brighton: Institute of Development Studies

Morrison, A., C. Pietrobelli and R. Rabellotti. 2006. Global Value Chains and Technological Capabilities: A Framework to Study Industrial Innovation in Developing Countries. *CESPRI Working Papers 192*, Milan: Bocconi University

Nadvi, K. 1999. Collective Efficiency and Collective Failure: The Response of the Sialkot Surgical Instrument Cluster to Global Quality Pressures. *World Development* 27 (9), 1605-1626

National Economic Advisory Council. 2007. Survey of quantity and quality of employment in the mining and manufacturing sectors in Zambia. Lusaka

North, D. 1990. Institutions, Institutional Change, and Economic Performance. Cambridge: Cambridge University Press

North-South Corridor International Financing Conference. 2009. Full Final Report, 6-7 April 2009. Lusaka

OECD. 1997. The National System of Innovation. Paris: OECD

Rabellotti, R. 1995. Is there an industrial district model? Footwear districts in Italy and Mexico Compared. *World Development* 23 (1), 29-41

Ren, B., H. Liang & Y. Zheng. 2010. Chinese Multinationals' Outward Foreign Direct Investment: An Institutional Perspective and the Role of the State. Paper presented at the *4th China Goes Global Conference*, Harvard University

Ross, M. 1999. The Political Economy of the Resource Curse. *World Politics* 51, 297-322

Rosser, A. 2006. The Political Economy of the Resource Curse: A Literature Survey. *IDS Working Paper 268*, Brighton: Institute of Development Studies

Sachs, J.D. & A.M. Warner. 2001. The curse of natural resources. *European Economic Review* 45, 827-838

-----. 1997. Natural resource abundance and economic growth. In G. Meier & J. Rauch (eds.) *Leading Issues in Economic Development*. Oxford: Oxford University Press

Sauvant, K.P. 2004. New Sources of FDI: The BRICs. Outward FDI from Brazil, Russia, India and China. *The Journal of World Investment and Trade* 6, 639-709

Schmitz, H. 1995. Small shoemakers and Fordist giants: tale of a supercluster. *World Development* 23 (1), 9-28

Schmitz, H. & P. Knorringa. 1999. Learning from global buyers. *IDS Working Paper 100*, Brighton: Institute of Development Studies

Schmitz, H. & K. Nadvi. 1999. Clustering and Industrialization: Introduction. *World Development* 27 (9), 1503-1514

Shafer, M.D. 1990. Sectors, states, and social forces: Korea and Zambia confront economic restructuring. *Comparative Politics* 22 (2), 127-150

Southern Africa Resource Watch. 2010. South African Mining Companies in Southern Africa. Corporate Governance and Social Responsibilities. Johannesburg: Southern Africa Resource Watch

Stiglitz, J. E. 1989. Markets, markets failures, and development. *The American Economic Review*, 79 (2), 197-203

Sturgeon, T.J. 2008. From commodity chains to value chains: Interdisciplinary theory building in an age of globalisation. *MIT IPC Working Paper 08-001*, Cambridge: MIT

Suliman, K. & Badawi, A. 2010. Assessment of the Foreign Direct Investment: the Case of Sudan. Paper prepared for the *AERC Collaborative Research Project on The Impact of China-Africa Relations*, Nairobi

Taylor, I.1998. The Evolution of Zambia's Relations with China, *Africa Insight* 28 (1/2), 47-52

UNCTAD. 2010. World Investment Report, New York and Geneva: UNCTAD

-----.2008. Africa Investment Directory, Volume X, New York and Geneva: UNCTAD

-----.2007. World Investment Report 2007: Transnational Corporations, Extractive Industries and Development. New York: United Nations

-----.1996. The Uruguay Round and the World Copper Market, Geneva: UNCTAD

UNDP. 2007. Economic Policies for growth, employment and poverty reduction. Lusaka: UNDP

UNESCO. 2010. Science Report. Paris: UNESCO

USGS. 2010. 2007 Minerals Yearbook, Zambia

-----. 2008. Mineral Commodity Summaries: Copper. http://minerals.usgs.gov/

World Bank. 2011. Doing Business 2011: Zambia. Washington DC: The World Bank

-----.2009. Transport prices and costs in Africa: A review of the international corridors. Washington DC: The World Bank

-----2003. Mining Reform and the World Bank: Providing a Policy Framework for Development. Washington DC: IFC

Wright, G. & J. Czelusta. 2004. The myth of the resource curse. *Challenge* 47 (2), 6-38

-----2007. Resource-Based Growth Past and Present. In Lederman, D. & W.F. Maloney (eds), *Natural Resources: Neither Curse nor Destiny*. Washington, DC: Stanford University Press and The World Bank, 183-211

Yao, S., D. Sutherland and J. Chen. 2010. China's Outward FDI and Resource Seeking Strategy: A Case Study on Chinalco and Rio Tinto. *Asia-Pacific Journal of Accounting & Economics* 17, 313-326

Zafar, A. 2007. The Growing Relationship Between China and Sub-Saharan Africa: Macroeconomic, Trade, Investment, and Aid Links. *World Bank Research Observer* 22 (1), 103-130

Zhan, J.X. 1995. Transnationalization and Outward Investment: the Case of Chinese Firms'. *Transnational Corporations* 4 (3), 67–100

Zhao H., & G. Zhu. 2000. Location Factors and Country of Origin Differences: An Empirical Analysis of FDI in China. *Multinational Business Review* 8, 60–73

Zambia Development Agency. 2010a. *Asian Investment in Zambia Rises above US$6 Billion*. 05/02/10 http://www.zda.org.zm

----. 2010b. *Zambia, China Sign Five Agreements*. 02/03/10 http://www.zda.org.zm

----. 2010c. *Chinese Firm To Invest In Zambia*. 27/07/2009 http://www.zda.org.zm